An integrative cognitive theory of suggestion and hypnosis

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ABSTRACT

On the basis of a critical review of the literature in chapter one, it is concluded that no existing theory of hypnosis is able to provide a satisfactory account of the entire set of behavioural, cognitive, social and physiological evidence pertaining to the phenomenon. In an attempt to rectify this situation, an integrative conceptual framework amalgamating existing theories of hypnosis into a single model on the basis of contemporary cognitive psychological theory is presented in chapters two and three. According to the model, successfully executed suggestions result from the automatic activation of perceptual and behavioural representations following the receipt of triggers by low level attentional systems. By this view, the processes involved in hypnotic and non-hypnotic suggestions are essentially the same; however, it is argued that contextual features and state changes associated with the hypnotic situation are responsible for the increased responsivity to suggestions typically displayed therein.

In the following chapters, four studies designed to assess predictions from the model are described. In the first two, the related predictions that suggestibility is positively related to a low level processing predisposition and negatively related to a high level processing predisposition were assessed. Both studies provided support for the first hypothesis although no evidence for the second hypothesis was obtained. The third and fourth studies examined the related hypotheses that hypnosis is associated with (i) a low level processing bias; and (ii) a high level processing inhibition. Neither hypothesis received any significant empirical support.

In the final chapter, the results of these studies are discussed with reference to the theoretical framework outlined in the introductory chapters. It is concluded that the model provides a fairly good account of suggestion, although certain revisions are required before an adequate account of hypnosis can be offered. Avenues for future research are explored.

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CHAPTER ONE: Literature review

1.1 Introduction

What is hypnosis? The question remains as pertinent today as it was two hundred years ago when the scientific investigation of the phenomenon first began. A recent definition (see appendix I) adopted by the hypnosis division of the American Psychological Association describes hypnosis as "...a *procedure* wherein changes in sensations, perceptions, thoughts, feelings, or behaviour are suggested" (in Kirsch, 1994, p 143; emphasis added). To remain theoretically neutral, the definition emphasises the operational rather than the psychological. For while few researchers within the field would deny that, in susceptible individuals at least, hypnotic procedures regularly succeed in bringing about such changes in sensation, perception and so forth, probably fewer still would argue that the field was in any way agreed as to why or how this is the case. Two centuries of research and theory have yielded an abundance of findings concerning the cognitive, social, phenomenological and physiological nature of hypnosis and hypnotic susceptibility. And yet a single integrative theory of hypnosis which ties together these disparate strands into a unifying explanatory framework remains curiously lacking.

In this thesis I aim to provide a tentative description of what such a unified theory might look like, and begin the task of assessing its validity empirically. In this chapter existing theory and research within the field will be examined in a bid to identify the current status of our knowledge concerning hypnosis and hypnotic susceptibility. In chapter two a model of the cognitive system based on contemporary cognitive psychological research and theory will be outlined which will then be used as a framework for the explanation of suggestion, hypnosis and hypnotic susceptibility in chapter three. In the subsequent chapters, four empirical studies designed to investigate the assertions laid out in chapters two and three will be described. In the concluding chapter the model will be evaluated in light of the findings of these studies and directions for future research will be discussed.

1.2 The domain of hypnosis

Before addressing contemporary hypnosis research and theory, some preliminary comments concerning the domain of interest to the current thesis are in order. Traditionally, and perhaps still within the public sphere, hypnosis has been regarded as an altered state of consciousness (or 'trance') resembling sleep[2], in which unusual or incredible mental and physical phenomena are manifested. The methods by which hypnosis can be 'induced'[3] vary enormously, although ritualistic instructions (or *suggestions*[4]) from the hypnotist[5] for sleep or relaxation, an inward focus of attention, and imagery are probably the most common, at least amongst proponents of so-called 'direct' methods of induction (see e.g. Edmonston, 1986; Waxman, 1989). Following the hypnotic induction, suggestions are typically given for particular behaviours or experiences, with the nature of suggestions varying from one situation and purpose to another. On the behavioural side, extremely complex actions are possible during hypnosis although typical behavioural suggestions involve instructions for relatively simple motor movements such as the rising of arms or fingers. Suggestions for simple motor inhibitions, such as the inability to bend or move a limb, are also commonplace. What is apparently unusual about hypnosis is that the successful enactment of such suggested behaviours is typically accompanied by a feeling of involuntariness, a phenomenon that has been labelled the 'classic suggestion effect' (Weitzenhoffer, 1953). Thus, the rising of an hypnotic subjects' arm following a successful arm levitation suggestion feels as though it is happening 'by itself' and without any effort. Conversely, following a successful suggestion for motor inhibition, the individual seems to make every effort to overcome the inhibition and is often surprised at their inability to do so.

The enactment of experiential suggestions during hypnosis are perhaps even more impressive. Following a set of simple commands from the hypnotist, a responsive subject can, for example, be inspired to display (i) behaviours consistent with the presence or absence of people or objects that seem in direct conflict with objective reality (positive and negative hallucination suggestions); (ii) an apparent insensitivity to pain (as in an analgesia suggestion), and (iii) an inability to remember extremely well-learned material (an amnesia suggestion); moreover, an individual may display suggested behaviours after the termination of the hypnotic session, as in the enactment of post-hypnotic suggestions. As with suggestions for hypnotic behaviours, experiential suggestions are perceived as

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[2] Indeed, the word hypnosis is derived from the Greek *hypnos* or 'sleep'.

[3] Scare quotes are used here to emphasise the fact that many theorists do not regard hypnosis as an altered state of consciousness and therefore not something that can be 'induced' as such.

[4] In a practical sense, the term 'suggestion' refers to the communication from an apparently authoritative source which implicitly or explicitly advances some proposition without supporting justification or evidence (Gwynn & Spanos, 1996). Hypnotic suggestions are distinctive only in that they are administered in a context which is explicitly labelled as hypnosis.

[5] In other words, the person attempting to induce hypnosis in the subject or client.

subjectively real, in that the hypnotic individual genuinely believes that they cannot feel pain, cannot remember and so on.

It is such apparently incredible suggested behaviours and experiences that are responsible for the reputation that hypnosis maintains within the public sphere as a powerful and unusual phenomenon. Regardless of theoretical persuasion, few hypnosis researchers would doubt the validity of the subjective reality of suggested behaviours and experiences, and it is the explanation of such effects that is the primary focus of research within the field. However, the field is far from agreed as to the psychological mechanisms by which these effects are brought about. In contrast with the majority of previous theories, this thesis is unusual in that it represents an attempt to provide an account of the mechanisms involved in the production of these effects which is acceptable to theorists from across the conceptual spectrum.

1.3 Hypnosis theory and research

In this section several of the more popular contemporary accounts of hypnosis and the evidence cited in their support will be described and evaluated, as a backdrop and general introduction to the theoretical framework which will be outlined in chapters two and three.

1.3.1 Ego-psychological theory

Since the development of psychoanalysis by Freud and Breuer, psychodynamically oriented clinicians and researchers have had an interest in the nature of hypnosis and its potential value as a therapeutic tool. Possibly the most influential psychodynamic account of hypnosis is the ego-psychological model of Fromm (e.g. Fromm, 1979, 1992). Fromm's account of hypnosis is based largely on the application of psychoanalytical concepts to hypnosis theory and research, and her own substantial clinical observations. More specifically it has theoretical roots in the tradition of ego-psychology originated by Freud (1923/1961) and borrows heavily from the work of Rapaport (1953/1967) and Gill and Brenman (1959). It is also similar in many respects to the later topographical regression theory proposed by Nash (1991).

Traditionally, psychoanalytic theory suggests that mental functions can be divided into the *primary* and *secondary processes.* The primary processes are emotional, illogical and image-based, developmentally immature and are said to be the seat of intuition. Conversely, secondary processes are developmentally mature, based on sequential logic and reason, and encode information as language and abstract propositions. Fromm

(1979) suggests that pure secondary and primary processes are most usefully regarded as the extreme poles of a continuum of ego functioning representing the distinction between conscious and unconscious.

All behaviour is controlled through the dynamic balance that exists between the primary and secondary processes, with normal functioning in the mature adult being biased towards secondary process activity. According to Fromm's ego-psychological model, hypnosis represents one way in which this balance becomes subject to change. By this view, during the course of an induction the individual enters a state of 'ego receptivity' (Deikman, 1971) by which a reduction in normal orienting functions (Generalised Reality Orientation; Shor, 1959) facilitates the relaxation of defensive barriers. In so doing the individual relinquishes a degree of secondary process activity biasing them towards the adaptive use of primary process thought; this shift from sophisticated, logical thought towards more primitive and illogical mental activity has been described by Gill and Brenman (1959) as a 'regression in the service of the ego'. Fromm (1992) suggests that one of the mechanisms by which this regression might occur during hypnosis is through the individuals' intense *absorption* (Tellegen & Atkinson, 1974) in the imagery that is used in the course of a typical hypnotic induction, so-called 'imaginative involvement' (J. Hilgard, 1974, 1979).

According to the ego-psychological view, the increase in suggestibility that accompanies hypnosis is a result of the reduction in critical thought associated with extremely focused attention and states of ego-receptivity. Other characteristics of hypnosis, such as the use of imagery and fantasy (see Sheehan, 1979, for a review), the incidence of 'trance logic' (the apparent tolerance for logical incongruities during hypnosis; Orne, 1959), heightened emotionality (e.g. Crawford, Clarke, Kitner-Triolo & Olesko, 1989), superior creativity (e.g. P. Bowers, 1967; Raikov, 1976, 1977) and the sense of involuntariness that accompanies hypnotic behaviours are the product of the resultant bias towards primary process activity.

A small number of studies inspired by psychoanalytic conceptions of hypnosis have investigated whether the hypnotic state is characterised by increased primary process activity with a corresponding decrease in the secondary processes. Fromm, Oberlander and Gruenewald (1970) administered an adapted version of the Rorschach test (with a scoring method designed to assess the degree and kind of primary process thought and its fluctuations; Holt, 1963, 1969) to medium and high hypnotic susceptibles in both the waking and hypnotic states, with a four week interval separating the two sessions to counteract the influence of memory on the test. As predicted, when calculated blindly by three independent raters, scores indicated a significant increase in primary process activity during hypnosis. When this experiment was replicated and extended in a follow-up by Levin and Harrison (1976) including scores on a Thematic Apperception Test (TAT) as a further dependent variable, similar results were obtained. More recently, a study by Hammer, Walker and Diment (1978) using detailed content analysis of subjective responses to a poem presented to waking, hypnotic and simulating groups indicated a similar increase in primary process mentation.

Although these studies have been cited as supporting the idea of a shift from secondary to primary process thinking during hypnosis, the validity of this conclusion can be seriously questioned on methodological grounds. Despite the popularity of projective methods in the psychoanalytic world, the Rorschach test is regarded by many in mainstream psychology as being somewhat inadequate as a psychometric device (e.g. Reber, 1985; Eysenck, 1986). According to Eysenck (1986), due to its deliberately amorphous nature, the Rorschach test is sensitive to almost any whim of an individual's personality; as such, it is extremely difficult to say with any certainty what the test is actually measuring, a product of the inherent *generality* that most psychoanalytical models have, over the years, been found guilty of, and of which the ego-psychological account of hypnosis is no exception. In addition, it is entirely plausible that subjects' responses on the Rorschach simply reflect their beliefs concerning hypnosis and not any fundamental change in information processing occurring therein.

There is, however, some evidence in support of the ego-psychological assertion that hypnosis is associated with an unusual tolerance for logical incongruities, so-called 'trance logic' (Orne, 1959, 1966). In the original demonstration of the trance logic phenomenon (Orne, 1959), the responses of a group of highly suggestible individuals given an hypnotic induction and visual hallucination suggestion were compared to those of a group of low suggestibles instructed to simulate[6] hypnosis. Both groups of subjects were placed in front of a seated experimental confederate and told to close their eyes; at this point the confederate moved out of the subjects' line of sight, the suggestion that the individual was still sitting in front of them was given, followed by the instruction to open

[6] Orne's (1959) paper is considered by many to be a landmark in hypnosis research for its introduction of the so-called 'real-simulator' (RS) design (see also Orne, 1979). In the RS design, the responses of highly suggestible individuals following an hypnotic induction are compared to those of a group of low suggestibles (who are insensitive to the hypnotic induction) who have been instructed to fake the performance of a good hypnotic subject; this hypnotic 'simulation' is performed in a bid to fool the experimenter, blind to their group status, into believing that they are hypnotised, something which the majority of simulators are capable of doing with ease. The use of such a quasi-control group is intended to reveal what aspects of hypnotic behaviours and experiences are potentially the result of expectations and contextual cues present in the hypnotic situation, and those which cannot be explained by such factors.

their eyes. Many of the hypnotic 'reals', but none of the simulators, subsequently reported seeing a transparent image in front of them (the 'transparency response'); moreover, when confronted by the actual confederate, the majority of hypnotic 'reals' reported seeing both the confederate and their hallucinated image (a so-called 'double hallucination'), while the simulators rarely reported seeing both. According to Orne (1959), such real-simulator differences are the product of the hypnotic individual's tolerance for logical incongruities (trance logic), something which, not being shown by hypnotic simulators, he argued was part of the 'essence' of hypnosis (i.e. not a product of 'demand characteristics').

Although a number of studies have subsequently failed to find evidence for Orne's double hallucination phenomenon (e.g. Blum & Graef, 1971; Johnson, Maher & Barber, 1972; McDonald & Smith, 1975; Sheehan, Obstoj & McConkey, 1976; Spanos, de Groot, Tiller, Weekes & Bertrand, 1985), the transparency effect has been replicated a number of times using a number of different stimuli and assessment techniques (e.g. Johnson *et al*, 1972; McDonald & Smith, 1975; Sheehan *et al*, 1976; Spanos, de Groot, *et al*, 1985; Stanley, Lynn & Nash, 1986). Moreover, the demonstration of a third phenomenon that apparently discriminates reals and simulators, so-called 'incongruous writing[7]', has lent further support to the trance logic concept. Such apparent demonstrations of trance logic phenomena have not been without criticism, however. Most notably, a number of investigators (e.g. Barber, 1969; Spanos, 1986) have argued that the demands placed on reals and simulators are not comparable, and there is some evidence to suggest that these differential demands are responsible for the trance logic effect in visual hallucination (see e.g. Barber, 1969). Accordingly, alternative explanations of the trance logic phenomena have been proposed. Spanos and Radtke (1981), for example, summarise evidence showing that individuals asked to *imagine* objects tend to describe their images as vague and transparent, contradicting the view that the transparency response is illogical and unique to hypnotic hallucination. According to Spanos (1986), simulating subjects do not show the transparency response to the double hallucination suggestion because the inherent demand is to behave as though the hallucinated object is "as real as real" rather than vague and incomplete. At

[7] The incongruous-writing effect (Peters, 1976; cited in Spanos, 1986) can be observed during the enactment of an hypnotic age regression to early childhood in which the regressed subject is asked to write a complex sentence such as 'I am participating in a psychological experiment'. Although the hypnotic subject completes the sentence in what appears to be child-like handwriting (in line with their apparently regressed state) they typically do so without making a single spelling-error, despite the fact that a young child would almost certainly be unable to do this.

present, existing evidence is insufficient to provide an unequivocal resolution to the dispute.

There are also doubts regarding the ego-psychological account's prediction that hypnosis involves a significant increase in the amount and quality of imagery experienced by the hypnotised subject. While many studies (e.g. Sanders, 1967; Starker, 1974) have found the expected increase in reported imagery during hypnosis compared to a relaxed, waking condition, a similar proportion have not (e.g. Barber & Wilson, 1977; Coe, St. Jean & Berger, 1980). While such contradictory findings are not encouraging, at least some of the problem would appear to lie in the inadequacies of the self-report measures used in many of these studies. For example, Crawford (1979) has demonstrated how the limited range of scores on the most commonly used of these measures (the Vividness of Visual Imagery Questionnaire or VVIQ; Marks, 1973) can artifactually influence results by creating a ceiling-effect for high imagers during hypnosis. In addition, such measures are highly sensitive to subject expectations and demand characteristics; although scores on the VVIQ demonstrate a reasonable test-retest reliability (de Groh, 1989), their usefulness remains limited due to the subjective nature of the responses required.

With regards more objective measures of imaginative processes during hypnosis, there is a considerable lack of empirical work. Findings indicating that high imagers perform certain tasks involving imagery in their mediation better than low imagers (e.g. Ernest, 1977) has fuelled the suggestion that, for susceptible individuals, hypnosis enhances performance on imagistic tasks. However, despite the extensive investigation of mental imagery within cognitive psychology, very little of this work has actually been utilised to investigate the effect of hypnosis on imagery-related processing (Crawford, 1982a). A study by Crawford (1979) using a visual memory discrimination task (developed by Gur & Hilgard, 1975, as an objective, non-hypnotic test of imaging ability) to examine the differences between high and low susceptibles in the waking and hypnotic states is one notable exception. No differences between the two groups were revealed during ordinary waking, but under hypnosis the highly susceptible group demonstrated a clearly superior improvement on the task compared to the lows. Similar results were found in a more rigorous follow-up study using the same stimuli (Crawford & Allen, 1983). Perhaps an even more impressive example of this apparent facilitative effect of hypnosis on imaging has been the demonstration of eidetic-like (i.e. photographic) memory for complex visual stimuli (unfakeable Julesz stereograms) by a very few high, but not low, susceptibles during hypnosis (e.g. Walker, Garrett & Wallace, 1976; Wallace, 1978).

Although studies such as these have yielded results in line with the ego-psychological theory's predictions about the effect of hypnosis on imagery, sample sizes have generally been low and often the use of important control groups, such as Orne's (1979) hypnotic simulators used to control for expectation and task demands, has been neglected. Furthermore, some studies using objective measures have not supported this hypothesis (e.g. Cooper & London, 1973). Clearly there exists some relationship between imagistic processes and hypnosis but existing evidence remains insufficient to elucidate the nature of this relationship (Sheehan, 1979). Given the extensive history of the association between hypnosis and imagery, dating back to the findings of the Franklin commission in the eighteenth century, it is hard to reject the notion of increased imagery during hypnosis. However, whether imagery is intrinsic to hypnosis or is simply a product of the wording of hypnotic inductions is questionable, with recent evidence suggesting that imagery is not essential to hypnotic responding (Bartis & Zamansky, 1990; Hargadon, Bowers & Woody, 1995; although cf Heyneman, 1990) seeming to support the latter interpretation.

Nevertheless, the idea that hypnosis involves an intense fascination with fantasy-related material which is central to the ego-psychological model is strongly supported by the work of J. Hilgard (1974, 1979) concerning the phenomenological nature of hypnosis. Following a series of extended interviews, J. Hilgard noted that the most highly susceptible individuals tend to describe the hypnotic situation as one in which they experience "...almost total immersion in the [imaginal] activity, [and] with indifference to distracting stimuli in the environment" (1974; p.5). In addition, Hilgard's research suggests that high susceptibles are more inclined to engage in similar activities in the course of their everyday lives. For example, sports which require absolute, absorbed concentration to excel such as archery and long-distance running are likely to yield a disproportionate amount of highly susceptible individuals. Other roles that entail this 'imaginative involvement' (e.g. acting) are also liable to be filled by high susceptibles.

J. Hilgard's concept of imaginative involvement is practically synonymous (see Kirsch & Lynn, 1995) with Tellegen and Atkinson's (1974) concept of hypnotic *absorption*. Research using the Tellegen Absorption Scale (TAS; Tellegen & Atkinson, 1974), a self-report measure designed to assess subjects' experience of 'hypnotic-like' (e.g. Shor, 1960; Lee-Teng, 1965) phenomena in the course of normal life, has shown that absorption consistently correlates with hypnotic susceptibility, typically in the region of

0.3 - 0.4 (Roche & McConkey, 1990) making it arguably the most successful personality predictor of susceptibility.

More recently, the concepts of imaginative involvement, absorption and imagery have been tied together with the notion of the *fantasy-prone personality* (Wilson & Barber, 1983). On the basis of work using the Inventory of Childhood Memories and Imaginings (Wilson & Barber, 1981), Lynn and Rhue (1986) have demonstrated a strong relationship between abnormally high levels of hypnotic susceptibility and a constellation of personality traits that converge on fantasy involvement and a preference for an imaginative cognitive style. In particular, these fantasy-prone individuals are likely to engage in disproportionately large amounts of image-based day-dreaming, become intensely absorbed in imaginative activities such as reading books or watching films and show high levels of imagery vividness (Crawford, 1982b). Furthermore, they are far more likely to experience physical reactions such as nausea to observed violence on television or in films, suggesting that fantasy-prone individuals are more sensitive to unconsciously evaluating stimuli on the basis of emotional valence than those who are less prone to fantasy. On the basis of this research, it is apparent that a fairly large proportion of the most highly susceptible individuals tend to engage in primary process activities in their everyday waking lives - they are emotional, absent-minded day-dreamers: according to Lynn and Rhue (1991a) these individuals "...seem able to respond to non-hypnotic activities that require a temporary diminution of rational, reality-bound analytical thinking" (p. 203). The notion that individuals who are highly prone to engaging in fantasy-related activity involving the inhibition of rational and reality-based cognitive processes are extremely susceptible to hypnosis clearly seems to support the assertions of the ego-psychological model. However, it is apparent that the relationship between imaginative involvement, fantasy proneness and hypnotizability is not as strong as one might expect. According to the findings of Lynn & Rhue (1986), for example, not all fantasy-prone individuals are highly hypnotizable, demonstrating that there is more to hypnotizability than a simple propensity for fantasy.

Evidence cited in support of the ego-psychological prediction that hypnosis will be characterised by an increase in creativity has also come under question in recent years (see Lynn & Sivec, 1992, for a review). Although a small number of studies have found that high hypnotizables show a significant increase in creativity performance on certain tasks during hypnosis (e.g. P. Bowers, 1967; Gur & Reyher, 1976; Raikov, 1976, 1977) several others have not (see e.g. K. Bowers & van der Meulen, 1970; Perry, Wilder & Appignanesi, 1973); in addition, a study by Jackson and Gorassini (1989) found the predicted increase in creativity during hypnosis for both high *and* low susceptible subjects, suggesting that relaxation rather than hypnosis may be the moderating variable. According to Lynn and Sivec (1992), the most robust finding regarding the creativity and hypnosis relationship is that high susceptibles seem to demonstrate superior creativity to lows, irrespective of the condition in which this is measured. Although interesting in its own right, this finding does not lend particular support to the ego-psychological view of hypnosis *per se*.

1.3.2 Dissociation theories

1.3.2.1 Neodissociation theory

Since the turn of the century and the work of Pierre Janet, William James and William McDougall, hypnosis has been regarded by many as a form of dissociative phenomenon and neodissociation theory (e.g. Hilgard 1977, 1986, 1994) is firmly rooted in this tradition. In this context, dissociation has been defined as the splitting off of actions, thoughts, feelings etc. from conscious awareness. Neodissociation theory regards hypnosis as the state in which the hypnotised individual becomes subject to such dissociations in a controlled fashion, as manipulated by the suggestions of the hypnotist. Hilgard's theory has proved an extremely popular cognitive account of hypnotic responding, representing, until recent years at least, probably the most influential of the more traditional approaches to hypnosis.

According to the theory, our cognitive architecture consists of a number of functionally autonomous, yet interacting cognitive control systems - corresponding to specialised behavioural routines - that are hierarchically arranged beneath a central executive ego. The executive ego is a limited capacity monitoring and controlling system that deals with planning and initiating goal-directed behaviours; moreover, it is under the conscious control of the individual and thus consumes attentional resources. The executive ego is responsible for selecting the appropriate cognitive control systems for any given task; however, in order to conserve the limited resources of the executive, once control systems are selected they are able to function with a considerable degree of autonomy from the executive, themselves monitoring environmental events for appropriate triggers and executing behaviours accordingly. As such, they have become *dissociated* from the executive ego, with their continued operation occurring largely outside awareness. In this way, well-learned behaviours can be performed effortlessly and concurrently. According to Hilgard, such processing dissociations are fundamental to human cognition, with the

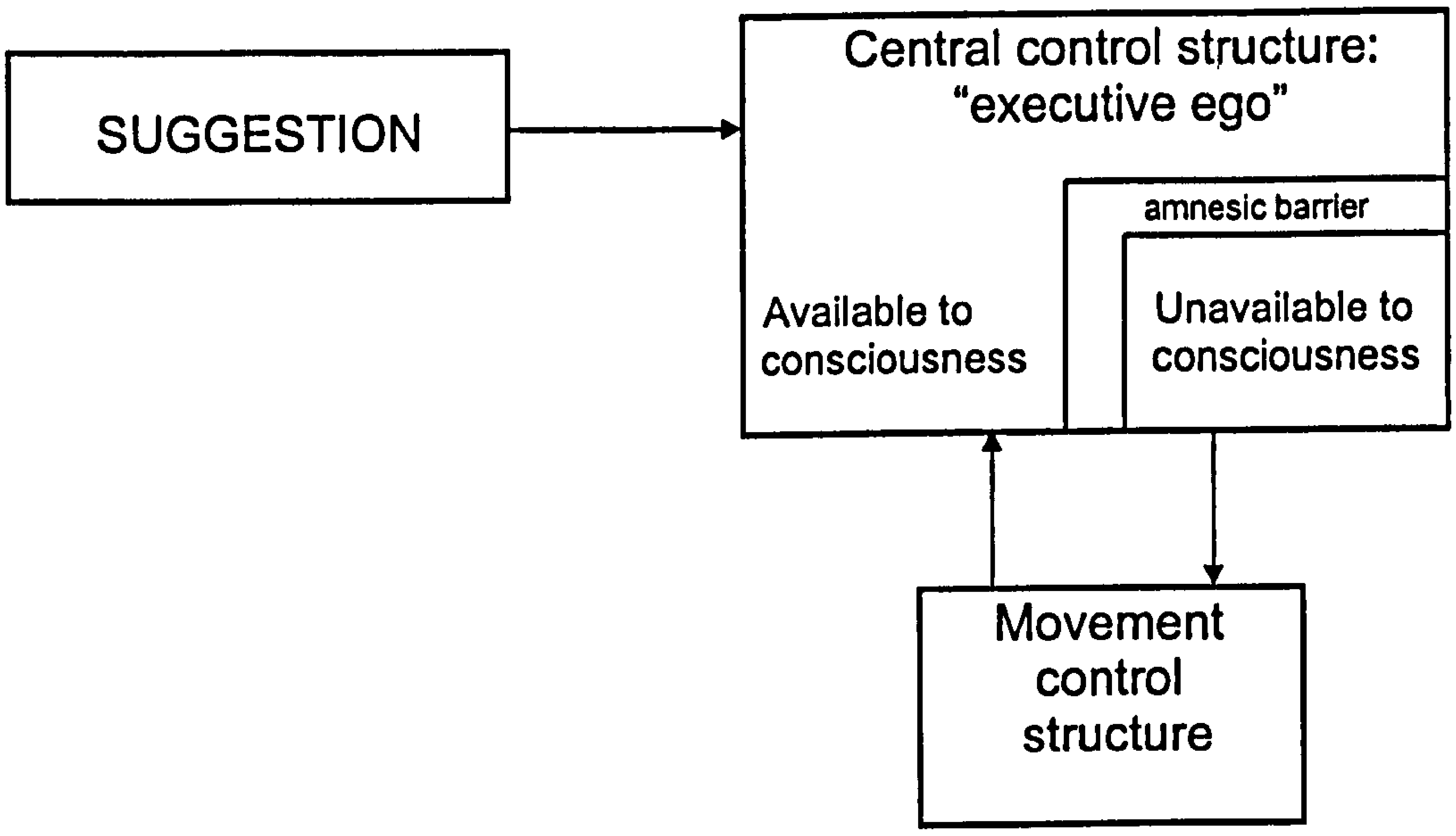

Figure 1.1: The neodissociation account of non-volitional responding. Adapted from Kirsch and Lynn (1995).

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conscious representation of information being largely unnecessary for the execution of extremely complex behaviours.

By Hilgard's view, the notion that the majority of cognitive activity, including complex operations such as low-level planning and monitoring, is realised outside conscious awareness provides the basis for understanding the nature of hypnotic responding. Although the selection of cognitive control systems is under the remit of the executive ego, the operation of the ego itself is constrained by both situational and dispositional factors. According to Hilgard, hypnosis represents one situation where the operation of the executive ego may become subject to external influences, in the form of suggestive communications from the hypnotist. Hilgard asserts that an hypnotic induction brings about the inhibition of executive functions creating a fractionation within the ego. Although part of the executive continues to function as normal during hypnosis, a second, dissociated part, is concealed from awareness by the formation of an amnesic barrier. This part of the ego can exert control in the usual fashion but such control is prevented from representing itself in consciousness by the amnesia (see figure 1.1). The hypnotist's suggestions operate by influencing the dissociated part of the executive to initiate changes in the cognitive hierarchy. In this way, cognitive control systems can become artificially dissociated from the controlling influence of the executive: their selection or inhibition can be controlled by the suggestions of the hypnotist, but once selected, and if left without further suggestion, they will function autonomously as normal, as though their action had been instigated in the usual fashion. As the hypnotised individual is aware only of the resultant changes in behaviour and experience, and not the cognitive activity by which such changes were brought about, they experience the execution of suggestions as occurring involuntarily.

Hilgard's notion that hypnosis brings about the fractionation of the executive ego was originally posited as being one of two dissociative mechanisms which are responsible for hypnotic phenomena (see Bowers & Woody, 1996). However, in recent years Hilgard has argued that the fractionation mechanism is the most plausible account of hypnotic responding, and it is now widely regarded as being the central tenet of the neodissociation model (see Kirsch & Lynn, 1995; Bowers & Woody, 1996). The second dissociative mechanism originally presented by Hilgard now forms the basis of the dissociated control model of hypnosis (e.g. Bowers, 1990, 1992; Woody & Bowers, 1994) and will be discussed presently.

The assertion that hypnosis brings about the fractionation of the executive ego producing co-existing conscious and unconscious executive elements was partly inspired by a chance discovery made by Hilgard during a routine classroom demonstration of hypnotic phenomena. Following the successful implementation of an hypnotic deafness suggestion, the question arose as to whether or not the 'deaf' individual was at some level aware of the things being said around them, despite overt evidence to the contrary. Intrigued by the question, Hilgard asked the subject whether or not part of their mind could hear what was being said to them, and, if so, whether they could confirm this by raising a finger. The subsequent finger-raising and recounting of all that had transpired since the deafness suggestion was given signalled the discovery of what Hilgard (1973a) has termed the 'hidden observer' phenomenon. This apparent demonstration that a hypnotised individual remains aware, at an unconscious level, of that which they seemingly cannot hear (or see, smell, feel, remember etc. according to the suggestion given; see Hilgard, 1977) has been cited by proponents of Hilgard's view as strong evidence for the executive split reportedly operating during hypnosis.

Since this time, the hidden observer has been examined empirically in a number of studies designed to elucidate the validity of the neodissociation model, with mixed results. In apparent support of Hilgard's position, a study by Knox, Morgan and Hilgard (1974) demonstrated that virtually all (seven out of eight) of their highly susceptible subjects displayed the hidden observer phenomenon, as evidenced by reports of greater 'hidden' ischemic pain than indicated by their hypnotised self following an analgesia suggestion. A number of subsequent attempts at replication (Hilgard, Morgan & Macdonald, 1975; Hilgard, Hilgard, Macdonald, Morgan & Johnson, 1978; Perry &

Laurence, 1980; Laurence & Perry, 1981) have, however, suggested that only a relatively modest proportion of highly susceptible subjects (between 40 and 50%) actually exhibit hidden observers.

Perhaps more importantly, the finding that 75% of subjects instructed to simulate hypnosis also displayed behaviour apparently indicative of a hidden observer in the Hilgard *et al* (1978) study seems to indicate that the phenomenon might be a product of experimental demand characteristics (see also Nogrady, McConkey, Laurence & Perry, 1983). This supposition was bolstered by a number of studies suggesting that the nature of hidden observer reports are extremely sensitive to the manipulation of situational demands by the use of, for example, different experimental instructions (e.g. Spanos & Hewitt, 1980; Spanos, Gwynn & Stam, 1983; Spanos, Radtke & Bertrand, 1984; Spanos, Flynn & Gwynn, 1988). As Nogrady *et al* (1983) have pointed out, many of the early studies demonstrating relatively high hidden observer rates invariably used instructions explicitly identifying this as the expected, and desired, outcome of the experiment, greatly increasing the likelihood of subject compliance[8].

Nevertheless, one study investigating the hidden observer using the real-simulator design (Nogrady *et al*, 1983) appears to refute the social compliance hypothesis. In this study, 40% of highly susceptible subjects displayed hidden observers following ambiguous instructions concerning the expected outcome of the suggestion, while no high-medium or simulating subjects did so. Nogrady *et al* concluded that such a finding provided good evidence for dissociative processes operating during hypnosis. However, if the hidden observer is a genuine index of the hypothesised fractionation mechanism posited by neodissociation theory, then an alternative explanation for the behaviour of the remaining highly susceptible respondents (60% in this case) is clearly required. Nogrady *et al* propose that the two types of highly susceptible subjects might be executing the suggested responses in different ways. On the basis of their finding that subjects displaying hidden observers also appear to demonstrate duality[9] during age regression, Nogrady *et al* suggest that the hidden observer might indicate the use of a

[8] The notion that hypnotic responses are the result of individuals simply complying with the wishes of the experimenter has been expounded most notably by Wagstaff (1981, 1986). One aspect of this notion supposes that individuals are deliberately (i.e. consciously) pretending to be experiencing an hypnotic effect despite the fact that they are not; Spanos (1991) offers a similar explanation for many hypnotic responses. It is widely assumed that such an explanation can account for some hypnotic responses (particularly in certain situations e.g. stage hypnosis), but not all (e.g. the use of hypnotic pain management in the treatment of burns, to take an extreme example). The second aspect of the compliance notion suggests that this process occurs without the individual's awareness.

[9] In the context of an age regression suggestion, 'duality' refers to the subjects' experience of being both age regressed and adult at the same time, or in alternation.

divided attention strategy during hypnosis which allows the subject to switch between hypnotised and non-hypnotised modes according to suggestions. In contrast, subjects who do not experience the hidden observer might achieve suggested responses through their intense absorption in the imagery that accompanies the presentation of the suggestion. However, there is no evidence at this point that highly susceptible subjects who do and who do not experience the hidden observer differ on any variables pertaining to this hypothesis.

In addition to assessing the validity of the neodissociation account using the hidden-observer paradigm, the predictions the theory makes regarding hypnosis and task-interference have also been examined. It is a long established fact that two tasks performed concurrently will, given a certain amount of task difficulty, interfere with one another such that both tasks will be performed worse than when either is performed alone. This dual-task interference effect will occur even when the two tasks do not require the same output systems, and is, according to many recent models of attention, the product of an executive system with only limited amounts of attentional resources to allocate to task performance at any one time (e.g. Kahneman, 1973). According to classical dissociation theory (e.g. Janet, 1901; Prince, 1929), the task-interference effect may be reduced or eliminated during hypnosis if suggestions are given for one of the tasks to be performed subconsciously. Early studies investigating this 'functional independence' hypothesis failed to find such an effect, however (for reviews see Hull, 1933; Hilgard, 1977); indeed, this early evidence suggested that the opposite effect occurs during hypnosis, that is, task interference actually appears to *increase* when suggestions are given for one of the tasks to be performed subconsciously. This effect holds for both tasks, regardless of which is performed outside of awareness[10].

According to the neodissociation model, however, this is exactly what one would expect to occur during hypnotic dual-task performance (see Hilgard, 1977, 1979). By this view, although a secondary task may appear to be effortlessly performed outside awareness given appropriate suggestions during hypnosis, this appearance is in fact illusory. Rather, the task continues to be performed effortfully by the executive but the representation of this effort is prevented from reaching consciousness by the amnesic barrier. Moreover, maintaining the amnesic barrier is in itself a cognitively demanding task; dual-task performance will, therefore, be worse during hypnosis than in a divided-

[10] Whether or not it is valid to say that a task can be performed 'outside of awareness' is a contentious issue, especially given that verbal report has been the only measure used to validate this assertion. Assessing whether or not something has been performed unconsciously is notoriously problematic (see e.g. Jacoby, 1991).

attention condition because there are less attentional resources available. A small number of studies have confirmed the earlier findings in this regard (e.g. Knox, Crutchfield & Hilgard, 1975; Stevenson, 1976; Green & Lynn, 1995). However, although these findings support the predictions of neodissociation theory, several other studies have not found this pattern of results and appear to accord more with the classical view of dissociation; these findings will be examined presently when the dissociated control model of hypnosis is discussed.

The predictions of neodissociation theory concerning hypnotic susceptibility have also been addressed empirically. According to the neodissociation account, an individual's susceptibility is a stable cognitive trait corresponding to their ability to experience dissociative phenomena. Evidence for the relationship between hypnotizability and dissociative ability has been obtained in a number of studies concerning patients with so-called dissociative psychopathology. Pettinati, Horne and Staats (1985) and Kranhold, Baumann and Fichter (1992) for example, found that individuals suffering from Bulimia Nervosa tend to display extremely high levels of hypnotic susceptibility. A similar pattern of results has been found with individuals suffering from Dissociative Identity Disorder (Bliss, 1980, 1983, 1984) and Post-Traumatic Stress Disorder (e.g. D. Spiegel, 1984; Stutman & Bliss, 1985; D. Spiegel, Hunt & Dondershine, 1988). In each of these cases, it has been suggested that the individual's ability to dissociate material from consciousness is used as an adaptive mechanism to protect themselves from overwhelming negative affect at times of extreme stress or trauma. It has been argued that such a dissociative ability coincidentally predisposes these individuals towards high hypnotic susceptibility also.

Regarding less pathological forms of dissociation, however, results have been less conclusive. Most studies investigating this issue have used the Dissociative Experiences Scale (DES; Bernstein & Putnam, 1986), a self-report instrument originally designed as a diagnostic tool for the identification of patients with dissociative disorders. The DES consists of twenty-eight statements concerning the frequency of dissociative-like episodes experienced outside the hypnotic context. Although some studies (e.g. Frischholz, Braun, Sachs *et al*, 1992; Butler & Bryant, 1997) have found a significant correlation between the DES and standard measures of hypnotic susceptibility such as the Harvard (Shor & Orne, 1962) and Stanford scales (Weitzenhoffer & Hilgard, 1959), other have not (e.g. DiTomasso & Routh, 1993; Faith & Ray, 1994). In addition, it has been argued that any such significant correlations can be accounted for by the overlap between the DES and the Tellegen Absorption Scale (TAS; Tellegen & Atkinson, 1974;

Kirsch & Council, 1992). Factor-analytic studies of the DES suggest the existence of an absorption-like factor (e.g. Sanders & Green, 1994), and several other investigators have reported strong correlations between the DES and TAS (e.g. Nadon *et al*, 1991). A small correlation between the DES and susceptibility measures is therefore unsurprising given the relative reliability of the relationship between absorption and susceptibility (Roche & McConkey, 1990). Perhaps more critical for the relationship between hypnotizability and dissociation has been the finding that the correlation between susceptibility and the DES only holds when the two are measured in the same context (Kirsch & Council, 1992). Not all studies have found such a context effect, however (e.g. Butler & Bryant, 1997).

It is possible that the unconvincing results obtained correlating the DES with hypnotizability measures are more a product of the inherent limitations of self-report measures than the lack of a relationship between susceptibility and dissociation. This is perhaps particularly true for a concept such as dissociation, which, by Hilgard's model, is a complex cognitive process that might not easily be captured by a questionnaire concerning events only of an apparently dissociative nature. While the DES may have face validity, its construct validity in this domain is far from beyond question; moreover, even if the DES can be linked in a meaningful way to clinical dissociation, the question of whether or not it is an appropriate measure of dissociation within normal populations is also open to doubt.

Published attempts to construct more objective measures of dissociative ability have, however, been extremely rare. One such attempt is reported by Stava and Jaffa (1988), who offer three alternative views of dissociation based on Hilgard's theory, providing cognitive operationalisations of each. First, dissociation is described as a process of divided attention, such as when holding a conversation whilst driving a car, an example of dissociation provided by Hilgard himself; this is operationalised by Stava and Jaffa using a dual-task methodology similar to that used in the task-interference studies described earlier. Good dissociators by this view will experience less interference between the two tasks than those who are poor at dissociation. Second, dissociation is conceived as a process of selective attention, and is operationalised using a dichotic listening task. Rather than being asked to shadow (i.e. repeat aloud) speech presented to one ear whilst ignoring material presented to the other, as in the traditional dichotic listening task, subjects in this study had simply to attend to one ear and not the other; according to Stava and Jaffa good dissociative performance is demonstrated here by those best able to concentrate on the to-be-attended ear. Related to this notion is Stava and Jaffa's third account of dissociation, that of incidental learning, which is measured by the amount of information that the subject learns about the material that is presented to the unattended ear in the dichotic learning task. Both the dual-task and dichotic-listening measures used two 'clerical-motor' tasks assessing digit copying and recoding speed, and four 'cognitive' tasks assessing reading speed and comprehension, in a variety of combinations. These measures were then correlated with susceptibility scores obtained using the HGSHS.

With baseline performance statistically partialled out of the analysis, none of the dissociation measures correlated significantly with scores on the HGSHS, apparently contradicting the predictions of neodissociation theory. However, these findings can be strongly criticised on a number of conceptual and methodological grounds, particularly concerning Stava and Jaffa's conceptualisation of dissociation, which I would argue is, in part at least, inherently flawed. As we have seen, the essence of dissociation as stated by Hilgard is the operation of cognitive systems outside awareness. However, the point of a divided attention paradigm is to split attention and awareness between two concurrent tasks; if both tasks are performed consciously, a paradigm of this sort cannot be used as a measure of dissociation, at least not as defined by Hilgard. Indeed, Stava and Jaffa themselves explicitly state that their study differs from the task-interference studies discussed previously in that suggestions are not given for one of the tasks to be performed without awareness. Moreover, even if one could argue that one of the tasks in the divided attention paradigm was being carried out unconsciously, no measure of this was included in Stava and Jaffa's study.

Stava and Jaffa's operationalisation of dissociation using a dichotic listening task is perhaps less controversial from a conceptual stand-point, as the ability to keep irrelevant material out of awareness whilst concentrating on another task appears fairly faithful to the account of dissociation offered by Hilgard. However, we have absolutely no grounds for assuming that subjects were not actually aware of the material presented to the unattended ear in Stava and Jaffa's dichotic listening task, as no measure of this was included in their study. This methodological concern also undermines Stava and Jaffa's incidental learning concept of dissociation, as we cannot tell whether material presented to the supposedly unattended ear was learnt incidentally or otherwise. Moreover, the question of whether subjects are alternating between the two ears during the dichotic listening task is also not addressed by Stava and Jaffa. If the incidental learning element of the dichotic listening task is to be regarded as dissociative, then it is essential that subjects are simultaneously learning unattended information whilst exclusively attending to another stimulus, and not simply switching between the two (cf. Zamansky & Bartis, 1985).

In summary, the existing empirical evidence concerning the validity of neodissociation theory is at best inconclusive, and at worst contradictory. Regarding the hidden observer, the majority of studies have indicated that only a modest proportion of highly susceptible subjects exhibit the phenomenon. If, as Hilgard suggests, the hidden observer reflects a split in executive functions that is responsible for the execution of hypnotic behaviours, one would expect a considerably higher proportion of subjects to display the phenomenon, including those only moderately susceptible to hypnosis. As this is not the case, if we are to retain the concept of executive fractionation during hypnosis we must, at best, adopt a more diluted version of neodissociation theory which does not claim that all hypnotic behaviours are carried out in this way. However, it is not beyond question that the hidden observer actually reflects an executive dissociation as Hilgard suggests it does. It would appear that the nature of hidden observer reports is exquisitely sensitive to demand characteristics, indicating that it is more of a suggested effect like any other than a veridical reflection of what a dissociated, 'non-hypnotised' part of the individual is experiencing.

Studies concerning hypnosis and dual-task interference are similarly inconclusive. Although some studies in this domain appear to support a neodissociation interpretation, in that hypnosis seems to increase interference between concurrent tasks, this is not a particularly robust finding, as will be demonstrated presently in a discussion of Bowers' dissociated control model. Moreover, even given the validity of the increased interference effect, this in itself is not particularly strong evidence for a neodissociation account of hypnosis, as sociocognitive theories predict a similar pattern of findings also (see Ruehle & Zamansky, 1997).

Neodissociation theory also does not fare particularly well in studies assessing the relationship between dissociative ability and hypnotic susceptibility. In support of the theory, a number of studies have shown elevated levels of susceptibility in sufferers of so-called dissociative disorders. In non-clinical populations, however, the correlation between susceptibility measures and the Dissociative Experiences Scale is typically very small, often only apparent when both are assessed in the same context, and may be a product of an overlap between the DES and absorption. There has been very little research using more objective measures of dissociative ability, however. When this has been done, in the case of Stava and Jaffa's (1988) study, there have been serious conceptual and methodological concerns about the operationalisations offered, suggesting that further research is needed.

The lack of objective means for testing the predictions of neodissociation theory probably reflects how ill-defined the concept of dissociation actually is (Cardeña, 1994). In both clinical and research settings, 'dissociation' has been used as a generic term to describe a diverse array of apparently similar phenomena, both normal and pathological, on the basis of face validity alone. Whether it is valid to describe the processes operating in a complex disorder, such as DID, as being the same or even similar to those operating in a relatively simple task, such as talking whilst driving, is largely uncertain. This conceptual inclusivity probably underpins, to an extent at least, the popularity of neodissociation theory within the clinical sphere; for a scientific account of hypnosis, however, it is a considerable burden making objective assessment of its postulates extremely problematic.

On the conceptual side, neodissociation theory offers only a cursory examination of more phenomenological aspects of hypnosis and says little about the way social factors influence the nature of the hypnotic experience. Moreover, although Hilgard asserts that imaginative involvement might be one way by which the fractionation of the executive could occur, he does not indicate why or how this might be so. In addition, the theory does not provide an adequate account of how self-hypnosis fits within its explanatory scheme. Combined with its conceptual ambiguity and the lack of research support for its predictions, it is perhaps surprising that neodissociation theory remains as one of the leading contenders for explaining the nature of hypnotic responding (see Kirsch & Lynn, 1995).

1.3.2.2 Dissociated control theory

Despite their adherence to a dissociation explanation of hypnosis, other theorists (e.g. Bowers, 1990, 1992; Woody & Bowers, 1994) have been particularly critical of the 'amnesic-barrier' notion that is central to Hilgard's exposition. If such a notion were correct it would imply that all hypnotic performances involve some degree of spontaneous amnesia, a phenomenon which has, in fact, proved extremely uncommon (Hilgard & Cooper, 1965). Moreover, such an amnesia would have to be highly selective, sparing the initial suggestion and accompanying imagery but not the actual realisation of the suggested phenomena (e.g. pain reduction in an hypnotic analgesia; Bowers, 1992). Furthermore, one would also expect individuals to experience *suggested* amnesia far more readily than is actually observed - many individuals are capable of

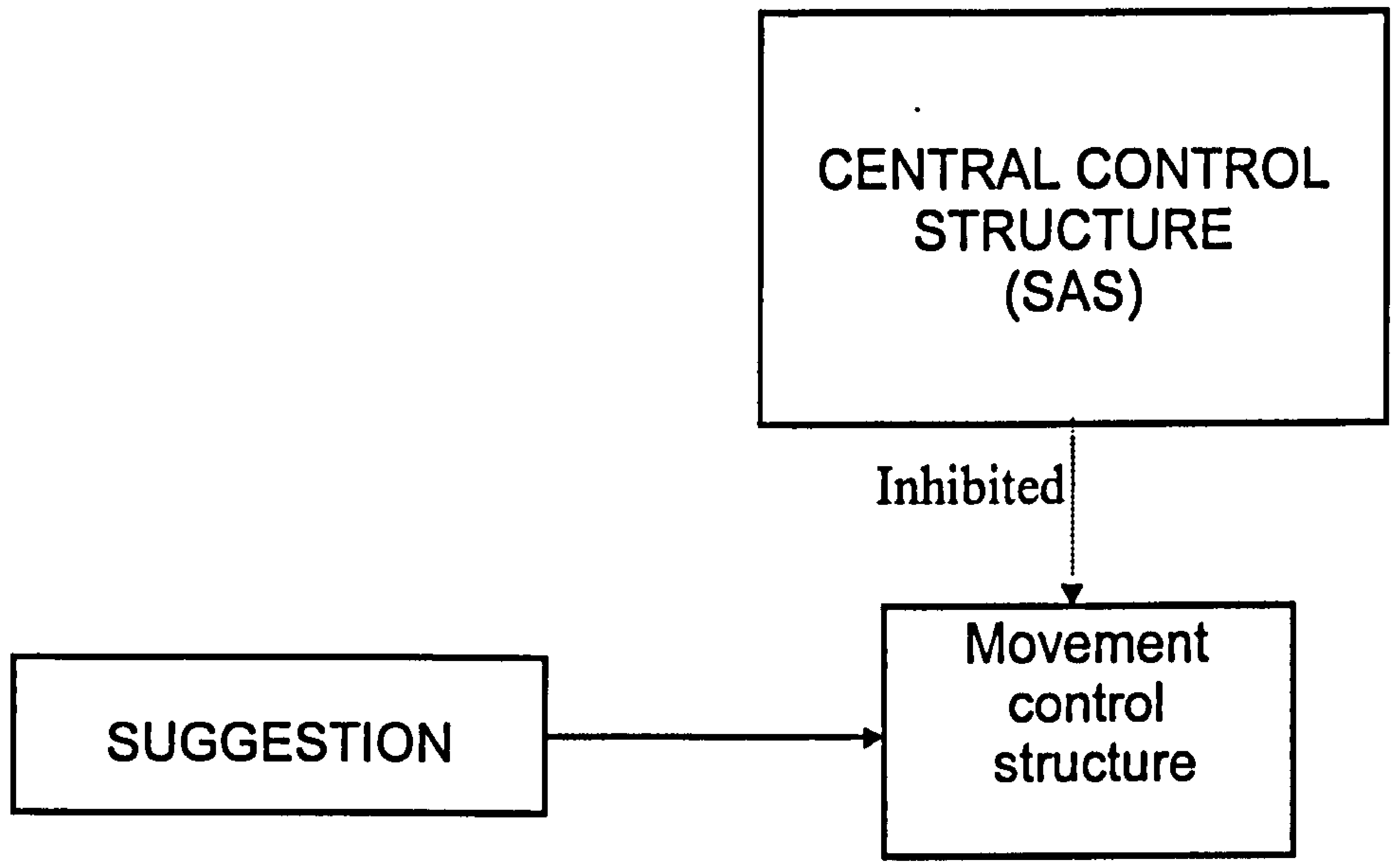

Figure 1.2: The dissociated control account of nonvolitional responding. Adapted from Kirsch and Lynn (1995).

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experiencing a relatively large number of hypnotic phenomena yet attempts to induce amnesia for some aspect of their experience consistently meets with failure (Woody & Bowers, 1994). Indeed, the amnesia item on the Harvard and Stanford scales of hypnotic susceptibility is regarded by many as being one of the more 'difficult' items, and passing it is often used as a criterion for selecting groups of highly susceptible subjects (e.g. Wallace, Allen & Weber, 1994).

Although the concept of executive fractionation is widely regarded as being the central hypothesis of neodissociation theory, a second dissociative mechanism by which hypnotic phenomena might operate was also offered by Hilgard (1977). Intrinsic to Hilgard's concept of executive fractionation is the assumption that hypnotic suggestions do not *directly* initiate the operation of appropriate cognitive sub-systems, but do so via that part of the executive ego that is concealed beneath the amnesic barrier (figure 1.1). In this sense, as Woody and Bowers (1994) have pointed out, recent instantiations of neodissociation theory may be regarded as being based on the idea of *dissociated experience*; that is, the hypnotised individual has the *experience* of a dissociation between higher and lower levels of cognitive control but this experience is in fact illusory. According to Hilgard's alternative mechanism of dissociation, however, rather than activating cognitive systems via a dissociated part of the executive, hypnotic suggestions are capable of circumventing the executive ego and directly activating or inhibiting the appropriate lower level systems themselves (see figure 1.2). Thus, hypnosis directly alters the way in which the selection of behaviour is controlled, not just experienced; this version of the theory has been described by Woody and Bowers (1994) as the first instantiation of *dissociated control* theory. In many respects, the dissociated control model of Bowers and colleagues is extremely similar to this version of neodissociation theory. However, they have extended these ideas by conceiving them in terms of a more contemporary model of behavioural control, that of Norman and Shallice (1986), that is widely respected and supported by a growing literature in the fields of cognitive psychology and neuropsychology (see Shallice, 1988).

The Norman and Shallice (1986) model of behavioural control views the organisation of the cognitive architecture in a similar vein to that proposed by neodissociation theory, with one fundamental difference. According to the model, control of routine behaviour is carried out via a hierarchical system of interactive schemata (analogous to Hilgard's cognitive control structures) operating according to a selection mechanism termed *contention scheduling*; this mechanism operates automatically and without consuming attentional resources.

When novel demands are placed on the individual, a second, higher level system corresponding to Hilgard's executive ego can intervene to initiate behaviour via the active excitation or inhibition of schemata at the level of contention scheduling. This central cognitive structure, the *supervisory attentional system*, is both a monitoring and a controlling system in very much the same way as Hilgard's executive ego. Norman and Shallice (1986) suggest that the distinction between the selection of behaviours by the supervisory system and contention scheduling represents a phenomenological distinction between 'willed' and 'unwilled' acts respectively.

The main difference between Hilgard's model of the cognitive system and that proposed by Norman and Shallice (1986) is that the higher level control structure is not needed to select lower level schemata when processing demands are routine. In the case of routine processing, environmental triggers and the competitive excitation and inhibition between schemata (contention scheduling) is sufficient to control behaviour. Broadly speaking, the supervisory attentional system intervenes only when existing schemata are unable or unsuitable to meet processing demands, as in the case of a novel situation or when a habitual response is no longer appropriate. However, the degree to which the supervisory system will be used in the control of behaviour is a function of both situational and dispositional factors, including the availability of attentional resources moderated by current processing demands, the perceived importance or difficulty of a situation, or other variables such as fatigue, intoxication or system damage. The occurrence of 'actions-slips' (Reason, 1979; Norman, 1981) provides one example where an unplanned or inappropriate action is automatically triggered by situational cues following a lack of monitoring by the supervisory system. The increased distractibility and inability to inhibit inappropriate behaviours characteristic of the frontal lobe syndrome result, according to Shallice (1988), from damage to the supervisory system.

According to dissociated control theory (e.g. Bowers, 1990, 1992; Woody & Bowers, 1994), hypnosis represents one situation where supervisory system control is inhibited, leading to the hypnotised individual's over-reliance on situational cues for determining subsequent behaviour; in this regard, Woody & Bowers (1994) liken the hypnotised individual to the frontal lobe patient. By this view, the resulting dissociation between higher and lower levels of control allows for the automatic activation of suggestion-related schemata by the words of the hypnotist, at the level of contention scheduling (see figure 1.2). Put another way, the hypnotised individual relinquishes the conscious and volitional selection of behaviour to the hypnotist. As the experience of will is associated with schema-selection by the supervisory system, behaviours not selected in this way will be perceived as occurring involuntarily. Dissociated control theory proposes, then, that hypnotic behaviours are perceived as occurring involuntarily because they have not been performed intentionally.

Dissociated control theory makes certain predictions regarding the operation of hypnotic responses that are in marked contrast to those offered by the executive fractionation version of neodissociation theory. As we have seen, the fractionation account proposes that competing tasks carried out during hypnosis will be performed less efficiently than outside hypnosis, due to the increased cognitive effort associated with maintaining an amnesic barrier. According to dissociated control theory, however, hypnotic suggestions are executed automatically and effortlessly by lower-level systems. Given that this is the case, one would expect the execution of hypnotic suggestions not to interfere with other tasks; if this supposition is correct, one might expect less dual-task interference during hypnosis given the appropriate suggestions. However, as we have seen, a number of studies have shown that the converse appears to be the case, that is, hypnotic dual-task interference is greater than without hypnosis (Knox, Crutchfield & Hilgard, 1975; Stevenson, 1976). In addition, studies by Bowers and Brenneman (1981) and Green and Lynn (1995) which have shown the effect predicted by dissociated control theory have used very easy secondary tasks, and have found no difference between hypnosis and passive attention conditions in any case.

Although these findings would, at first glance, appear to contradict the dissociated control notion that hypnotically enacted behaviours are performed automatically, this is not necessarily the case. I would argue that the performance of a task outside awareness (i.e. without executive control) will only reduce dual-task interference to the extent that it is actually possible to complete the task automatically. As most complex tasks, such as those used in dual-task methodologies, involve both automatic *and* executive elements (Tzelgov, Henik & Leiser, 1990), requiring the hypnotised individual to complete the task automatically can only have an adverse effect on their subsequent performance. Thus, in cases such as this, one would actually expect an increase in dual-task interference, and not the converse. I would argue, therefore, that the dual-task methodology is only of interest in this context when we are comparing the levels of interference associated with hypnotic and non-hypnotic means of achieving suggested behaviours.

Two studies conforming to this paradigm have recently been reported. In the first, Miller and Bowers (1993) compared the effect of hypnotic analgesia and a stress inoculation procedure on a cognitively demanding competing task. If, as predicted by dissociated control theory, the level of analgesia achieved through hypnotic means is executed more automatically than that achieved via the stress inoculation procedure one would expect lower task-interference in the former case than the latter. Miller and Bowers found that hypnotic analgesia and stress inoculation showed a comparable reduction in cold-pressor induced pain, and both showed interference effects with the competing task. However, the competing task showed significantly more impairment in the stress inoculation condition, suggesting, in line with the predictions of dissociated control theory, that hypnotic analgesia is a *relatively* automatic process.

More recently, Bowers and Woody (1996) used a variation of Wegner's (1989) 'white bears' paradigm to investigate the predictions of dissociated control theory regarding hypnotic amnesia. Wegner (1989) observed that subjects show a remarkable inability to suppress thoughts of a given item when instructed to do so, experiencing large numbers of mental intrusions of the to-be-ignored material; apparently the intentional attempt to suppress a given thought paradoxically brings the unwanted material to mind (see Wegner, 1994, for a more detailed account of this process). Following this line of reasoning, Bowers and Woody (1996) argued that if the dissociated control account of hypnotic amnesia is correct and amnesia is the result of an unintentional process, subjects should in this case show a significant decrease in the amount of white-bear intrusions. Results indicated that the amnesia suggestion was indeed successful in reducing the number of intrusions compared to conditions of waking and hypnosis without an amnesia suggestion, in support of the initial prediction.

Unlike neodissociation theory, Bowers' dissociated control theory concedes that social factors have an important role to play in explaining hypnotic phenomena. In a number of recent articles, Bowers and colleagues (e.g. Woody, Bowers & Oakman, 1992; Balthazard & Woody, 1992; Hargadon, Bowers & Woody, 1995; Woody, Drugovic & Oakman, 1997) have argued that social factors are particularly important in determining responses to the easier items (such as ideo-motor responses) on susceptibility measures such as the Harvard and Stanford scales; dissociated control, on the other hand, has a major role to play in explaining more difficult cognitive items such as amnesia, analgesia and hallucinations. In a recent study using a spectral analysis technique, for example, Woody *et al* (1997) showed how a measure of social suggestibility (using an alcohol placebo paradigm) correlated significantly with the easier but not the more difficult items on the Harvard scale, in support of their view. This finding has been replicated in our own laboratory (Frasquilho, R. Brown, Smith & Oakley, in preparation). Conversely, a study by Balthazard and Woody (1992) using similar techniques found that the more difficult items on the Harvard and Stanford scales are more strongly associated with absorption scores than the easier items. Following this finding, Hargadon, Woody and Bowers (1995) have suggested that the ability to become intensely absorbed in a given experience is one mechanism by which dissociated control might be brought about, although the two must be regarded as distinct processes in their own right.

Two other studies concerning susceptibility may also be pertinent to the principles of the dissociated control model. Dixon, Brunet and Laurence (1990) and more recently Dixon and Laurence (1992a) have found that highly susceptibles individuals are more prone to Stroop interference than low susceptibles, suggesting that susceptibility is in some way related to how automatically individuals' process language. Given that hypnotic phenomena are executed automatically by lower level systems as suggested by dissociated control theory, it seems plausible to expect that an everyday bias towards automatic processing should be related to the incidence of those phenomena.

The dissociated control model of hypnosis is still very much in the early stages of its development, and one must be relatively cautious when attempting to draw any firm conclusions regarding its validity. However, it represents a considerable improvement on its precursor, neodissociation theory, in a number of important respects. First, it rejects the notion of an amnesic barrier, consequently distancing itself from the hidden observer phenomenon which for some is the major short-coming of the neodissociation model (e.g. Fellows, 1988). Second, while retaining its cognitive basis, it acknowledges that social factors play an important role in hypnotizability and the execution of hypnotic responses. Third, it is conceived in terms of a well-respected model of behavioural control developed within cognitive psychology and, on this basis, offers testable predictions with which to assess its validity. Finally, the small amount of empirical research conducted to test some of these predictions has, in most cases, supported the dissociated control view. For example, the work of Miller and Bowers (1993) and Bowers and Woody (1996) respectively suggest that hypnotic analgesia and amnesia appear to be more automatic than non-hypnotic means of achieving such effects. Work using spectral analysis techniques (e.g. Woody, Bowers & Oakman, 1992; Balthazard & Woody, 1992; Woody, Drugovic & Oakman, 1996) also seems to support the two-component view of hypnosis and hypnotizability offered by dissociated control theorists. Moreover, as we shall see, there is a certain amount of neuropsychophysiological evidence supporting its assertions also.

Nevertheless, it is clear that the dissociated control model also suffers from a number of short-comings. Although it acknowledges that social factors have an important role to play in explaining hypnotic behaviour, for example, it is not clear whether it goes far enough in this regard. According to dissociated control theorists (e.g. Woody, Bowers & Oakman, 1992; Balthazard & Woody, 1992; Hargadon, Bowers & Woody, 1995; Woody, Drugovic & Oakman, 1996) social factors are only important for the explanation of relatively simple hypnotic responses. However, a large number of studies have demonstrated that the occurrence and nature of more complex phenomena such as amnesia and analgesia are also sensitive to subtle manipulations in expectation and context (see e.g. Spanos, 1986). It is essential that the dissociated control model provides an account of why and how this is the case.

Moreover, although the theory provides a relatively detailed explanation of how ideo-motor and challenge suggestions are performed (e.g. Woody & Bowers, 1994), this is not the case for other behaviours such as hallucinations, analgesia, amnesia and the like. Equally problematic, it is extremely difficult to reconcile the dissociated control model with the concept of self-hypnosis, which would, on the face of it at least, seem to require some form of higher-level control which is supposedly inhibited following the induction of hypnosis.

In addition, the dissociated control account of hypnotic involuntariness is also not beyond question. As we have seen, dissociated control theory suggests that hypnotic behaviours are experienced as occurring involuntarily, being governed by automatic schema-selection at the level of contention scheduling. It is also worth recalling that the Norman and Shallice (1986) model suggests that the supervisory attentional system is required only in situations that are novel or where lower level schemata are inappropriate; during routine situations, the process of contention scheduling alone is capable of directing behaviour. Given that both hypnotic behaviours and routine actions are executed automatically by the same contention scheduling mechanism, one must ask why the former are perceived as occurring involuntarily whereas the latter are not. Clearly, some revision needs to be made either to dissociated control theory or the model of behavioural control offered by Norman and Shallice (1986) to account for this.

In summary, although the dissociated control model has much in its favour, a great deal of further work, both conceptual and empirical, needs to be done for it to provide a comprehensive account of hypnosis and hypnotic susceptibility.

1.3.3 Sociocognitive theories

The ego-psychological and dissociative accounts of hypnosis represent modern-day proponents of the traditional 'state' view of hypnosis. Such a view originated in the work of Mesmer and dominated hypnotic theorising in the nineteenth and early twentieth centuries. According to this school of thought, hypnosis is fundamentally different to ordinary waking, involving the implementation of a special state of psychological functioning characterised by unique cognitive, behavioural, phenomenological and physiological processes. Inspired by the work of White (1941; see Spanos & Coe, 1992), some more recent theorists have rejected this view, arguing instead that hypnosis is simply a complex personal interaction that can be explained in terms of the common-place processes of social psychology. By this view, the execution of hypnotic behaviours is, broadly speaking, the result of a normal process of social suggestion rendered unusual by popular accounts of the phenomenon. This so-called 'non-state' view has become increasingly popular in recent years and has been reformulated numerous times by different theorists over the last four decades.

One of the earliest social-psychological accounts of hypnosis was Sarbin's (1950, 1956) role-theory. According to this view, the hypnotic situation can be regarded as an on-going drama between two individuals playing the roles of hypnotist and hypnotised. The nature of this drama is determined by the individuals' perceptions concerning their roles, which are governed by their prior beliefs about hypnosis and the cues inherent within the hypnotic situation. The execution, or 'enactment', of hypnotic behaviours is a result of the subject's belief that such behaviours are appropriate to the role of a hypnotised individual. In other words, the hypnotic subject is behaving 'as if' they were hypnotised in order to comply with the demands placed upon them by the hypnotic situation.

Rather than being a passive automaton with little or no control over their behaviour - as suggested by dissociative models - the hypnotised individual by this view is an active agent who is consciously striving to fulfil the goal of behaving like someone who has been hypnotised. The apparently unusual nature of hypnotic behaviours is simply a by-product of the culturally derived and situationally reinforced belief that that is what hypnosis involves. Individual differences in hypnotic responsiveness are, by this view, the result of both situational variables and subject differences in motivation[11], expectation, the ability to become engaged in the hypnotic role (as mediated by absorption and imaginative abilities), and their sensitivity to contextual demands (Coe & Sarbin, 1991). This is in stark contrast to more traditional state approaches to hypnosis, which typically view susceptibility as a stable personality/cognitive trait which is more or less uninfluenced by situational factors (Kirsch & Council, 1992).

The role-theory account of hypnosis offered by Sarbin has been extremely influential within the field, with many investigators proposing similar accounts since this time (e.g. Barber, 1969; Coe, 1978; Diamond, 1974; Wagstaff, 1981, 1986; Lynn, Rhue & Weekes, 1989). Despite certain variations between these accounts, as Bowers and Davidson (1991) have noted, the similarities between them are far more apparent than the differences. For this reason I will concentrate largely on the work of Spanos (1982, 1986) who has been possibly the most influential, and certainly the most prolific (see Bowers & Davidson, 1991), of contemporary social-psychological theorists, extending Sarbin's original position in a number of significant ways.

Sarbin's original formulation may be criticised on the grounds that it focuses largely on the overt behaviours of hypnotic subjects and says little or nothing about their subjective experience of hypnosis. Many have argued that hypnotic subjects are not just behaving 'as if' they were hypnotised, but actually believe in themselves that they are experiencing an authentic phenomenon (Orne, 1959). By this view, a subject report of hypnotic involuntariness reflects not just their compliance with situational demands in line with role perceptions, but a genuine belief that their behaviour has a non-volitional quality to it. As we have seen, dissociative theorists have argued that such a sense of

[11] In this context, motivation has been conceived on two levels: (i) the motivation to experience hypnosis and hypnotic phenomena; and (ii) the motivation to please the hypnotist by behaving like a 'good' subject, thereby fulfilling their part of the social contract which they have entered into by taking part.

non-volition results from the fact that hypnotic behaviours are the product of involuntary cognitive processes.

While agreeing with the validity of involuntariness reports, Spanos (e.g. 1982, 1986; Spanos & Coe, 1992) rejected the dissociation interpretation and offered an alternative account described in social-psychological terms. According to Spanos, the feeling of involuntariness that accompanies hypnotic suggestions is the result of a misattribution on the part of the hypnotic subject concerning the source of their behaviour while 'hypnotised'[12]. This misattribution is a product, in part, of the subject's expectancy that involuntariness is a central feature of hypnotic responding, which is reinforced by situational cues such as the wording of hypnotic suggestions. By this view the arm-levitation suggestion "your hand is rising by itself", for example, carries with it an implicit request to experience any movement associated with the suggestion as being involuntary (Spanos, 1982). Thus, the role-demands of the hypnotic situation require the subject to *feel*, as well as to behave, as though they were hypnotised, a process which requires a considerable degree of self-deception (e.g. Spanos, 1986). In other words, although the hypnotised individual feels and behaves as though they are an automaton, in reality they are engaging in effortful, intentional behaviour; however, they are not aware of this fact (Lynn & Rhue, 1991b).

Also contributing to this hypothesised misattributional process is the hypnotic subject's use of certain cognitive strategies in the attempted execution of suggested behaviours. For example, in the case of an arm levitation suggestion, the use of, and subsequent absorption in, suggestion related imaginings (such as imagining the arm being pumped full of helium) diverts the subject's attention away from cues associated with volitional responding, and onto those that support a non-volitional interpretation (Spanos & Coe, 1992). Such 'goal directed fantasies' are also regarded by some proponents of this view (although not Spanos; see Spanos & Gorassini, 1984) as being directly responsible for the overt behavioural response itself, following the idea that thinking about a particular action has the tendency to bring that action about (so-called 'ideo-motor action'; Arnold, 1944). Attention-diversion strategies have also been posited to explain the occurrence of more complex phenomena such as hypnotic amnesia and analgesia (Spanos, 1986).

The social-psychological assertion that hypnotic behaviours are the result of a process of social-suggestion that is moderated by situational, motivational and expectational factors has generated a vast amount of empirical research, with results largely supporting

[12] Scare quotes are used here to underline the fact that sociocognitive theorists reject the notion of hypnotic trance; in this context 'hypnotised' is simply a short-hand way of saying 'in the hypnotic situation'.

the social psychological view. The body of research findings relating to the sociocognitive view is too large to review in any detail here; for this reason only a small number of representative studies will be described - for a fuller account see Spanos and Chaves (1989). Moreover, a certain proportion of the research cited in support of the sociocognitive account has been based on attempts to invalidate relatively specific theoretical statements concerning experiments carried out by dissociation theorists (see e.g. Spanos, 1986). As the major substantive issues concerning dissociation models have been dealt with already, it would serve little purpose to review this research here.

Early support for the sociocognitive stance was provided in a series of studies by T. X. Barber and his associates demonstrating that an hypnotic induction is actually unnecessary to produce supposedly hypnotic responses such as analgesia and amnesia; indeed, including an hypnotic induction appears to increase responsiveness to suggestions by only a very small degree (Barber, 1969; Barber, Spanos & Chaves, 1974; Spanos, 1982). Moreover, following the presentation of instructions designed to increase motivation, non-hypnotic subjects showed even greater increments in overt responsing to suggestions than a group receiving an hypnotic induction. The importance of motivation as a moderating variable is now widely accepted, and the use of such 'task-motivated' control groups (Barber, 1969) has become increasingly widespread within hypnosis research since this time. On this basis, virtually all behaviours previously attributed to an hypnotic 'trance' because of their apparently unusual or transcendent nature have, through repeated demonstrations, been shown to be equally possible without an hypnotic induction (see e.g. Spanos, 1982; Spanos & Coe, 1992). Perhaps more striking are the findings reported by Spanos and McPeake (1977; see also Spanos, Spillane & McPeake, 1976) indicating that both hypnotic and task-motivated, non-hypnotic subjects report equivalent levels of involuntariness for the execution of suggestions also.

Relatively simple contextual variables have also been shown to have a profound effect on the degree to which hypnotic subjects respond to suggestion. Balaschak, Blocker, Rossiter and Perin (1970), for example, found that hypnotic subjects show significantly fewer responses to suggestion when they believe the hypnotist to be inexperienced. Barber and Calverley (1965) found that subjects were significantly more or less responsive according to whether they were informed that a given induction was effective or ineffective. Barber and Calverley (1964, 1965) found that subjects' responsiveness to suggestions could be enhanced simply by labelling the situation as 'hypnosis', even in the absence of any formal induction procedures. The view that labelling the context as hypnosis is more important than the nature or even the presence of an hypnotic induction is bolstered by evidence showing that virtually anything described as hypnosis tends to produce 'hypnotic' effects. Studies using placebos (Glass & Barber, 1961), flashing lights (e.g. Kroger & Schneider, 1959), biofeedback (Council, Kirsch, Vickery & Carlson, 1983), alert inductions (Bányai & Hilgard, 1976), rapid inductions (J. Barber, 1977) and direct vs. indirect suggestions (Lynn, Neufeld & Matyi, 1987) have all been shown to produce roughly equivalent levels of hypnotic responsivity.

It has also been shown that the wording of suggestions is an influential factor in determining the nature of hypnotic responding. Spanos and Gorassini (1984), for example, assessed the notion that subjects interpret suggestions as implying that suggested behaviours will occur automatically and should be experienced as occurring involuntarily. Even in the absence of an hypnotic induction, Spanos and Gorassini found that subjects rated movements associated with suggestions as significantly more involuntary than those associated with direct instructions, in support of the sociocognitive view. Similar results have been reported by Spanos & Katsanis (1989).

Most sociocognitive theorists have argued that contextual variables influence responsiveness by their effect on subject expectancies. A large number of studies have attempted to assess the influence of expectancies on subject response, with largely positive findings. Several investigators, for example, have shown that the manipulation, via bogus personality test feedback, of individuals' beliefs concerning their level of hypnotizability is a strong determinant of subsequent hypnotic responsivity (Saavedra & Miller, 1983; Wickless & Kirsch, 1989). Other studies have also shown that modifying individuals' expectancies can have profound effects on the degree to which they respond to suggestions. Wilson (1967), for example, examined the effect of expectancy modification on waking suggestibility. In this study, subjects were presented with waking suggestions for alterations in perceptual experience which were subtly confirmed by the experimenter's manipulation of environmental variables. For example, after presenting subjects with a suggestion for seeing the colour red, the experimenter gradually turned on a red light bulb that was surreptitiously hidden from the subjects' view. Such environmental manipulations produced substantial increases in waking suggestibility, presumably due to the fact that subjects consequently believed themselves to be more suggestible than they really were. In a carefully controlled partial replication, Vickery and Kirsch (1991) found a similar effect for hypnotic suggestibility, again confirming the role of expectancy in hypnotic responding.

There is also a considerable body of evidence concerning the impact of expectancies on responses to specific hypnotic suggestions. One notable early example was reported by Orne (1959), who informed one group of experimental subjects that arm catalepsy was a common characteristic of hypnosis, while not providing any specific expectancy information to the other. In subsequent hypnosis sessions, significantly more of the former group displayed catalepsy when tested for the phenomenon than did the latter. Similar findings concerning hypnotic amnesia have been reported by Young and Cooper (1972). A particularly striking example of this effect has been described by Spanos, Radtke and Bertrand (1984). In a study investigating hypnotic amnesia using the hidden observer paradigm, Spanos *et al* informed a group of eight highly susceptible subjects that they had two hidden parts, one aware of everything occurring in their right cerebral hemisphere, and the other aware of everything occurring in their left hemisphere. Half of the subjects were then informed that concrete and abstract words were stored in the left and right hemispheres respectively, while the other half were given the opposite information. Subjects were then asked to learn a list containing both abstract and concrete words. Following an hypnotic induction and a subsequent amnesia suggestion, the subjects' hidden observers were then contacted and asked to recall as many words as they could. Based on the expectancy information they had been given, subjects demonstrated selective amnesias according to which hidden part was contacted and which type of word was required for recall. In other words, those subjects who believed concrete words were stored in the left hemisphere showed no amnesia for these words when the left hidden part was contacted, and so on. A growing body of findings has confirmed that the effect of specific suggestions can be systematically manipulated by the use of expectancy information. Expectancy effects of this kind have been reported for amnesia breaching (Dubreuil, Spanos & Bertrand, 1983), the generality of amnesia (Spanos, Radtke & Dubreuil, 1982), and the nature of hidden observer reports of analgesia (e.g. Spanos & Hewitt, 1980; Spanos, Gwynn & Stam, 1983; Spanos, Radtke & Bertrand, 1984; Spanos, Flynn & Gwynn, 1988).

Other studies have addressed the role of contextual and expectational variables on the subjective nature of hypnotic responses. Henry (1985; cited in Kirsch, 1991) showed that individuals' subjective reports concerning their first experience of hypnosis were largely determined by their beliefs about the phenomenon prior to the hypnotic session. For example, subjects rated time as passing either quicker or more slowly, the hypnotists's voice as nearer or further away and logical thought as either more or less difficult, according to what they believed constituted a genuine hypnotic experience. Lynn, Snodgrass, Hardaway and Lenz (1987) found that subjects' involuntariness ratings were significantly correlated with their pre-hypnotic beliefs about the ability of the hypnotist.

Such findings have been cited (e.g. Lynn & Rhue, 1991b) as supporting the view that Western cultures propagate the belief that involuntariness is a characteristic feature of hypnotic responding, which in turn dictates subjects' experiences of the phenomenon. Consistent with this view, a study by Lynn, Jacquith, Jothirathnam and Rhue (1987) has shown that a correlation between susceptibility and involuntariness reports is only found when subjects personally familiar with Western culture are tested, despite comparable levels of susceptibility between these and Eastern individuals.

On the basis of this expectancy research, Kirsch (1985, 1991; Kirsch & Lynn, 1997) has argued that all hypnotic behaviour is mediated by expectancy-related cognitive activity. According to Kirsch and Lynn (1997), most behaviour is executed automatically and effortlessly outside awareness and will therefore be experienced as nonvolitional unless the individual expects otherwise. Although individuals typically expect their behaviour to feel voluntary, the hypnotic situation is one which is associated with an abnormal sense of passivity and the loss of volitional control over one's behaviour. When an individual participates in a hypnosis experiment, this culturally mediated belief is activated and subsequent behaviour becomes subject to control by *response expectancies*. Although response expectancies and intentions are both types of response sets that prepare the individual for the automatic execution of behaviours (see Kirsch & Lynn, 1997; Lynn, 1997), the former can be differentiated from the latter in that behaviours executed in this manner are perceived by the individual as being outside their volitional control. Moreover, response expectancies tend to be self-confirming (Kirsch, 1985) in that they tend to automatically bring about the subjective experiences that they refer to. When a particular hypnotic suggestion is given (e.g. arm immobilisation), the response expectancy generates the corresponding subjective experiences (i.e. arm stiffness) which in turn reinforces the expectancy thus producing the hypnotic behaviour (i.e. an inability to bend the arm) that is experienced as occurring involuntarily.

Another avenue of research has concerned subjects' use of cognitive strategies in their attempt to achieve suggested effects. For example, Spanos (1986) has argued that the hypnotised individual's inability to recall following an amnesia suggestion is the result of an active effort to divert their attention away from target material. Supporting this contention, Spanos and D'Eon (1980) found that an attention-diversion strategy (counting backwards in threes) produced a similar degree of recall disorganisation to that found in partial hypnotic amnesics, undermining the dissociative view that recall disorganisation illustrates the hypnotised individual's loss of control over their normal recall processes. Other studies using non-hypnotic attention-diversion strategies to investigate the nature of hypnotic amnesia have reported similar findings (e.g. Bertrand & Spanos, 1985). Spanos (1986) has also argued that a similar mechanism is in operation during hypnotic analgesia

The concept of attention-diversion has also been posited to account for the sense of involuntariness that accompanies the execution of most successful suggestions. More specifically, Spanos and Coe (1992) have argued that the use of, and absorption in, suggestion-related imagery, or so-called 'goal-directed fantasies' (GDFs), increases involuntariness reports because they deflect subjects' attention away from those contextual cues which are normally used to define a given behaviour as voluntary. Supporting this assertion, a large number of studies have shown that subjects' ratings of hypnotic involuntariness are positively related to the degree to which they were engrossed in such GDFs (e.g. Spanos, 1971; Spanos & Barber, 1972; Spanos & McPeake, 1974; Spanos, Spillane & McPeake, 1976; Spanos & Gorassini, 1984; Lynn, Snodgrass, Rhue & Hardaway, 1987). Also consistent with this view is the evidence discussed previously indicating that individuals capable of becoming completely absorbed in imaginative and fantasy-based activities also show high levels of hypnotic responsivity (Tellegen & Atkinson, 1974; J. Hilgard, 1974, 1979; Crawford, 1982b; Lynn & Rhue, 1986; Roche & McConkey, 1990).

It is clear that the sociocognitive account of hypnosis has received considerable empirical support for its assertions. A multitude of studies, too numerous to review in any detail here, have demonstrated that psychosocial factors have a profound role to play in determining (a) the extent to which individuals respond to suggestions and how the execution of those suggestions are experienced; and (b) the nature of responses to specific suggestions. Moreover, numerous studies have demonstrated that most apparently hypnotic responses can be achieved without any formal induction procedure, and that virtually any pattern of findings regarding hypnotic subjects' behaviour can be replicated by simulating or task-motivated controls given appropriate instructions. Indeed, the failure of state theorists to identify a single defining characteristic that is unique to hypnosis (see Kirsch and Lynn, 1995) underlines the legitimacy of the sociocognitive assertion that we must look to normal psychological processes for the explanation of hypnotic behaviour. While this may be the case, however, there are a number of reasons to believe that the sociocognitive account as it stands is an inadequate explanation of hypnosis and hypnotic susceptibility. For the sake of brevity, I will identify only what I consider to be the most substantive criticisms of the sociocognitive account. For further discussion see Bowers and Davidson (1991) and the commentaries accompanying Spanos (1986).

As we have seen, the sociocognitive account argues that hypnotic behaviours are simply the result of normal processes of social suggestion that are rendered unusual by factors such as expectancy and situational/contextual cues. In a bid to support this position, sociocognitive researchers have concentrated on providing examples of how subjects' responses to suggestions vary as a function of psychosocial factors. While this research has demonstrated the importance of understanding the role of these factors in the determination of hypnotic responses, it has not actually provided an account of how these responses are brought about. In short, the question of what suggestion, hypnotic or otherwise, actually is or how it works has not been addressed by sociocognitive theorists. Until this is done, the sociocognitive account will remain a description of the factors that moderate hypnotic responses and not those that mediate them.

Furthermore, I would argue that, as they stand, the assertions made by sociocognitive theorists regarding how social factors moderate hypnotic responses are simply too descriptive to provide a particularly serviceable account of what is clearly an extremely complex phenomenon. Most sociocognitive theorists, for example, make repeated reference to supposedly explanatory constructs such as 'misattribution' (e.g. Spanos, 1986) and the 'tacit interpretation of implicit contextual demands' (see e.g. Spanos & Coe, 1992). However, apart from identifying some of the factors which contribute to misattribution, sociocognitive accounts have not offered an explanation of how this process actually operates. Similarly, no account of what is meant by the term 'tacit interpretation' is provided, let alone any indication of how such interpretations might be arrived at. Moreover, the notion that hypnotised individuals are actively and effortfully striving to meet the demands of the situation whilst remaining unaware of this activity, a claim that is central to all sociocognitive models, has yet to be satisfactorily explained. I would argue, that in order to provide an adequate account of these processes, we must go beyond the relatively descriptive language of social psychology and offer explanations that are stated in more explicit cognitive terms. Although socially oriented research is crucial to our understanding of hypnosis, it can only ever represent one level of description which must be complemented by more mechanistic explanations of the phenomenon.

On a more empirical note, the idea that absorption in goal-directed fantasies is instrumental in producing hypnotic involuntariness has been strongly challenged by a number of recent studies. Hargadon, Bowers and Woody (1995) addressed this hypothesis using an hypnotic analgesia paradigm involving two groups, one presented with the analgesia suggestion accompanied by corresponding imagery, and the other presented with the suggestion alone. A manipulation check confirmed that the no-imagery group experienced significantly less images than those in the imagery group. Findings showed that the level of pain-reduction obtained was the same for both groups, indicating that imagery is not necessary for the execution of hypnotic analgesia.

In a similar vein, a study by Zamansky & Ruehle (1995) has shown that suggestions are also just as effective when the hypnotised individual is engaging in imagery that runs counter to the suggested effect; imagining their arm being made of rubber, for example, had no effect on subjects' responses to an arm-immobilisation suggestion. In this case, precisely the opposite goal to that prescribed by the goal-directed fantasy was achieved. Also problematic for the goal-directed fantasy hypothesis are the findings obtained by Lynn, Nash, Rhue, Frauman and Stanley (1983) and Lynn, Snodgrass *et al* (1987). In these studies, both high and low susceptible subjects engaged in the same amount of fantasies and became absorbed in them to the same extent, despite the fact that the highly susceptible subjects showed significantly more overt and subjective responses to suggestions. These findings clearly dispute the hypothesis that goal-directed fantasies have a major role to play in explaining why subjects experience the execution of suggestions as involuntary. As a result, many theorists who remain loyal to a sociocognitive view have rejected the notion that goal-directed imagery is an essential part of hypnotic responding (e.g. Lynn *et al*, 1983, 1987).

Two other studies have disputed the attention-diversion account of hypnotic analgesia and amnesia also. First, the study by Miller and Bowers (1993) discussed previously demonstrated that hypnotic analgesia was significantly more effortless than a comparable stress inoculation procedure involving attention-diversion, despite equivalent levels of pain-reduction. This is a particularly important finding as it demonstrates that although apparently hypnotic effects can be achieved by non-hypnotic means, the possibility that they do so by different mechanisms is eminently plausible. Second, the study by Bowers and Woody (1996) using the 'white-bears' paradigm to investigate hypnotic amnesia showed that amnesia does not result from deliberate attempts to suppress thoughts as suggested by the sociocognitive account.

Findings undermining the cognitive strategy hypothesis offered by the socio-cognitivists are particularly problematic for proponents of this view. Without recourse to the strategy notion, existing sociocognitive theory is unable to offer an account of how suggestions are actually executed, and one of the main hypotheses underlying its account of hypnotic involuntariness is invalidated.

Also difficult to explain in purely sociocognitive terms are the findings by Dixon, Brunet and Laurence (1990) and more recently Dixon and Laurence (1992a) showing that highly susceptible individuals process language more automatically than low susceptibles. It is unlikely that these results are due to highly susceptible subjects' interpretation of the desired outcome of the study - a common argument offered by sociocognitive theorists for observed relationships between susceptibility and cognitive/personality variables - as the experiment was conducted outside the hypnotic context. Moreover, it is highly implausible that high susceptibles would have been able to predict and enact the complex pattern of responses that were observed in this study (Dixon & Laurence, 1992b). The finding of a relationship between susceptibility and a cognitive variable with no face-valid association with hypnosis clearly seems to require an explanation that goes outside the bounds of much current sociocognitive theorising.

1.3.4 The Neuropsychophysiological Model

Research investigating the psychophysiological concomitants of hypnosis and hypnotic susceptibility gained momentum in the late 1960s and early 1970s. Many studies during this period examined general differences in hemispheric dominance and EEG activity in hypnosis and waking conditions and between high and low susceptible subjects, with largely inconclusive results. Since this time, however, refinements in the methods used to assess brain activity have inspired a series of exciting developments within the field. While research in this arena continues to address simple hemispheric differences between subjects and conditions, researchers have now begun to examine more complex patterns of activation both between and within hemispheres during hypnotic rest and in the enactment of specific suggestions. In addition, greater efforts have been made to understand the cognitive differences between high and lows susceptible subjects and the physiological concomitants of such differences. Research within this sphere has yielded a number of theoretically important findings, and led to the development of the neuropsychophysiological model of hypnosis (Crawford & Gruzelier, 1992).

According to the neuropsychophysiological model, hypnosis is an altered state of awareness during which highly susceptible individuals undergo shifts in cognitive and physiological activity involving the reallocation of attention. More specifically, following their intense absorption in the induction procedure, the susceptible individual shifts from an analytical, sequential type of processing to a more holistic and imaginal mode; such a shift underpins a reduction in generalised reality testing (Shor, 1959) and an increase in dissociative experiences during hypnosis. Following the induction of hypnosis, specific suggestions bring about their effects through the reallocation of attention according to the nature of the suggestion given.

As the neuropsychophysiological model was developed out of a broad programme of research there is a considerable body of findings in support of its postulates. Support for the notion that hypnosis involves increased focal attention has been provided in studies by Graham (1970, 1975) indicating that high susceptibles experience a decrease in the deployment of attention in the peripheral portions of the visual field during hypnosis. In addition, a number of studies have shown that hypnosis involves an increase in mean high-range (5.5 - 7.5 Hz) theta power in both high and low susceptible subjects, with highs showing significantly greater theta than lows across frontal, temporal, occipital and parietal regions (e.g. Sabourin, Cutcomb, Crawford & Pribram, 1990; Crawford, 1990, 1991). High-range or 'class II' theta (Vogel, Broverman & Klaiber, 1968), particularly in the midline frontal region, has been associated with increased attention and performance on cognitive tasks (e.g. Nakagawa, 1988; Yamamoto & Matsuoka, 1990; both cited in Crawford & Gruzelier, 1992). Citing research using animal (e.g. Isaacson, 1982; cited in Crawford & Gruzelier, 1992) and human subjects (e.g. Arnolds, Lopes Da Silva, Aitink, Kamp & Boeijinga, 1980; cited in Crawford & Gruzelier, 1992), Crawford (1990) has argued that the increases in theta during hypnosis reflects the operation of the fronto-limbic attentional system in the disattention of irrelevant stimuli (see R. Miller, 1989, for a discussion of the role of the hippocampus in selective disattention). Supporting this contention, a study by Gruzelier and Brow (1985) demonstrated that high but not low susceptible subjects during hypnosis show increased habituation of the orienting response, also indicating superior focal attention for these individuals following an hypnotic induction. This finding has been replicated and extended by Gruzelier, Allison and Conway (1988), who also showed that increased habituation during hypnosis reliably differentiates between high susceptibles and motivated, simulating subjects.

The notion that hypnosis subsequently involves a shift from an analytical to a holistic style of thinking was based on a number of early psychophysiological studies showing activity shifts from the left to the right hemisphere during hypnosis (e.g. Gur & Gur, 1974; Morgan, Macdonald & Hilgard, 1974; Graham & Pernicano, 1979). It is widely held that the distinction between analytical and holistic processing corresponds to a gross functional distinction between the left and right hemispheres respectively (e.g. Springer & Deutsch, 1981). As Gruzelier (1988) has pointed out, however, many of these early studies may be criticised on a number of methodological grounds concerning a lack of standardisation and the failure to consider the responses of low susceptible subjects. Since this time, a number of more methodologically sound studies have been carried out, with results largely supporting the laterality hypothesis. A study by Gruzelier, Hancock and Maggs (1991), for example, showed that high and low susceptibles during hypnosis could be reliably distinguished on the basis of generalised delta, theta and alpha activity predominantly in the right hemisphere. McCormack and Gruzelier (1993) using a signal-detection paradigm found that high but not low susceptible subjects showed a significant left-field (i.e. right hemisphere) visual processing improvement during hypnosis. A study by Gruzelier and Brow (1985) showed that in high susceptible subjects electrodermal responses to tones were significantly lower on the left hand (i.e. right hemisphere) during hypnosis than in a waking condition, with low susceptibles not showing this difference. Also cited in support of the holistic-shift hypothesis, a study by Crawford and Allen (1983) found that high susceptible subjects' improvement on a visual memory discrimination task was accompanied by reports of a shift from a detail-oriented to a holistic processing strategy.

Support for the idea that the shift towards more holistic, right hemisphere oriented processes during hypnosis is accompanied by the inhibition of the critical faculties of the left-hemisphere has been shown in two studies by Gruzelier, Brow, Perry, Rhonder and Thomas (1984). Using a haptic processing task, highly susceptible subjects in both studies showed a significant slowing in right hand (i.e. left hemisphere) sorting times following the induction of hypnosis, with the degree of slowing correlating significantly ($r = 0.65$; $p \leq 0.01$) with susceptibility level. This effect was replicated by Cikurel and Gruzelier (1990) using an active-alert induction procedure (Bányai & Hilgard, 1976). Studies by Gruzelier *et al* (1991, 1993) have provided further support by showing that high susceptibles display a decrease in verbal memory performance, a task shown to preferentially involve the left hemisphere, during hypnosis.

Other work has shown the importance of within-hemisphere dynamics during hypnosis also. Gruzelier & Warren (1993), for example, found that highly susceptible subjects showed a significant decline in performance on a word fluency task (involving left frontal regions) during hypnosis. However, using a design fluency task indexing right frontal function no such impairment was found during hypnosis, suggesting that the inhibitory effects of the hypnotic induction are specific to left frontal regions. In a more recent evoked-potential study by Gruzelier, Gray and Horn (cited in Gruzelier, 1996) a decrease in the difference between N120 components evoked by frequent and infrequent tones from baseline, through early and then late stages of an hypnotic induction also strongly suggests that frontal regions have been inhibited by the induction of hypnosis. Taken together, Crawford and Gruzelier (1992; see also Crawford, 1994; Gruzelier, 1996, 1998) have argued that hypnosis is a three-stage process: (i) during the induction of hypnosis, focused attention on the words of the hypnosist with disattention to extraneous stimuli engages the supervisory attentional system of the frontal lobes, primarily in the left hemisphere; (ii) once attention has been sufficiently engaged, suggestions for relaxation bring about a left-frontal inhibition which corresponds to the hypnotic individual 'letting go' of critical thought and reality testing as they relinquish executive control to the hypnotist; and (iii) the subsequent use of suggestions for passive imagery engages posterior cortical sites, particularly in the right hemisphere (see Gruzelier, 1998).

Given that this is the case, highly susceptible individuals will be those that (a) are best able to attend to the initial induction and disattend to extraneous stimuli; and (b) are best able to flexibly shift between states of awareness and cognitive strategies and structures in order to enter hypnosis (i.e. allow themselves to 'let go') and execute the suggestions given therein. There is a considerable body of evidence in support of both of these predictions.

The notion that high susceptibles are good at sustaining attention sits well with the concepts of imaginative involvement and absorption, measures of which, as we have seen, consistently correlate with susceptibility. Since the development of these concepts, a number of studies have supported the relationship between attention and hypnotizability. Van Nuys (1973), for example, obtained results showing a negative correlation ($r = -0.42$) between hypnotizability and the number of intrusive thoughts on a meditational task requiring absolute concentration on one's breathing or a candle flame. More recently, Karlin (1979), using a modified version of a dichotic listening task, demonstrated that high susceptibles have superior selective attentional abilities compared to lows. In addition, Graham and Evans (1977) provide evidence to suggest that the ability to generate a series of random numbers, a difficult task thought to require considerable attentional abilities, is directly related to hypnotic susceptibility. Neither of these findings were replicated by Crawford, Brown and Moon (1993), however. Nevertheless, a number of studies (e.g. Wallace, Knight and Garrett, 1976; Crawford *et al* 1993) have shown that highly susceptible subjects are more responsive to ambiguous figures such as the Necker cube than their less susceptible counterparts. Evidence suggests that the number of apparent reversals reported in response to an ambiguous illusion is directly related to sustained attention to salient cues in the figure, with selective disattention to non-salient cues (Power & Day, 1973; cited in Crawford *et al*, 1993). Buttressing the idea that high susceptibles have superior attentional abilities are a number of findings revealing that highs show greater left-frontal cerebral activation outside hypnosis than lows (e.g. Gruzelier *et al*, 1984; Cikurel & Gruzelier, 1990; McCormack & Gruzelier, 1993; Gruzelier & Warren, 1993). As we have seen, left-frontal regions have been identified as the site of higher level supervisory attentional systems (e.g. Shallice, 1988; Pribram & McGuinness, 1992).

The idea that high susceptibles are better able to shift between cognitive strategies and states of awareness than lows (i.e. have superior *cognitive flexibility*; Battig, 1979; Crawford, 1989) has also been supported by a number of findings. The studies by Crawford and Allen (1983) and Crawford *et al* (1989) mentioned previously have both been cited by Crawford (1994; Crawford & Gruzelier, 1992) as examples of high susceptibles' ability to shift cognitive strategies to perform tasks. In addition, a series of studies utilising variants of the embedded figures task (EFT) using either words or complex figures (Priebe & Wallace, 1986; Wallace & Patterson, 1984; Wallace, 1988, 1990; Wallace, Allen & Weber 1994) have shown that, regardless of the strategy most likely to yield superior performance on the task, high susceptibles consistently out-perform their low susceptible counter-parts. Zelniker (1989) suggests that the core element of the EFT is the ability to flexibly shift attention from one portion of the stimulus to another, using both holistic and analytic strategies to disembed figures or words. Furthermore, there is evidence to suggest that high susceptibles find it easier to get to sleep at night and are more prone to taking naps during the day than lows, suggesting they have a superior control over their ability to shift states of awareness (Evans, 1977). Moreover, as we have seen, high susceptibles appear to be more creative than lows (see e.g. Lynn & Sivec, 1992), also implying a superior cognitive flexibility in these individuals: as MacKinnon (1971) has noted "the truly creative person might be distinguished from the non-creative individual by his great ease in moving from more conscious and active to more unconscious and passive states" (p. 227).

From the brief review provided here, it is evident that a considerable body of well-designed research studies support the predictions of the neuropsychophysiological model of hypnosis. The use of a broad range of cognitive, psychophysiological and neuropsychological techniques to provide converging lines of evidence adds significantly to the considerable explanatory power of Crawford and Gruzelier's model. Furthermore, the use of these techniques has allowed the addition of a temporal element to their theorising which other accounts of hypnosis lack. Moreover, by couching their work in terms of contemporary cognitive and psychophysiological research and theory they do much to bridge the divide between mainstream psychology and the field of hypnosis that has grown over the years.

Despite its obvious explanatory power, the model of hypnosis offered by Crawford and Gruzelier cannot by itself provide a comprehensive account of the phenomenon however. Although it provides a detailed account of the cognitive and physiological markers of hypnosis and certain hypnotic suggestions, there is a clear explanatory gap between this and the way in which hypnotic phenomena are actually brought about. Furthermore, many studies in this area have not included appropriate control conditions and, as such, it is not clear whether any physiological changes occurring during hypnosis are unique to that situation[13]. Moreover, the model has very little to say about the way in which social factors influence the nature of hypnotic responses, and does not provide an account of the phenomenology of hypnosis. Clearly this is not what Crawford and Gruzelier set out to do when they developed the neuropsychophysiological model - they are simply providing one angle on a complex phenomenon which can be looked at in a number of different ways.

However, certain aspects of the theory need to be clarified. For example, reference is made to concepts such as 'dissociation', 'holistic processing', and the 'reduction in reality testing' which are supposedly characteristic of hypnosis. As they stand, these concepts are ill-defined and for this reason are empirically as well as theoretically cumbersome; clearly work needs to be done to identify what these concepts actually mean in order to evaluate their explanatory adequacy.

On a more substantive note, the research on which the neuropsychophysiological model is based exclusively uses a traditional hetero-induction involving relaxation and imagery. As Gruzelier (1998) himself has noted, such research is relatively limited in scope and, as such, the generalisability of these findings is not without question. In particular, one wonders whether the cerebral dynamics of self-hypnosis are similar to those involved in more traditional hetero-hypnosis. As with dissociated control theory, the assertion made by the neuropsychophysiological model concerning executive inhibition during hypnosis appears at odds with the existence of self-hypnosis which, on the face of it at least, would appear to require some level of executive control. One

[13] As the neuropsychophysiological model does not claim that this should necessarily be the case, this does not represent a substantive criticism of the model. The lack of control conditions does, however, limit the usefulness of the data in question.

possible explanation in keeping with the neuropsychophysiological model rests on recent findings concerning a dissociation in the effects of hypnosis on executive functions. A study by Kaiser, Barker, Haenschel, Baldeweg and Gruzelier (1997; cited in Gruzelier, 1998) appears to indicate that hypnosis differentially affects the cognitive and affective executive functions of the anterior cingulate, as evidenced by a reduction in the psychophysiological indicators of error evaluation but not error detection processes. The finding that hypnosis inhibits some but not all executive functions suggests one possible explanatory route by which the neuropsychophysiological model (and, of course, dissociated control theory) might accommodate the existence of self-hypnosis. However, until research has addressed this question directly no firm conclusions can be drawn in this regard.

1.4 Summary

The selective review of hypnosis research and theory presented here provides a basic account of the most popular theories within the field at the present time: ego-psychological theory, neodissociation theory, dissociated control theory, sociocognitive theory and the neuropsychophysiological theory. An evaluation of the theories and the research that has been cited in their support has revealed that, while each may provide an account of certain aspects of hypnosis and hypnotic susceptibility, none of them alone is able to provide anything like a comprehensive account.

In chapter two, a model of the cognitive system which captures the similarities between the different theories of hypnosis reviewed in this chapter will be presented; in chapter three, this model will then be applied to the understanding of suggestion, hypnosis and hypnotic susceptibility. On this basis, a preliminary model which attempts to integrate the different theories of hypnosis into a single explanatory framework will be presented.

CHAPTER TWO: A model of the cognitive system

2.1 Introduction

In chapter one, we saw how the ego-psychological, neodissociation, dissociated control, sociocognitive and neuropsychophysiological models attempt to explain the nature of hypnosis and hypnotic susceptibility, and the evidence which has been cited in their support. These accounts are commonly portrayed as theoretical opponents that are mutually incompatible (see e.g. Lynn & Rhue, 1991c; Fromm & Nash, 1992) and which must compete with one another for conceptual supremacy. Indeed, the 'great state debate' (Kirsch, 1992) that has plagued the field of hypnosis since the nineteenth century (Dixon & Laurence, 1992b) exists as a telling reminder of the conceptual divisions that still blight theorising within this sphere. A number of recent commentators (e.g. Kirsch & Lynn, 1995; Nadon, Laurence & Perry, 1991; Laurence, 1997; Nadon, 1997; cf. Kihlstrom, 1997; Wagstaff, 1998) have, however, argued that such theoretical debates represent more of a historical legacy than any substantive conceptual incompatibility between the different accounts. According to this view, it is more likely that different theorists are simply looking at diverse aspects of the same phenomenon and providing accounts of hypnosis described in the terms most closely allied to the domain under scrutiny, be it the social, the cognitive or the physiological. Although different theories occupy different levels of the explanatory hierarchy, there is no need to suggest that any one theory is better than any other; which is the most useful is entirely dependent on the questions that one wishes to ask.

What is important, however, is that the different levels of description correspond to one another in a consistent and meaningful way. As Nadon (1997) has pointed out, what the field needs is a unifying nomological network specifying how the social, cognitive, phenomenological and physiological aspects of hypnosis relate to one another, as a basis for the organisation of existing research and the generation of new hypotheses. In this chapter I will begin the process of specifying what such a nomological network might look like.

2.2 The nature of the cognitive system

Despite attracting widespread academic interest during the nineteenth and early twentieth centuries, the scepticism born with the behaviourist revolution relegated the study of hypnosis to the periphery of mainstream psychology (Dixon & Laurence, 1991). Although hypnosis researchers have made considerable efforts to forge links between the field of hypnosis and the wider psychological community since this time (see e.g. Sarbin, 1950, 1956; Hilgard, 1977, 1986; Spanos, 1982, 1986; Wagstaff, 1981, 1986; Kirsch, 1985, 1991; Crawford & Gruzelier, 1992), the same cannot be said for those outside the field. One possible reason why the value of hypnosis research remains largely unrecognised in the broader academic domain might be that too little emphasis is placed on the insights that hypnosis and hypnotic phenomena can offer to an understanding of 'normal' psychology. In this and the next chapter, I will outline an integrative model of hypnosis and suggestion which, through the use of research and theory from the field of cognitive psychology, attempts to redress the balance in this regard. In the following pages I aim to demonstrate (a) that the field of hypnosis stands to gain both conceptually and methodologically by conceiving hypnosis and suggestion in terms of contemporary cognitive psychology; and (b) that the study of suggestion and hypnosis raises a number of important issues with profound implications for cognitive psychology itself. The basic premise throughout is that hypnotic phenomena, while perhaps a little unusual[14], are the product of ordinary psychological processes, and any account of them must be entirely described in these terms. By attempting to describe suggestion and hypnosis in terms of a contemporary cognitive psychological framework, it is hoped that greater communication and cross-fertilisation between these still relatively disparate fields may be engendered to their mutual benefit.

In this chapter a model of the cognitive system will be presented, which will then be used as a framework for the explanation of suggestion and hypnosis in chapter three. Few of the ideas presented here are novel in their own right; the major change in emphasis lies in their combination and application to the understanding of hypnosis and suggestion. Although the account presented here is as much a model of cognition as it is a model of hypnosis, it should be noted that it is relatively descriptive from a cognitive standpoint, and provides more of a heuristic than a complete and tight description of the cognitive system. Nevertheless, as the basis for an account of hypnosis it is considerably more detailed than those provided by ego-psychological, neodissociation, dissociated control and sociocognitive theorists, and, I would argue, provides greater explanatory power and scope for hypothesis generation on this basis alone. Moreover, although the primary motivation for the current analysis is to provide an account of suggestion and hypnosis of use to researchers and theorists within that field, the integration of previously unrelated cognitive research, the emphasis that is placed on consciousness,

[14] In that they are not *normally* encountered outside the hypnotic situation.

and the implications of suggestion and hypnosis for its explanation and investigation, will hopefully offer something of interest to cognitive psychologists also.

2.2.1 The Norman and Shallice model, automaticity and control

As discussed in chapter one, the Norman and Shallice (1986) model of behavioural control has been particularly influential within the field of hypnosis in recent years, forming the basis of dissociated control theory and the recent sociocognitive view of Kirsch and Lynn (1997). It has also played a significant role in the development of the ideas presented here; in order to help elucidate the present position, this section begins with a reappraisal of the Norman and Shallice model.

Norman and Shallice propose that the cognitive system is comprised of a large, distributed set of specialised processing systems under the guidance of a two-tiered cognitive control system. In routine situations, behaviours may be controlled exclusively by the operation of low-level cognitive control structures or schemata, which are triggered by cues in the internal and external environment in accordance with a contention scheduling mechanism. This is held to be an automatic process, requiring neither attention, awareness or volition for its operation. In the case of non-routine situations, however, where schemata are inappropriate or their triggering conditions are not present, a high-level supervisory attentional system may intervene to excite or inhibit schemata via the scheduling mechanism. The supervisory attentional system is a limited capacity structure and its operation requires attention, mental effort and volition. Its primary functions involve goal setting, planning, problem solving, decision making, and troubleshooting.

The Norman and Shallice model has enjoyed considerable success in recent years and is supported by a growing literature in the fields of cognition and neuropsychology. In line with the dissociated control and recent sociocognitive theories, the model is viewed here as a useful starting point for the explanation of hypnotic behaviours. However, while the basic Norman and Shallice framework is broadly supported in this context, I would argue that there are a number of reasons why the model, in its present form at least, is unable to provide an adequate account of suggestion, hypnosis and hypnotic susceptibility. First and foremost, the intention of the Norman and Shallice model was to provide an account of the cognitive systems involved in the selection of behaviour. In this context we are interested in much more than simply the control of action, however. During hypnosis, suggestions call not only for hypnotic behaviours but also for hypnotic experiences, often requesting alterations in perception such as those involved in suggestions for analgesia, hallucinations and the like. Indeed, explaining the phenomenological aspects of hypnosis is arguably the most important task for theorists working within this domain, particularly given the fact that hypnotic behaviours can easily be reproduced by simulating individuals. Although dissociated control theorists have appealed to the model as an account of the phenomenology of hypnotic behaviours, consciousness and subjective experience play only a small and relatively peripheral role in Norman and Shallice's theorising; the profound alterations in experience associated with the execution of certain hypnotic behaviours would seem to require an account which places much greater emphasis on the nature of perception and consciousness.

A second problem with the Norman and Shallice model is the distinction that it makes between routine and non-routine behaviour, the former being controlled exclusively by automatic schema selection with the latter requiring the SAS for its management. As Jonides, Naveh-Benjamin and Palmer (1985) have noted, most complex behaviours, such as those often observed in the hypnotic situation, are comprised of numerous components and typically involve both higher and lower level control processes in their execution (cf. Tzelgov, Henik & Leiser, 1990; Uleman, 1989). In addition, the number of higher or lower level components that behaviours are comprised of will vary over the course of an individual's learning history, with the number of automatic (i.e. routine) components increasing over time. Thus, rather than drawing a strict dichotomy between routine and non-routine behaviours, it makes more sense to view the two as opposite poles on a continuum described by the relative proportion of automatic and non-automatic control components comprising the behaviour in question (cf. Uleman, 1989). By this view, the question of whether or not a particular complex hypnotic behaviour is automatic is relative rather than absolute (cf. Logan, 1988). The failure of both the neuropsychophysiological model and dissociated control theory to provide an adequate account of self-hypnosis arguably stems from having overlooked the importance of higher level processing in the management of complex behaviour[15]. It is also important that one remains aware that many cognitive processes can be *either* automatic *or* controlled by higher level processes (see e.g. Posner, 1978); it is likely, therefore, that there will be both situational and individual differences in the degree to which a given behaviour is carried out in a routine or non-routine fashion. If we are to understand the control processes associated with hypnotic behaviours it is essential that such potential differences are taken into account.

[15] Although see section 1.3.4.

Finally, and perhaps most importantly, there are certain problems with the way that Norman and Shallice conceive of automaticity which challenge its use, at least in its present form, as an account of hypnotic behaviours. The central problem is well illustrated by the recent conflict between dissociated control theory and the sociocognitive model of Kirsch and Lynn (1997). According to dissociated control theory, hypnosis is one situation where the supervisory attentional system becomes inhibited, delegating the management of behaviour to lower level control systems at the level of contention scheduling. By this view, hypnotic suggestions bypass the supervisory system and serve to automatically activate sub-systems of control at the lower level. As the phenomenological sense of volition is associated with the operation of the supervisory system, behaviours controlled at the lower level will be experienced as non-volitional; in this way, dissociated control theory accounts for the sense of involuntariness that typically accompanies the successful execution of hypnotic behaviours. However, as Kirsch and Lynn (1997) have pointed out in their recent sociocognitive account of hypnosis, the Norman and Shallice model proposes that virtually *all* behaviours, at least in the case of routine situations, result from the automatic activation of lower level control systems. Given that this is the case, one may retain the notion that hypnotic behaviours are executed automatically without positing a state of supervisory system inhibition analogous to frontal lobe pathology; indeed, this is precisely what the sociocognitive model of Kirsch and Lynn (1997) maintains. By this view, hypnotic involuntariness is the product of a misattribution based on the individual's mistaken belief that hypnotic behaviours involve less control than normal ones.

This conceptual dispute clearly highlights a fundamental problem with the Norman and Shallice model. On the one hand, the model postulates that the majority of behaviour is controlled automatically by lower level systems, while on the other it suggests that the phenomenological sense of volition is associated with higher level control. If this were true then one would expect all routine behaviour to be experienced as involuntary, which is clearly not the case. It is this inconsistency that underlies the conceptual problems associated both with the Norman and Shallice model and dissociated control theory which relies upon it. In order to accommodate this fact, Kirsch and Lynn (1997) argue that the sense of volition is not a product of whether a behaviour has been controlled automatically or not, but rather is an attribution based on the individual's perception of the causes of their behaviour. Clearly, however, this goes outside the bounds of the

Norman and Shallice model, which obviously requires revision if it is to take the notion on board.

This conceptual problem with the Norman and Shallice model is a product of its reliance on the traditional view of automaticity and control (e.g. LaBerge & Samuels, 1974; Posner & Snyder, 1975; Shiffrin & Schneider, 1977; Hasher & Zacks, 1979) derived from research into attention that posits a central processing system with limited resources (e.g. Kahneman, 1973). According to the traditional view, automatic and controlled processes occupy opposite sides of a mutually exclusive functional dichotomy based on four criteria: awareness, attentional efficiency, intention and control (see Bargh, 1989, 1994). Automatic processes are those that occur outside awareness, with little or no attentional effort, are involuntary in that they are triggered without intention, and are outside the direct control of the individual. Controlled processes, on the other hand, are conscious, intentional, consume attentional resources, and are controlled directly. For a process to be defined as automatic it must meet all four criteria; if it does not then it is a controlled process by definition.

Despite the popularity of the traditional model of automaticity, the validity of this view has recently been called into question by a number of commentators (e.g. Logan, 1988; Bargh, 1989). The principal difficulty with the traditional dichotomy between automatic and controlled processes is cogently expressed by Bargh:

> ...attention, awareness, intention, and control do not necessarily occur together in an all-or-none fashion. They are to some extent independent qualities that may appear in various combinations. As there is ample evidence that automatic processing is not unitary, such that all of its component properties do not co-occur, so also there are no compelling theoretical reasons to believe in its unitary nature (1989; p.6).

Rather than being a unitary construct as suggested by the traditional view, the concept of automaticity captures a range of related processes that vary in the degree of effortlessness, control, awareness, intentionality and attentional requirement associated with their operation (see Bargh, 1989, for a discussion of this research). Without further qualification, the suggestion made by Norman and Shallice that the operation of low level control systems is automatic is simply too vague, and is responsible for the kind of conceptual trap which dissociated control theory has unwittingly fallen into. The methodological implications are clear: whether a particular behaviour requires attention, effort, awareness or control is an empirical rather than a conceptual issue, and one that requires the assessment of each of the four factors in an independent and systematic fashion based on careful task analyses. The fact that this has not been done in recent research inspired by the dissociated control and sociocognitive theories may go some way towards explaining the equivocal findings obtained in this regard (see Ruehle & Zamansky, 1997).

2.2.2 Memory-based views of automaticity

The conceptual problems associated with the traditional view of automaticity have been addressed in a number of recent theoretical models of the concept. The modal view of automaticity as a phenomenon of attention (e.g. LaBerge & Samuels, 1974; Shiffrin & Schneider, 1977; Norman & Shallice, 1986) regards the development of automatic processing as involving a general reduction in the amount of attentional resources required for a process to operate. Recent approaches to automaticity, however, have adopted a contrasting view in which the concept has been described more as one of memory than attention. According to proponents of this view (e.g. Anderson, 1982; Schneider, 1985; Logan, 1988), when an individual attempts to learn a novel task, a set of general-purpose problem solving algorithms are employed to assess the nature of the task and guide behaviour accordingly. As experience with the task increases so appropriate responses are learned, such that on subsequent attempts the individual can either complete the task via the use of general-purpose algorithms, or alternatively by retrieving the appropriate solution from memory. By this view, it is this transition from algorithm-based performance to performance based on the single-step retrieval of memory traces that characterises the development of an automatic process (e.g. Logan, 1991; 1992), and not, as is traditionally held, a reduction in the attentional resources required for a process to operate.

According to the memory-based view, automatic and non-automatic processes are simply different rather than opposite sides of a processing dichotomy as suggested in the traditional model. What defines a process as automatic is whether or not it is based on the direct retrieval of information from memory, rather than whether it can occur without attention, effortlessly, unconsciously, or unintentionally. Most automaticity-as-memory (Logan, 1991) theorists retain many elements of the traditional model, however. For example, automatic processes are still regarded by many proponents of this view as occurring rapidly, effortlessly and without awareness. Similarly, the operation of general purpose algorithms is regarded by most as being a time-consuming and conscious process requiring sustained, focal attention and mental effort. However, according to this view these characteristics are due more to the differing nature of the cognitive operations which underlie automatic and non-automatic processes rather than the amount of attentional resources required for them to occur. In this way, the memory view retains the ability to account for the same range of qualitative findings as earlier models, without the associated conceptual problems (see Logan, 1988, 1991, for a general discussion of the automaticity-as-memory position and its relation to more traditional views).

It is proposed here that if we are to retain something like the Norman and Shallice model as an account of hypnotic behaviours then it must take on board the insights provided by memory-based views of automaticity, such as that offered by Logan (1988). Broadly speaking, Logan's account is compatible with the distinction between higher and lower level control processes adopted in the Norman and Shallice model. Shallice and Burgess (1996), for example, suggest that the operation of the supervisory attentional system in many ways resembles a problem-solving process based on multi-step general purpose routines. Such a notion clearly accords well with the definition of controlled processing offered by Logan (1988). Similarly, the direct activation of schematic information by environmental triggers corresponds closely with the idea of the single-step retrieval of representations that characterises the operation of automatic processes in Logan's account. As such, the Norman and Shallice model may adopt the view of automaticity offered by Logan without losing its basic theoretical structure; in so doing it would attain greater conceptual and mathematical[16] precision, whilst avoiding the pitfalls that lie in wait for models that are based on the traditional automatic/controlled dichotomy. Such an integrated view is endorsed here.

There is one further conceptual advantage of adopting this type of integrated approach which is of relevance here. In the traditional automatic/controlled dichotomy embraced by the Norman and Shallice model, the fact that certain processes normally performed automatically may be subject to conscious control (see e.g. Posner, 1978) was accounted for by relating control to the deployment of attentional resources. The degree of attention that an individual pays to a task directly determines how controlled their performance will be. Whilst accounting for certain qualitative differences, such a notion is unable to explain performance differences in situations where the amount of attention devoted to a task may be equal across subjects; one conceivable example might be the difference between expert and novice performance. The model of automaticity offered by Logan (1988) does not suffer such an explanatory shortcoming, however. According to Logan, the development of automaticity involves the laying down of memory traces which, once sufficiently numerous and well established, may support performance on a task which has previously required the operation of controlled processing algorithms for its

[16] See Logan (1988) for a demonstration of how the memory-based view provides a powerful account of the quantitative findings concerning the development of automaticity.

completion. Despite the possession of adequate memory representations to support automatic performance, however, the individual remains capable of using controlled processes to approach the task. Thus, performance may be either automatic or controlled depending on the processing circumstances of the time. By this view, the difference between expert and novice performance is accounted for by suggesting that experts and novices differ in the way that they perform tasks, that is, via the use of memory retrieval and algorithm-based processes respectively. Thus, although the same 'amount' of attention might be paid to the task in each case, the direction and nature of attention will differ significantly between the two. Such a view is compatible with the notion that there are situational and individual differences in the degree to which behaviours are controlled automatically or by higher level processes.

2.2.3 Perception, automatic inference and the construction of consciousness

In the previous section it was suggested that the Norman and Shallice model could attain greater conceptual precision by adopting the Logan (1988) model of automaticity. As will hopefully become apparent in this section, Logan's model also offers a useful starting point for incorporating the concepts of perception and consciousness within the Norman and Shallice model.

The question of how the cognitive system interprets the environment is a complex and multi-faceted issue reflected by the volume and diversity of research within the field of perception. The perceptual process as a whole, that is, from the receipt of physical information by the sensory apparatus to the conscious recognition of a stimulus by the perceiving organism, involves a series of computational stages whereby information is reduced, transformed and ascribed meaning by the cognitive system (see e.g. Marr, 1982; Kosslyn, 1980, 1987). Lower-order perceptual processes, such as those involved in figure/ground segregation and parsing in the case of visual perception, are typically performed on the basis of stimulus properties alone (Kosslyn, 1987). At higher levels, where the perceptual units correspond to objects and their parts, information makes contact with representations derived from prior experience as a basis for perceptual classification, semantic analysis and, ultimately, conscious recognition (see e.g. Marr, 1982); it is at this level that the perceptual process is influenced by 'top-down' or conceptually driven factors such as expectation and set. Although lower-order computations play a significant role in determining the nature of conscious percepts, in this context our interest is largely limited to high-order perceptual processes: it is here that suggestions for alterations in perception will exert their influence on the perceptual process.

Once lower-order perceptual analyses have been performed, the resulting information is passed on to associative memory where it is encoded for recognition (Kosslyn, 1987). According to the present model, representations of the world derived from previous experience are distributed throughout an associative memory network as patterns of activation between network nodes that broadly correspond to features of the environment. The encoding process serves to activate the appropriate nodes within the network providing a basis for recognition. According to Logan (1988), this process is the inevitable and automatic consequence of attention being paid to a stimulus, a concept which he has termed "the assumption of obligatory encoding". Following Logan's second assumption, that of obligatory retrieval, encoding of a stimulus also serves to automatically retrieve everything associated with that stimulus in the memory network. This parallel spreading of activation within associative memory may be viewed as an *inferential process*[17] by which the cognitive system automatically computes an interpretation of the environment for the subsequent control of action (cf. Smolensky, 1988; Hinton, 1990; Sloman, 1996). This interpretation, which is a product of the interaction between existing knowledge and stimulus information, provides the system with (a) an understanding of the situation and what it involves; (b) what to expect and therefore what to attend or disattend to; and, most importantly (c) what to do and when. This process provides the cognitive system with a rapid and efficient method for the control of routine behaviour, requiring little or no mental effort and only a modicum of attention for its operation.

Given that this process is somewhat chaotic, in that it involves multiple representations being active simultaneously and in a constant state of flux, the question remains as to why subjective experience is perceived as a coherent and unitary whole. According to Marcel (1983), the activation of representations actually serves to suggest an *array* of alternative interpretations of the environment which are activated in parallel and prior to awareness. These so-called *perceptual hypotheses* are organised representations of perceptual and categorical information stored in memory and are analogous to the schemata of Norman and Shallice. Once generated, these hypotheses are matched to temporally defined segments of sensory information in a search for the best-fitting interpretation; this interpretation subsequently serves to parse the relevant sense data into

[17] Indeed, there is a considerable body of literature concerning the inferential properties of associative networks (see Sloman, 1996).

an integrated perceptual whole corresponding to the individual's conscious percept. Conscious representations do not, therefore, possess a one-to-one correspondence with those used and derived by sensory and cognitive systems; rather they represent one way of organising sensory information out of a number of possible alternative organisational schemes (cf. Gheorghiu & Kruse, 1991). Moreover, the apparent unity and inevitability of conscious percepts conceals the multiple unconscious interpretations that have taken place in order to provide meaning to what is essentially ambiguous input.

The essence of Marcel's exposition is that consciousness is a *construction* (cf. Ornstein, 1986; Chapman & Nakamura, 1998; Mandler & Nakamura, 1987) that is a product of the organisation placed on in-coming sensory information by existing representations. Which representations or hypotheses are selected to organise sense information is dependent on a number of factors, including the nature of the sense data received, its relative match to the representations competing for the control of experience, and how well learnt the representations are. In addition, the selection of hypotheses can be biased in a top-down fashion through the allocation of attention. Thus, what the individual perceives at any one time is an inference determined by the complex and dynamic interaction between situational features, existing knowledge and current processing concerns. Importantly, however, behaviour may be controlled prior to or without the process of hypothesis selection occurring.

Assuming the validity of this account, what cognitive system systems might be responsible for the selection of hypotheses which provides the basis for the integration of information underlying consciousness? One plausible candidate might be the low level attentional systems described by Shallice (1988). According to Shallice (1988), the cognitive system requires some way of prioritising processing operations in order to reduce the demands placed on the limited resources available to it. Shallice suggests that this function might be performed, at least in part, by a series of de-centralised control structures or low level attentional systems[18], which serve as a gateway between the parallel processing of information at lower levels of the cognitive system and the serial processing of information at higher levels; in the case of the Norman and Shallice (1986) model, this higher level processing would be performed by the supervisory attentional system. The notion that low level attentional systems serve as an interface between parallel and serial processing is clearly consistent with the claims of Marcel (1983). Also in line with Marcel's account, it is likely that low level attentional systems operate by

[18] Of which there are probably several, each relating to specific domains (e.g. vision).

integrating the available data into a unitary whole before passing it on for further processing, in order to retain the most information in as economical a way as possible. Moreover, Shallice (1988) has suggested that damage to a low level visual attentional system might be responsible for the deficits associated with visual neglect, closely paralleling Marcel's (1983) own position.

2.2.4 A model of the cognitive system

Figure 2.1 shows a diagrammatic representation of the cognitive system based on the discussion in the preceding sections. The similarities between this model and that provided by Norman and Shallice are readily apparent. In line with Norman and Shallice, it is proposed that the cognitive system is comprised of a large distributed set of specialised processing structures managed by a hierarchically organised cognitive control system. At the lower[19] level, behaviour is controlled by the automatic activation of representations following the receipt of input from the stimulus environment. Lower level processing is regarded here as a default mode of cognition that is fundamental and basic to all cognitive activity; as such, it provides the foundation for the more complex processing operations associated with processing at the higher level. Although higher level systems are ultimately constrained by the input that they receive from lower level systems, they in turn serve to co-ordinate lower level activity allowing behavioural flexibility and the ability to deal with novel situations.

The lower level control of behaviour is based on the automatic activation of behavioural representations. The basis for this process is the obligatory encoding of stimulus information following attention to the stimulus environment (Logan, 1988); the activation of the corresponding perceptual representation by the encoding process serves to automatically retrieve associated representations through the spreading of activation throughout associative memory (Logan, 1988). This process subserves recognition of the stimulus situation, which is an inference based on the relationship between existing

[19] The distinction between 'higher' and 'lower' levels of cognition brings with it certain unfortunate connotations, in that the term lower may be taken as implying that processing at this level is in some way inferior to its higher level counter-part. This, of course, is not the case, as higher level systems are ultimately dependent on processing at the lower level for their operation. The higher/lower distinction is used here, following much cognitive theorising (see e.g. Shallice, 1988), as a convenient spatial metaphor which captures the hierarchical nature of the cognitive system.

Figure 1: Structure of the cognitive system and its relation to non-conscious awareness and consciousness

knowledge and stimulus information (cf. Marr, 1982; Kosslyn, 1987; Smolensky, 1988; Hinton, 1990; Sloman, 1996). The results of this process act as triggering input to the network of behavioural representations (i.e. thought and action schemata), which are executed when threshold activation levels are reached; this is analogous to the operation of the trigger data-base in the Norman and Shallice model. Behaviours executed on the basis of memory retrieval alone are regarded as *automatic* (cf. Logan, 1988). It is assumed that behavioural representations are mutually inhibitory, endowing the system with a mechanism for preventing the activation of conflicting behaviours; this corresponds to the contention scheduling mechanism proposed by Norman and Shallice (1986).

In the present model it is assumed that, at its most basic level, this entire process requires only low level attentional systems for its operation. Low level attentional systems exist at the interface between the internal and external environment and co-ordinate activity between the two. Thus, in the situation where behaviour x is to be executed on the receipt of information y, low level attentional systems monitor the environment[20] for y-related information (as specified by the prior activation of x), which, when received, serves to define the parameters for the subsequent implementation of x accordingly. This process, which is rapid, dynamic and highly efficient, provides the system with a basis for the adaptive control of thought and action in situations with which it is at least relatively familiar. At its purest level, it requires only that low level attention be paid to the stimulus environment for its operation; as such, it is not demanding of high level attentional resources or mental effort, and need not necessarily be conscious. Rather, the control of behaviour at this level is best regarded as an *intuitive* process which requires *non*-conscious rather than conscious awareness. The term non-conscious awareness has been chosen to indicate that low level activity need not necessarily be unconscious in the strict sense; rather, the individual may be aware on an intuitive (i.e. feeling) level of the operation of lower level systems, but be unable to put their intuitions into words.

In order to prioritise processing operations, low level representational activity generated by stimulation from the internal and external world serves to suggest a number of alternative interpretations of the overall environment, or so-called perceptual hypotheses (cf. Marcel, 1983). The perceptual hypothesis which provides the best interpretation of the current state of affairs (i.e. most representative and economical) is

[20] It is important to note that the present model uses the term environment to refer to activity in both the external stimulus world and the internal representational world.

selected by low level attentional systems and subsequently serves to synthesise sensory information into a coherent whole according to the organisational scheme provided by the perceptual hypothesis. This information is then passed onto higher level systems for further processing; at this point the information becomes the individual's conscious percept.

Once information has been passed to higher level systems it is subject to numerous manipulations and transformations in order to meet current processing concerns. Following Norman and Shallice (1986), higher level processing operations in the present model are governed by the supervisory attentional system (SAS), a limited capacity structure associated with attention and mental effort; in addition, it is proposed that the operation of the SAS corresponds to *conscious* awareness in the strict sense, in that the information received and used by it is reportable by the individual[21]. The SAS comprises a complex set of sub-systems working in concert to manage numerous high level processes including trouble shooting, behavioural inhibition, planning, goal setting, decision making and problem solving (for recent theoretical developments in this regard see e.g. Burgess & Shallice, 1996a, b; Shallice & Burgess, 1996). Unlike low level attentional systems which have direct control over the representations underlying perception and action, the SAS operates indirectly by setting up temporary schemata specifying the type of representations required for its purposes (Burgess & Shallice, 1996b; Shallice & Burgess, 1996); as such, the processing operations available to the SAS are ultimately constrained by the information that it receives from low level systems. Nevertheless, the SAS serves to confer a level of organisation upon lower level systems, ensuring that the long term goals of the system are met and behavioural standards are kept within acceptable limits. Thus, the activity of low level attentional systems and the representations under their guidance is constrained, to an extent at least, by the moderating input they receive from higher level systems also.

The SAS is required when the operation of existing representations under the guidance of low level attentional systems alone are unable to meet the processing demands of the situation. In novel situations, for example, where appropriate representations have not been formed through learning, the SAS intervenes to guide behaviour on the basis of general purpose problem solving algorithms (Shallice & Burgess, 1996; cf. Logan, 1988). Extending the basic Norman and Shallice position, however, it is proposed that

[21] Nevertheless, the quality of information received by the SAS is likely to vary considerably and, thus, so too will the individual's reports of it. Moreover, whether or not the individual will be able to provide an *accurate* description of the information received by the SAS is probably dependent upon factors that are more or less independent of the conscious status of it.

even relatively routine (yet complex) behaviours require the SAS at certain points for their successful operation. For example, in the case of visiting a restaurant, although many of the component behaviours may be executed on the basis of the automatic activation of representations alone, at certain critical junctures, such as when food is to be ordered, the SAS must intervene to make a decision before automatic behavioural control can resume. The extent to which the SAS is required is dependent on how many of the component processes in a given behavioural sequence can rely on automatic processing alone. This will vary according to the nature of the behaviour in question, how well learnt the behaviour is, and the interaction between the two. That is not to say, however, that a behaviour (or one of its components) that is typically automatic will necessarily be performed in this way: even though a behaviour has been well learnt, the individual retains the option to perform it on the basis of higher level processes if they so wish (Logan, 1988), despite the fact that this may be inadvisable (Norman & Shallice, 1986). Conversely, although certain behavioural components may normally be executed by the SAS, the individual may still be able to provide an adequate response on the basis of automatic processing. Which mechanism the individual chooses will depend in part on the processing circumstances of the time: when under a heavy cognitive load, for example, the individual may be forced into responding automatically. In addition, the degree to which the SAS or lower level processes are relied upon to control behaviour is subject to individual differences in higher and lower level processing preferences and abilities.

2.2.5 Higher and lower level 'modes' of processing

Following the Norman and Shallice model, it has so far been suggested that the cognitive system is subject to control at two levels, higher and lower. In line with Norman and Shallice, the central premise of the current model is that there are fundamental differences in the way in which behaviour is controlled at each of these levels. However, the current model also asserts that there are reliable differences in the relative degree to which individuals rely on higher or lower level control processes in the everyday management of behaviour. By this view, two different individuals in comparable situations may differ in the degree to which their behaviour is controlled by higher or lower level processes, despite equivalent levels of learning. Given that individuals differ in terms of processing bias, it is likely that such differences will manifest themselves not only in the automaticity of behaviour, but also on a more general level in the types of cognitive and personality attributes that individuals display.

Accordingly, the current model extends the basic Norman and Shallice position by proposing that, in addition to differences in behavioural control, there are also more general psychological characteristics associated with higher and lower level processing. A distinction between higher and lower level 'modes' of cognition will therefore be made here.

This distinction between higher and lower level modes of cognition is based partly on converging evidence from research and theory concerning the perception and categorisation of multidimensional stimuli. Consider three hypothetical stimuli, A, B and C, that vary on two dimensions within psychological 'space', such that A and B differ on one dimension, B and C differ on the second dimension, and A and C differ on both (see figure 2.2). We know the perceived similarities of A.B and B.C (i.e stimuli that differ on only one dimension); what is the perceived similarity between A and C, stimuli that differ on both dimensions? If we assume that the perceived similarity between stimuli is equivalent to the distance between them on this diagrammatic representation, then, according to standard Pythagorean laws of geometry, the perceived similarity between A and C is given by the formula $d_{xy} = (d_x^2 + d_y^2)^{½}$; this formula is known as the *Euclidean metric* and may be regarded as a holistic judgement as it calculates perceived similarity on the basis of family resemblance between stimuli.

If, however, we were unaware of the laws of Pythagoras, we may believe that the perceived similarity between two stimuli that differ on two dimensions is given by the *sum* of the perceived similarities between the stimuli that differ on only one of these dimensions, that is $d_{xy} = d_x + d_y$; this formula has been described as the *city-block metric*, as the way in which we get from one point in psychological space to another is analogous to the fashion in which one must traverse the streets of a city. This may be regarded as an analytical method of perceived similarity calculation, as it is based on the separation of dimensional values prior to their summation (for a more detailed discussion from which this was taken see Garner, 1974).

A considerable number of studies in this area have employed tasks based on this concept to assess which perceptual metric subjects use when perceiving stimuli that differ on two dimensions. An important step-forward in this research was the realisation that the nature of the stimulus dimensions themselves dictate, to an extent at least, the nature of the processing operations by which the stimulus is perceived (Shepard, 1964; Lockhead, 1972; Garner, 1974). A substantial body of evidence demonstrates that certain dimensional combinations (such as those between values of saturation and brightness, two of the three components of colour) give rise to similarity judgements most closely

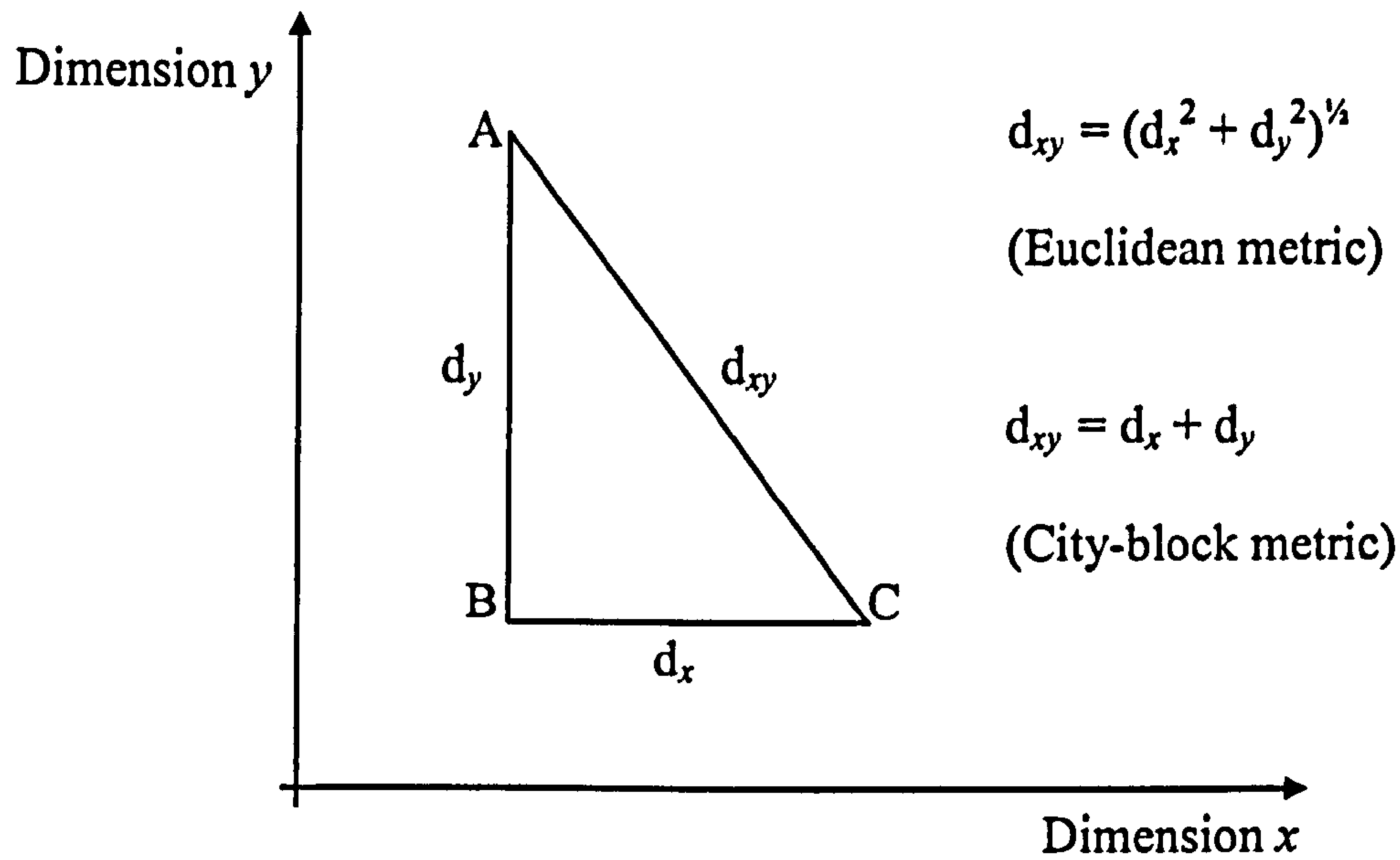

Figure 2.2: Alternative methods of calculating the perceived similarity between multidimensional stimuli. Adapted from Garner (1974).

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resembling the Euclidean metric; these have been described as 'integral stimuli' (Lockhead, 1972; Garner, 1974) because they are perceived as unitary wholes rather than as a conjunction of analysed parts. Conversely, other combinations of dimensions (such as that between size and brightness) give rise to similarity judgements seemingly based on the city-block metric; these have been described as 'analysable' (Shepard, 1964; Lockhead, 1972) or 'separable' stimuli (Garner, 1974) because they tend to be perceived as being composed of distinct elements. These findings generalise across a broad range of tasks, with the distinction being based on a set of converging operations (see Garner, 1974) that clearly defines the difference between those stimuli that encourage integral processing and those that are commonly processed separably.

What is it about certain dimensional combinations that gives rise to these distinct forms of processing? Torgerson (1958) suggests that separable stimuli are processed on the basis of an analytical operation because the dimensions of which they are composed are more 'obvious and compelling' than those of integral stimuli. For example, stimuli composed of variations of size and brightness are separable because their components are more psychologically 'real' for subjects. However, combinations of *saturation* and brightness are typically regarded as an archetypal example of *integral* stimuli. Thus, it is not simply the dimensional elements themselves, but the relationship between them that determines the nature of the stimulus: it is the *difference* between dimensions of size and brightness that encourages separable processing because it is this which has psychological reality for the subject. The difference between dimensions of saturation and brightness is not so readily apparent and hence stimuli composed of these dimensions are processed holistically.

However, as Garner (1974) has pointed out, the ability of subjects to separate hue, saturation and brightness led to the development of the Munsell colour system on which the majority of research concerning the processing of colour is based. This highlights an important point: both integral and separable stimuli may, under certain conditions, be processed separably and integrally respectively. For example, stimuli composed of dimensions of size and brightness, the prototypical example of separable stimuli, are commonly processed holistically (i.e. integrally) under incidental conditions or with concurrent task demands (see e.g. Foard & Kemler Nelson, 1984; J. D. Smith & Kemler Nelson, 1984). Thus, it is not simply the stimulus that determines the nature of the processing operation performed, but task requirements also. Furthermore, as Torgerson (1958) has noted, what determines the integrality or separability of a stimulus involves the 'psychological reality' of the dimensions under scrutiny. This would seem to suggest that subject factors may also play a significant role in the perception of the nature of a stimulus, a suggestion that has received considerable empirical support (Foard & Kemler Nelson, 1984). For example, a number of studies have shown that cognitive development appears to proceed in parallel with a shift from a holistic (i.e. integral) to a more analytical (i.e. separable) form of perceptual processing (e.g. Shepp, 1978, 1983; L. B. Smith & Kemler, 1977, 1978). Thus, young children tend to process stimuli commonly perceived as separable by adults in a holistic fashion, with this tendency diminishing as the child matures. Furthermore, older retarded children are more likely to process separable stimuli holistically, in a similar fashion to their younger counterparts.

Foard and Kemler Nelson (1984) have suggested that these findings indicate that holistic processing is a primitive default mode of operation of the cognitive system. The observed trend from integral to separable processing that proceeds in line with cognitive development strongly supports this notion. The nature of the task manipulations (concurrent task requirements, incidental conditions and manipulations of instructional set) that invite the integral processing of separable stimuli by adult subjects are also consistent with this idea. Foard and Kemler-Nelson argue that such manipulations encourage adult subjects to abandon their normally deliberative and analytical stance and adopt more efficient but primitive forms of processing for the control of behaviour.

The notion that the cognitive system has two modes of processing, one primitive but efficient mode operating according to holistic (i.e. integral) principles, and the other a more advanced but slower mode operating according to analytic (i.e. separable) principles, is strongly supported by research that has developed in parallel with the perceptual literature and concerns the way that humans acquire concepts. In traditional laboratory studies of concept learning, research has focused almost exclusively on the acquisition of concepts under intentional learning conditions, whereby the subject engages in deliberate attempts to memorise information concerning artificial categories. Theories concerning this process invariably regard the learner as an active hypothesis tester who analyses the available data for common attributes or underlying rules on which the category structure has been based (e.g. Bruner, Goodnow & Austin, 1956; Trabasso & Bower, 1964). However, Rosch and Mervis (1975) have suggested that such an approach does not represent the most ecologically valid way of understanding the acquisition of category information. They argue that the majority of natural categories do not conform to a structure whereby category membership is defined by a number of criterial attributes or underlying rules. Rather, natural categories tend to have a strong 'family-resemblance' structure so that several attributes *usually* predict membership of that category (J.D. Smith, 1989). Members tend to be grouped together on the basis of a number of common attributes that tend to naturally co-occur; rather than category structure being defined by criterial (i.e defining) features, it is the general overall similarity between members that creates the category. This absence of defining features suggests that the active, analytical method of concept acquisition is not the most natural way of learning category information: it is more adaptive to attend to several features at once in a diffuse fashion so as to capture the *overall* similarity relations between stimuli rather than the origins of that similarity.

In contrast to traditional studies of concept learning which use categories formed on the basis of one or two defining attributes, Brooks (1978) put this idea to the test using categories formed purely on the basis of overall similarity relations. His results revealed that subjects are, in fact, extremely adept at recovering information acquired on this basis. On the basis of his results Brooks argued that the storage of categories with a simple family-resemblance structure may be linked to incidental learning conditions, suggesting that under these circumstances individuals rely on a non-strategic fall-back mode of cognition rather than analysing the components of potential category members to see if any are criterial.

The work of Brooks concerning analytical and non-analytical concept learning (for a review, see Jacoby & Brooks, 1984) is of particular significance because it draws on the same sense of analytic and holistic modes of processing that formed the basis of the distinction between integral and separable perceptual analysis discussed previously. As

J.D. Smith (1989) has pointed out, the independence of category attributes emphasised by analytical models of concept learning and the computations on which these are based are reminiscent of the city-block metric described by Garner (1974). Conversely, models of category learning that emphasise the non-independence of category attributes have much in common with the Euclidean metric. Furthermore, Brooks' suggestion that the learning of concepts based on family-resemblance is directly linked to a primitive, 'fall-back' mode of cognition is compatible with that presented by Foard and Kemler Nelson (1984), who suggested that the integral perception of separable stimuli by young children, and by adults under certain task conditions, is due to the lack of available resources (or experience) to process analytically.

The notion that primitivizing conditions (e.g. concurrent tasks, incidental learning situations etc.) lead to categorisation on the basis of family resemblance rather than componential analysis was put to the test by Kemler Nelson (1984). A concept learning task was devised such that it could be completed according to either analytic or holistic strategies and presented in both intentional and incidental learning conditions. Results indicate that under intentional conditions, adults strongly favour categorisation on the basis of active hypothesis testing for criterial attributes of category membership. However, under incidental conditions, categorisation was frequently based on overall similarity relations rather than the more analytical strategy used when learning intentionally. In a fourth experiment Kemler Nelson (1984) went on to provide converging evidence for this fall-back mode of cognition idea through an investigation of the developmental nature of holistic and analytically based concept learning. Kemler-Nelson devised two more similar tasks drawing on the same conception of analytic and holistic categorisation, one that strongly favoured concept learning on the basis of family resemblance and a second that was most adaptively performed via criterially based similarity judgements. While fifth grade students performed comparably well on each of the tests, the performance of pre-school children on the analytically based version of the task was clearly inferior to that involving the learning of similarity based concepts. Perhaps more significantly, no difference was found between the groups on the holistic version of the task, providing a direct parallel to the developmental trend observed for the perceptual processing of integral and separable dimensions discussed previously (e.g. Shepp, 1978, 1983; L. B. Smith & Kemler, 1977, 1978).

The assertion that the cognitive system has a basic, yet rapid and efficient default or fall-back mode that provides the basis for more complex and deliberative forms of processing corresponds closely to the model of the cognitive system outlined thus far.

Integral perception and concept learning involves relatively effortless and automatic cognitive processing based on diffuse, passive attention (J.D. Smith & Kemler Nelson, 1984, 1988), and yields a direct interpretation or representation of the world which is unanalysed and based on the general similarity (or 'family-resemblance') between objects or category members. In a similar vein, the current model of the cognitive system also views the low level control of behaviour as an effortless and automatic process requiring only low level (i.e. passive) attention for its operation; in addition, the spreading of activation within associative memory which serves to provide an interpretation of the environment is also a similarity-based process (see Sloman, 1996). Separable perception and concept learning, in contrast, involves the analysis of stimuli into their constituent parts and is based on effortful and deliberative cognitive processing requiring active attention. Such a description corresponds closely to that of the higher level processes in the model of the cognitive system described here.

The preceding discussion of the perceptual integrality literature supports the assertion that low level processing is relatively quick and effortless and higher level processing is slower and more effortful and deliberative. In addition, the rapid low level processing style appears to be associated with more primitive, holistic forms of cognition, while slow, high level processing seems to support more sophisticated and analytical forms of cognition. How might such differences manifest themselves on a more general behavioural level? One possibility is that low level processors will be more impulsive and stimulus-driven than their high level counterparts, who will tend towards a slower and more deliberative approach to behaviour. The fact that one of the behavioural characteristics of patients with frontal lobe damage (i.e. individuals with a high level processing deficit) is the inability to inhibit behavioural responses (e.g. Burgess & Shallice, 1996a) certainly seems to support this hypothesis.

Research concerning the cognitive style dimension of reflection-impulsivity (RI; Kagan, Rosman, Kay, Albert & Phillips, 1964; Kagan, 1965) may shed some light on this issue. The concept of RI was originally proposed to account for cognitive performance differences between children that were otherwise equivalent in terms of motivation and intelligence. Kagan *et al* (1964) proposed that such differences were the product of the speed with which individual children respond to the tests in question; those children who respond quickly tend to do worse than their slower counter-parts, a finding which appears to be attributable to the fact that the quicker individuals have not spent long enough considering the validity of the answers that they provide. Clearly, the more time that is spent weighing up alternative hypotheses concerning a given problem, the more likely it is that incorrect solutions will be identified and rejected, thus improving the individual's performance. Kagan *et al* (1964) dubbed those individuals with long response latencies and low error-rates 'reflectives', while those individuals with short response latencies and high error-rates were termed 'impulsive'. Impulsive individuals appear to be highly stimulus driven and have difficulty in behavioural inhibition (see Kagan, Moss & Sigel, 1963). In contrast, reflectives are less stimulus driven and able to inhibit behavioural responses until their validity has been determined.

In addition to the differences between reflective and impulsive individuals in their general speed and accuracy in problem solving situations, a number of other cognitive and behavioural differences between the two have been noted. In particular, reflective individuals tend to display a more analytical processing bias in conceptual tasks than impulsives who tend to display a more global response set (Kagan *et al*, 1963; Lee, Kagan & Rabson, 1963; Kagan *et al*, 1964). Thus, when describing the similarity between objects, reflectives tend to analyse the objects into their constituent parts and use individual object features as a basis for categorisation. In contrast, impulsives tend to categorise objects in terms of their general relations to one another rather than on the basis of individual components. Further evidence for the notion that impulsive and reflective individuals display holistic and analytical forms of cognition respectively is provided by research indicating that the RI dimension is related to the concept of separable versus integral perceptual processing discussed previously (e.g. Ward, 1983; Kemler Nelson & J.D. Smith, 1984; J.D. Smith & Kemler Nelson, 1988). Several studies have shown that both impulsive adults and children tend to perceive separable stimuli in an integral fashion, whereas reflectives typically perceive most stimuli separably. According to J.D. Smith and Kemler Nelson (1988), such findings support the notion that integral perception and impulsivity are characteristic of a lower level or fall-back mode of cognition that provides the foundation to more complex, high level cognitive operations. Further support for this idea is provided by evidence indicating that there is a developmental component to the RI dimension. Although RI remains relatively stable over time, Messer and Brodzinsky (1981), for example, present results suggesting that there is a trend from an impulsive to a reflective cognitive style as development progresses.

On the basis of the convergence between the model of the cognitive system offered in this chapter and research concerning reflection-impulsivity and the perception and categorisation of multidimensional stimuli, an account of the differences between higher and lower level processing modes may be offered. Table 2.1 presents a comparison of

Table 2.1: Comparison of lower and higher level processing mode attributes.

Lower level processing mode	Higher level processing mode
Intuitive: "non-conscious awareness"	Deliberate: "consciousness"
Automatic: controls behaviour by the direct activation of representations	Non-automatic: controls behaviour by the direction of low level systems using multi-step processing algorithms
Based on low level attentional systems: passive and diffuse process not requiring mental effort	Based on high level attentional systems: Requires active attention and mental effort
Associative inference	Inference based on the controlled manipulation of representations (e.g. logical thought)
Rapid operation based on parallel processing	Delayed operation based on serial processing
Impulsive behavioural style	Reflective behavioural style
Holistic: processing based on overall similarity between unanalysed stimuli	Analytical: processing based on differences between stimuli on derived dimensions
Typically employed in routine situations or where high level resources are scarce	Typically employed in novel situations or those requiring inhibition, decision making, trouble-shooting or goal-setting
Primitive default mode of cognition: Developmentally immature	Sophisticated mode of cognition: Developmentally mature

the attributes of each of these processing modes. By this view, low level behavioural control involves the automatic activation of representations governed by a passive and diffuse mode of attending based on low level attentional systems. As a result of this passive attentional set, the individual will tend to perceive the environment in an integral fashion, viewing stimuli as unanalysed wholes rather than combinations of dimensions (Foard & Kemler-Nelson, 1984). As such, the similarity between objects or events will tend to be calculated on the basis of overall family resemblance rather than dimensional analysis and summation (Shepard, 1964; Lockhead, 1972; Garner, 1974). Furthermore, the relational organisation of the representations stored whilst processing in this mode will also conform to a family-resemblance structure (Jacoby & Brooks, 1984). In addition, low level processors will tend to be stimulus driven and display an impulsive behavioural style characterised by rapid, error-prone responding. In contrast, the individual processing in a high level mode necessarily adopts an active attentional set that underlies a tendency to perceive the environment in a separable fashion, viewing stimuli as combinations of dimensions rather than unanalysed wholes (Foard & Kemler-Nelson, 1984). As such, the similarity between objects or events will tend to be calculated on the basis of dimensional analysis and summation rather than overall family resemblance. Furthermore, the organisation of the representations stored whilst processing in this mode will also conform to a dimensional structure (Jacoby & Brooks, 1984). Finally, high level processors will tend towards a more deliberative and reflective behavioural style characterised by slow but accurate responding.

The distinction between higher and lower level cognition made here has much in common with a number of other theories which draw similar dichotomies (e.g. Taggart & Torrance, 1984; Epstein, 1994; Hinton, 1990; Sloman, 1996). In due course, some of these complementary positions, and the methodologies which have been used to assess them, will be examined in a bid to provide empirical support for the model of suggestion and hypnosis that will be outlined in the next chapter.

2.3 Summary

In the preceding sections a model of the cognitive system based on contemporary cognitive psychological research and theory was described. The basic structure of the model has much in common with the Norman and Shallice (1986) model which has proved popular in recent theorising within the field of hypnosis. However, in the model presented here, the basic Norman and Shallice framework has been revised and extended in a number of important ways. First, the conceptual problems associated with the traditional model of automaticity embraced in the Norman and Shallice model have been addressed by reconceiving the model in terms of the memory-based view of automaticity offered by Logan (1988). By this view, automatic processes are regarded as those that are based entirely on the activation of low level representations, rather than those that require no attention, intention, effort or awareness for their operation. Second, the question of how the concepts of perception and awareness might be conceived within the Norman and Shallice model was addressed with reference to Logan's (1988) model of automaticity, the work of associative inference theorists such as Smolensky (1988), Hinton (1990) and Sloman (1996), and Marcel's (1983) theory of consciousness. According to this view, high level perception is the product of the automatic spreading of activation within associative memory following attention to the stimulus environment. This process serves to suggest a number of possible interpretations of the environment, the best-fitting interpretation being selected by low level attentional systems and used to organise sensory information to form a conscious percept when it is received by high level attentional systems.

In addition to differences in behavioural control at higher and lower levels of the cognitive system as outlined in the Norman and Shallice model, a number of other distinct cognitive characteristics associated with processing at each of these levels were also proposed. As such, a distinction was drawn between higher and lower level 'modes' of processing. Finally, the likelihood of situational and individual differences in the degree to which high and low level control systems are relied upon in the management of behaviour was acknowledged.

In chapter three the question of how the concepts of suggestion, hypnosis and hypnotic suggestibility might be conceived within this explanatory framework will be addressed.

CHAPTER 3: A model of suggestion and hypnosis

3.1 Introduction

In the previous chapter, a model of the cognitive system based on contemporary cognitive psychological research and theory was proposed. In this chapter, this model will be applied to the explanation of suggestion, hypnosis and hypnotic suggestibility. The model of the cognitive system outlined in chapter two draws a distinction between higher and lower level modes of cognition, each of which serve complementary functions in the management of behaviour. As R. Brown and Oakley (1997) have shown, the distinction between higher and lower level cognition has played a fundamental role in recent theorising within the field of hypnosis and, as I intend to demonstrate presently, provides a scheme by which the different accounts of hypnosis reviewed in chapter one might be integrated into a single theoretical model.

3.2 The nature of suggestion

In the first chapter I concentrated exclusively on the major contemporary theories of hypnosis and have largely avoided reference to suggestion until now. The concepts of hypnosis and suggestion have, however, been inextricably linked since the late nineteenth century and the work of Bernheim and the Nancy School (Gheorghiu, 1989a). Bernheim (1888/1964) described a theory of hypnosis based entirely on the notion of suggestion, arguing that it is both the vehicle by which hypnosis is induced and the mechanism by which hypnosis and hypnotic phenomena might be explained. Moreover, Bernheim regarded increased suggestibility[22] as the primary defining characteristic of the 'hypnotised' individual. Although Bernheim's account of hypnosis has since declined in popularity (see Gheorghiu, 1989a), the concept of suggestion remains central to the study of hypnosis. Suggestions, be they direct or indirect, continue to be the predominant method for the induction of hypnosis, and most scales designed to assess individual differences in hypnotic responsivity, such as the Harvard and Stanford scales, do so by measuring the number of suggestions that an individual responds to following an hypnotic induction.

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[22] The term 'suggestibility' refers to the individual difference dimension describing the degree to which suggestions are accepted as veridical. If suggestions are presented in the hypnotic context, this is typically labelled 'hypnotic' suggestibility; if suggestions are presented outside the hypnotic context, this is typically labelled 'waking' or 'non-hypnotic' suggestibility. Kirsch (1997) has argued that, contextual differences aside, there is little difference between these concepts and has proposed a reappraisal of the classification scheme used to describe the two; according to Kirsch, both waking and hypnotic suggestibility are examples of 'imaginative suggestibility'.

Of particular relevance to the relationship between hypnosis and suggestion is the finding that so-called 'waking' and 'hypnotic' suggestibility correlate with one another to a substantial degree (Kirsch, 1997; Kirsch & Lynn, 1997); this is not surprising, given the evidence indicating that all so-called hypnotic responses are possible even in the absence of an hypnotic induction, with the induction increasing responsivity to suggestions by only a small degree (Barber, 1969). These findings have been interpreted (see e.g. Kirsch & Lynn, 1997) as indicating that an 'altered-state' premise is not required for the explanation of hypnotic behaviours, but rather that responses to waking and hypnotic suggestions are governed by the same causal mechanisms. It is nevertheless clear, however, that an individuals' responsivity to suggestions may be significantly increased by the induction of hypnosis; although modest, this increase is both highly consistent and more or less comparable to the effect size observed in most studies demonstrating the successful effect of a psychological manipulation (Kirsch, 1997). Given that this is the case, the most fruitful avenue for theoretical development would seem to entail addressing the nature of suggestion outside the hypnotic context first, and only then considering the way hypnosis fits within this explanatory scheme. This approach will be adopted here.

Before attempting to explain suggestion[23], it is worth confirming exactly what it is that we are trying to understand. Although the types of suggestions used in the hypnotic context vary widely, all verbal suggestions conform to a consistent theme in which one individual attempts, through the use of words, to induce a specific behaviour or alteration in experience of another individual. In many cases, though in some individuals more than others, the suggestion attempt is successful in producing the desired response. On the face of it, however, instigating a behaviour in another person is not in itself particularly remarkable: a simple request is capable of generating the same response. What is remarkable is the fact that the individuals' *experience* (i.e. hypnotic involuntariness) is completely unlike that which typically accompanies analogous behaviours in so-called normal situations. The experiential changes brought about by suggestions for alterations in perception are perhaps even more remarkable. The subjective reality of a successfully suggested hypnotic analgesia, for example, can be convincing enough for some individuals to request and/or accept its use during major surgery. Explaining the phenomenological aspects of suggestion and hypnosis is arguably the most important

[23] The theorising presented here will be restricted to what Kirsch has described as 'imaginative' suggestion. No attempt will be made to incorporate other types of suggestion (e.g. interrogative suggestion; Gudjonsson, 1984) within the current framework.

task for theorists working within this domain, particularly given the fact that so-called hypnotic behaviours can easily be reproduced by simulating individuals. Although a simulating individual may be able to feign an insensitivity to pain, there is not the concomitant reduction or amelioration in pain experience that typically accompanies a successful hypnotic analgesia suggestion.

In order to explain how suggested alterations in experience are possible, the concept of experience itself must first be addressed. In the model of the cognitive system described in chapter two, the contents of consciousness were identified as the information received by high level attentional systems from low level attentional systems. According to this view, the best-fitting perceptual hypothesis suggested by automatic representational activity is selected by low level attentional systems and used to organise sensory data into a coherent and integrated perceptual whole; it is this information which is passed on to high level attentional systems and therefore this information which forms the contents of consciousness. It follows, then, that for a suggestion for an alteration in perception to be successful, in that it is experienced as subjectively real, it must exert its influence prior to the low level selection of perceptual hypotheses for further processing. The only plausible candidate for the site of this influence is at the level of the representations themselves, and the low level attentional systems which govern their activation and selection: activity at this level not only governs the basic interpretation of the environment and the control of behaviour, but also what information is passed on for further, conscious processing at higher levels of the system. Conceivably, if one is able to influence the memory retrieval process, then one will be able to control, to an extent at least, what the individual perceives, attends to and does. This is precisely what one is attempting to do in the suggestive context.

The notion that the automatic activation of representations provides the basis for suggestive phenomena is the central assumption of the dissociated control theory of hypnosis. Where dissociated control theory falls down is in its assertion that this process occurs as a result of the inhibition of higher level attentional systems, which, as Kirsch and Lynn (1997) have pointed out, is not necessary for the automatic activation of schemata[24]. Although it rejects the higher level inhibition hypothesis, the recent sociocognitive model of hypnotic involuntariness offered by Kirsch and Lynn (1997) is based on a similar idea concerning the automatic activation of representations, although

[24] It should nevertheless be noted that an inhibition of higher level control mechanisms would certainly necessitate an over-reliance on automatic schema activation for the control of behaviour. The pattern of behaviour displayed by individuals with frontal lobe pathology provides, according to Norman and Shallice (1986; see also Shallice, 1988), one such example.

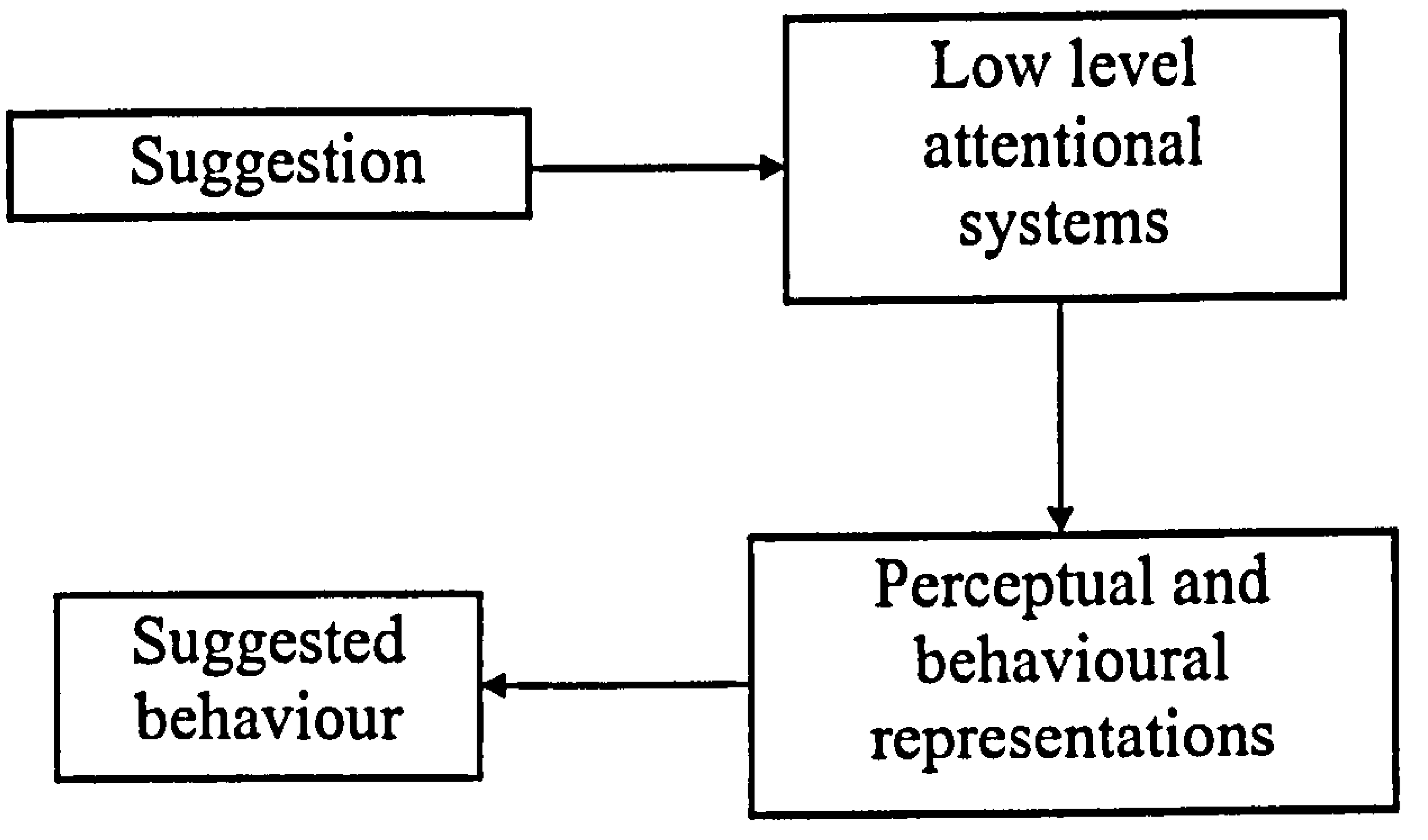
that account is limited to the explanation of relatively simple hypnotic behaviours and does not extend to an understanding of suggested alterations in experience as is the present theoretical goal. The ego-psychological theory of hypnosis (e.g. Fromm, 1992) also regards hypnotic behaviours as the product of low level, automatic processes; in this case, however, the model is too descriptive to provide an adequate account of how this process operates. With regards research and theory concerning suggestion per se, the model offered by Gheorghiu and Kruse (1991) also rests on similar premises concerning the automatic activation of representations. Moreover, as Gheorghiu (1989a, b) has noted, despite widespread disagreement over the explanation of suggestion, the majority of theorists tend to view suggested effects as the product of an inhibition or reduction in critical thought, a notion very similar to that proposed by dissociated control theory. Clearly, the notion that suggested effects are the product of the automatic activation of representations is an appealing one, but one which has not been developed in sufficient detail for it to provide an adequate account of suggested behaviours and experiences. The current model attempts to redress the balance in this regard.

The basic position offered here is that a suggested effect is the product of the automatic selection of a behavioural or perceptual schema[25] (or perceptual 'hypothesis'). In the case of a straightforward verbal suggestion (hypnotic or otherwise), receipt of the suggestive communication by low level attentional systems creates a pattern of activation across representational networks corresponding to the behavioural and experiential intent of the suggestion[26]. This process is likely to be particularly effective when mediated by language which, as a second signalling system (Luria, 1966), is commonly used by the cognitive system for the activation of representations in goal-directed behaviour. In the case of a behavioural suggestion, if the activation level of the corresponding representation reaches threshold the suggested behaviour is automatically executed (see figure 3.1). Broadly speaking, this process is no different to the way in which much of behaviour is controlled normally. If a suggestion for a delayed behavioural response is required (such as 'when I click my fingers you will get up and open the window'), low level attentional systems monitor the environment for the relevant information which,

[25] As such, the execution of a routine act provides the archetypal example of a suggested effect.

[26] As it is perceived by the individual, something which is ultimately dependent upon the nature of the representations present and activated within associative memory.

Figure 3.1: The execution of a behavioural suggestion.



when received, automatically triggers the behavioural representation. This process corresponds to what Kirsch and Lynn (1997) have described as setting up an 'implementation intention', a process which allows goal-directed activity to occur automatically rather than on a controlled (i.e. higher level) basis. In the case of a perceptual or cognitive suggestion, however, a further stage is required. Unlike a behavioural suggestion which only requires the appropriate action schema to reach activation threshold, for a perceptual suggestion to be successful its associated pattern of representational activity (or perceptual hypothesis) must also be selected by low level attentional systems as the best fitting account of ongoing activity (figure 3.2). It is conceivable that for this process to be successful the cognitive system must in some way be deceived into believing that the *suggested* interpretation of reality is more plausible than *actual* reality. Some form of positive feedback confirming the suggested reality is therefore likely to be required, a process which works in tandem with the initial activation of representations within associative memory. In the case of an analgesia suggestion, for example, the respective activation and inhibition of 'no pain' and 'pain' representations causes the individual's attention to be directed away from pain related information within the environment; this process serves to further decrease the activation of pain representations, producing positive feedback indicating that the suggested state of affairs is veridical[27]. At this point, the pattern of activation corresponding to the

[27] Such an explanation has, on the face of it, much in common with that provided by Spanos (1986), who argued that both hypnotic analgesia and amnesia are, in part, the product of the individual directing their attention away from the relevant pain or memorial information. The present account differs from that of Spanos (1986), however, in that it asserts that the process of attention diversion is automatic rather than done deliberately (i.e. consciously chosen) by the subject.

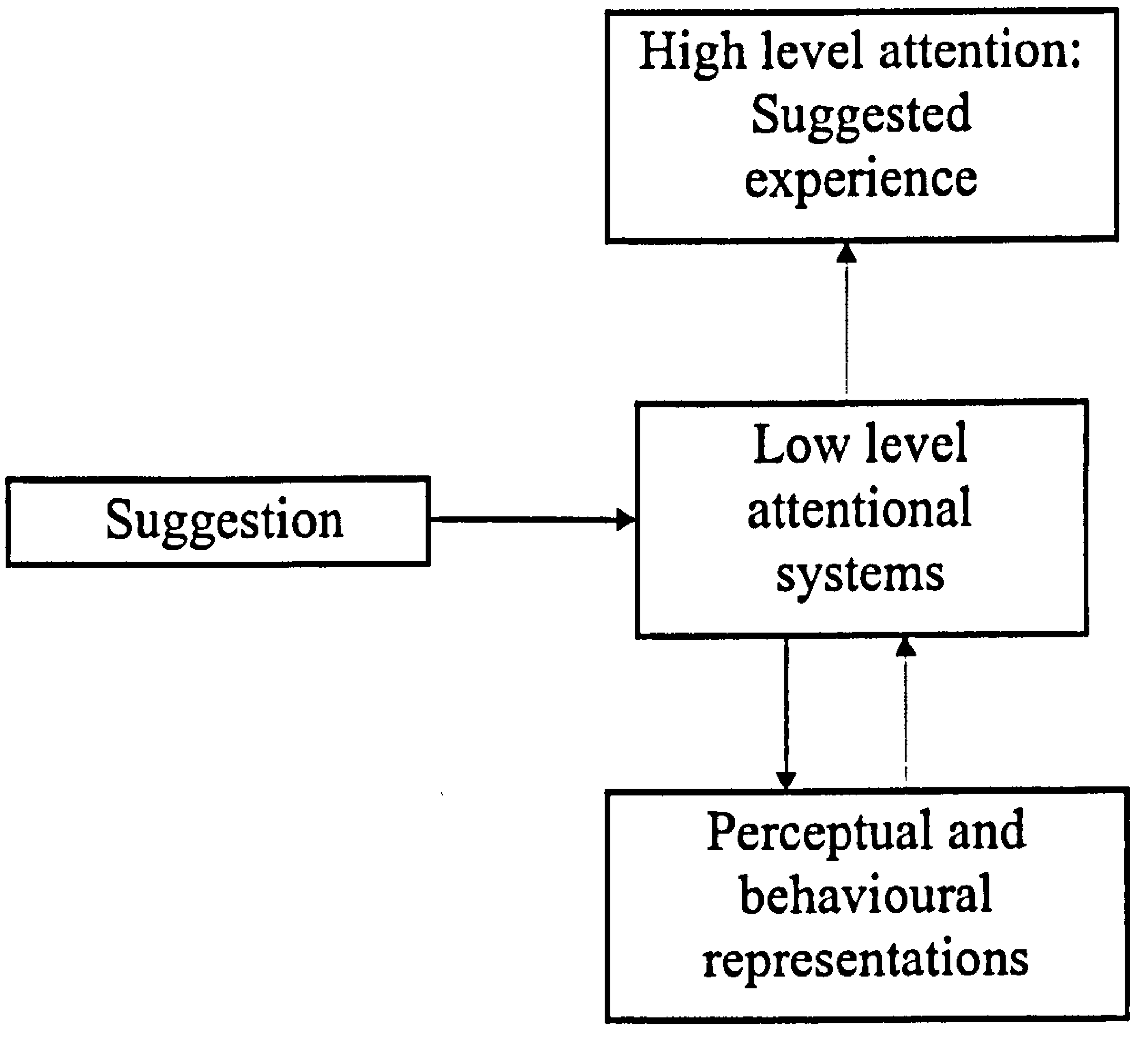


Figure 3.2: The execution of a perceptual suggestion. Dashed arrows represent the passing of perceptual information.

analgesia suggestion is more likely to be accepted as the best-fitting perceptual hypothesis, with the individual's subsequent experience reflecting this fact.

Such an account may go some way towards explaining why perceptual and cognitive suggestions tend to be more difficult than those for simple ideo-motor or challenge behaviours, as a further stage of processing is required for the former compared to the latter. One of the potential problems of such an account, however, is that it seems unable to account for the experience of involuntariness that typically accompanies the successful execution of hypnotic behaviours: if hypnotic behaviours are simply the product of the automatic activation of action schemata without concomitant attentional selection, how can they be accompanied by experiential qualities? The position adopted here is that hypnotic involuntariness is not a direct accompaniment of hypnotic behaviours but is a *post hoc* interpretation of them. In other words, the cognitive system observes that a behaviour has been executed and attributes it a sense of involuntariness after-the-fact, in light of the existing activational patterns across representational systems; such an account corresponds closely to that of Kirsch and Lynn (1997). By this view, hypnotic involuntariness is a product of the belief that suggested[28] behaviours feel involuntary, a representation which is activated when the individual enters the suggestive situation. In

[28] It should be noted that responses to behavioural suggestions *outside* the hypnotic situation are also typically accompanied by a sense of involuntariness (see Lynn, Rhue & Weekes, 1990).

this way one can retain the notion that responses to ideo-motor and challenge suggestions are easier than those for perceptual and cognitive alterations as only the latter actually require attentional selection for their operation: although hypnotic involuntariness is the product of the selection process, in itself it is not required for the successful execution of the behaviour. Such a notion is essential to the present account of suggestion: by this view, all automatically activated behaviours are suggested and yet only those presented as 'suggestions' (in the traditional sense) are accompanied by feelings of involuntariness; as such, involuntariness cannot be an inevitable concomitant of suggested behaviours.

Thus, both suggested behaviours and experiences are the result of the automatic activation (and selection in the case of the latter) of low level representations[29]. In both cases, this process is determined, to an extent at least, by the activation values of the representations being monitored by low level attention. Broadly speaking, therefore, anything which augments the activation of a particular representation will increase its likelihood of execution/selection. There are three potential sources of activation: the receipt of triggering input from the internal and external environment, lateral activation or inhibition by complementary or competitive representations respectively, and attentional input from higher level systems (see Norman & Shallice, 1986). In addition, the probability of selection is also determined by the representation's resting activation threshold: schemata with relatively low activation thresholds, such as those that have been well learnt through repeated use, require less activational augmentation for their selection by low level attentional systems. Moreover, it is worth noting here that selection is also a relatively self-perpetuating process: the selection of a particular representation directs low level attention towards information related to it in the environment, increasing the likelihood of its continued activation. Furthermore, the activation of a representation decreases its activation threshold, making it more likely to be selected on subsequent occasions. In this way, the system develops a certain behavioural and perceptual constancy, with familiar situations being perceived and responded to in an increasingly consistent fashion over time. Thus, an individual's initial

[29] According to this position, suggested effects are limited to those for which an adequate representation is available; as such, suggestion is more appropriately regarded as a routine rather than a novel psychological process. Such a view may appear at odds with the apparently unusual phenomena often observed within the hypnotic situation. A negative hypnotic hallucination, for example, involves not seeing something that is present, a rare occurrence for which, on the face of it, there would be few, if any, existing representations. Such an effect may, however, be achieved by hallucinating the *presence* of something obscuring the to-be-ignored stimulus, a process which could involve almost any existing representation. It is nevertheless likely that the execution of some suggestions involves the on-line creation of high level represention which are then used to direct the activity of lower level systems. Sugggested effects produced by such representations could conceivably be regarded as novel in the strict sense.

experiences with suggested effects are likely to have a strong influence over their subsequent experiences of them.

The selection of schemata is therefore determined by the dynamic balance between environmental factors and the nature of the representations themselves. The extent to which behaviour and experience are controlled by the automatic activation of representations will vary from one situation and individual to another, however. In situations or individuals where high level control influences over low level attentional systems are particularly strong, for example, the likelihood of an environmental cue automatically activating a representation (and hence suggestibility) will be reduced considerably.

The current model therefore extends previous theoretical formulations by providing a more detailed account of how the automatic activation of representations underpins suggested behaviours and experiences and the factors which affect this process. Moreover, the present model easily accommodates the existence of self-suggestion and hypnosis: the only difference in this case is that the suggestive communication comes from higher level systems rather than the external environment[30]. The advantage of such a view is that it brings the explanation of suggested phenomena firmly within the remit of everyday psychology. As we have seen, automatic memory retrieval provides the basis for the adaptive control of all behaviour and is inextricably linked to conscious experience. By this view, then, suggestion is not just conceived as a process by which direct verbal statements serve to generate unusual alterations in behaviour or perception, but as a ubiquitous phenomenon that is a fundamental aspect of the interaction between organisms and their environment: it is simply the process by which adaptive behaviour in a complex and changing world is maintained on the basis of previous experience. The implications of such a view should its validity be established would be far-reaching indeed, both for the study of hypnosis and that of cognition and consciousness in general.

3.2.1 Hypnotic suggestion

Having adopted the position that hypnotic suggestions operate according to the same fundamental processes that govern non-hypnotic suggestions, the question of how the model of suggestion provided in the previous section relates to the concept of hypnosis

[30] Although it is likely that the locus of suggestion will play a significant role in determining the efficacy of a given suggestion attempt. Some individuals, for example, may be extremely responsive to hetero-suggestions but show no responsivity at all to self-suggestions (and vice versa). The relative degree to which individuals rely on a higher or lower level processing mode for the everyday control of behaviour may be one influential factor in this regard.

must now be considered. The central question of interest concerns why, given that the same mechanisms are operating in both, the hypnotic situation is consistently associated with elevated levels of responsivity to suggestions compared to non-hypnotic situations. In addressing this question two general issues will be considered: the nature of the hypnotic situation and the role of absorption.

3.2.1.1 The hypnotic situation

While the hypnotic situation may, in terms of its components, have much in common with other more mundane situations, it is more or less unique with regards to the entire mosaic of cognitive and social demands that it places on the individual. In addition, the beliefs and attitudes that the participating individual brings to the hypnotic situation are largely unlike those which they bring to so-called normal situations. As sociocognitive theorists have been quick to point out, the unusual nature of the hypnotic situation, and the beliefs and attitudes associated with it, are likely to have a profound role in shaping the character and occurrence of the behaviours and experiences encountered therein. Indeed, as we saw in chapter one, there is a good deal of evidence in support of such an assertion. According to the model of suggestion presented in the previous section, the nature of suggested behaviours and experiences is inextricably linked to situational and expectational factors.

To begin with, it is important to consider what the subject brings to the hypnotic situation in terms of their beliefs and attitudes about hypnosis. In the case of a naive subject, it is highly likely, within Western culture at least, that they will possess vicariously derived beliefs and attitudes about hypnosis, based on the experiences of their friends and relatives, or from watching stage, film or television shows involving the use of it. Through such a process of cultural transmission, the individual may associate hypnosis with a number of things, including sleep, relaxation, alterations in consciousness, responding to suggestions and the loss of control over one's behaviour (e.g. McConkey, 1986; McConkey & Jupp, 1986). On the basis of these beliefs, the individual enters the hypnotic situation expecting and, assuming they have a willing rather than a resistant attitude, wanting certain things to happen. In addition, they may also be aware of what patterns of behaviour might be expected and desired from them as an hypnotic subject (cf. Spanos, 1982, 1986); indeed, such a sense of reciprocity is the inevitable consequence of any social situation. Furthermore, the hypnotic situation is also embedded in a wider social context, such as that of a psychological study or a therapeutic relationship[31], and will entail all of the beliefs, expectations and desires associated with these situations also. In particular, the subject will be sensitive to their obligation to maintain motivation and co-operate with the demands that are placed upon them, thereby fulfilling their part of the social contract which they have entered into by participating.

The individual's prior beliefs about hypnosis do not exist in isolation, however, but in interaction with the context provided by the specific hypnotic situation encountered. There are a number of contextual factors associated with the hypnotic situation that might be identified as potentially important. First, there is the hypnotist and their apparent level of confidence, experience and proficiency (Balaschak *et al* 1970), plus more general factors such as their age, sex, appearance and personality. Second, there is the preamble to the hypnotic induction, which might include a description of what the hypnotic session will involve, what the subject will be asked to do and what they are likely to experience. Third, there is the hypnotic induction itself. Although the induction may vary considerably from one hypnotic situation to another, instructions to relax, engage in imagery, respond to suggestions and concentrate on the hypnotist's words and requests to the exclusion of all else are commonplace, particularly in the experimental context where the standardised inductions included in the Harvard and Stanford susceptibility scales will often be used.

In terms of the model of suggestion described previously, an individual's beliefs concerning hypnosis (or, indeed, anything for that matter) may be regarded as a set of related schemata within the overall network of representations stored in memory. Upon entering the hypnotic situation, the activation levels of each of these schemata are automatically increased through attention by lower level systems while those of conflicting schemata are reduced through lateral inhibition. As such, the individual enters the hypnotic situation expecting[32] certain things to happen; the strength of these expectations is dependent on how well learnt the belief-representations are, as indicated by their activation threshold. Effectively, this process of schema activation and inhibition serves to provide a framework for the individual's interpretation of the hypnotic situation

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[31] It is, of course, true that other types of hypnotic situation exist, such as those involved in stage or 'party' hypnosis. These situations may provide a context that is, in many ways, entirely different to that described here; however, as the vast majority of research pertains to hypnosis in an experimental or clinical context, the analysis offered here will be limited to this domain.

[32] Not necessarily consciously, however; the fact that the individual may, if questioned, be able to describe what they expect to happen during the hypnotic situation does not necessarily mean that they will be conscious of those expectations when they enter it. In any case, whether or not they are is largely irrelevant to the position presented here, as the effect of expectations on subsequent behaviours and experiences may arise regardless of whether they are conscious.

and the management of their behaviour within it. The nature of this interpretive framework is modified on-line with the increased activation and inhibition of further schemata by the contextual cues present in the hypnotic situation itself; however, which schemata receive activation from contextual cues is, to an extent, moderated by those that have already received activation by prior beliefs: the activation of representations serves to prime the individual to attend to information within the environment that is consistent with them (and to ignore information that is not), producing something of a snowball effect.

Following the definition adopted here, the increase of schema activation by the interaction between beliefs and contextual cues may in itself be viewed as a process of suggestion. Working in concert they serve to create a 'hypnotic' frame of mind which will influence how the individual processes information in the hypnotic situation, thereby shaping the character of the behaviours and experiences that they produce within it: anything which is subsequently selected by low level attentional systems will reflect this pattern of schema activation. Using the terminology of Sarbin (1950, 1956), one might label this frame of mind the *hypnotic role*. It is important to note, however, that the individual has not consciously decided to behave in an hypnotic way as suggested by classical role-theory; rather, they assume such a mind-set automatically and without conscious consideration as a product of the interaction between their beliefs and the cues present within the hypnotic situation. Several sociocognitive theorists have alluded to a similar process in their assertion that the individual's behaviour is governed by their *implicit* or *tacit* perceptions of the role requirements involved in the hypnotic situation (e.g. Spanos & Coe, 1992; Kirsch, 1991; Lynn & Rhue, 1991c). This process is analogous to the way in which we automatically adopt the roles of offspring, sibling, friend, lover, teacher, footballer and so on according to who we are interacting with (and where) at any given moment.

By this view, the nature of hypnotic behaviours and experiences are intimately related to the beliefs that the individual brings to the hypnotic situation and the contextual cues that they encounter within it. As was discussed in the previous chapter, however, expectational and contextual factors may vary considerably between hypnotic situations and individuals. As such, one would predict that the nature of hypnotic behaviours and experiences will also vary considerably from one situation and individual to another, a hypothesis borne out by a substantial body of evidence. When conducting research into hypnotic behaviours and experiences it is essential, therefore, that one obtains an account of the participating individual's beliefs[33] concerning hypnosis and conducts a careful analysis of the specific hypnotic context used: without such information it would be impossible to assess which aspects of hypnotic behaviours and experiences are the product of suggestion and which are not.

So far it has been argued that expectational and contextual variables are instrumental in determining the nature of hypnotic responses. What effect, if any, will these factors have on the success rate of specific suggestive communications? Certain expectational and contextual factors are likely to be of particular importance in this regard. To begin with, it is conceivable that the more motivated an individual is, the more likely he/she will respond positively to hypnotic suggestions; contextual features which increase motivation may, therefore, be an important factor in increasing suggestibility. If the subject likes and trusts the hypnotist, for example, he/she may be more likely to be motivated and co-operative and might be more suggestible for this reason. Indeed, as de Groh (1989) has shown, positive rapport is a relatively reliable predictor of responsiveness to suggestions, at least in the hypnotic context. Anyone who has used hypnosis with any regularity, however, will be all too familiar with individuals who, although highly motivated, fail to show any responsivity to suggestions at all, much to their own annoyance and frustration. It is more likely, therefore, that motivation is a necessary rather than a sufficient condition for responsivity to suggestions (de Groh, 1989).

A more important factor in bringing about increases in suggestibility in the hypnotic situation is likely to be the belief that one of the defining features of hypnosis is an increased responsivity to suggestions. As a number of investigators have shown, such a view is extremely common within the general population, as is the related belief that hypnosis involves a loss of control over one's actions (e.g. McConkey, 1986; McConkey & Jupp, 1986). Given the profound role that beliefs (i.e. schemata) have in determining both the nature and occurrence of behaviour, it seems likely that such views will significantly influence the degree to which individuals respond to suggestive communications. Thus, simply labelling the situation as involving hypnosis will in itself be sufficient to produce increments in suggestibility[34], a hypothesis borne out by the investigations of Barber and Calverley (1964, 1965) discussed in chapter one.

[33] Those that are verbalisable at least.

[34] According to Wagstaff (1998), labelling a situation as hypnotic should be considered a suggestion in and of itself; by this view, the hypnotic label is a suggestion indicating that the recipient is entering a special state (i.e. hypnosis) associated with an increased responsivity to suggestions. Such a view is entirely consistent with that presented here

In addition to this potential effect, there are two other factors associated with the hypnotic situation that may bring about increases in an individual's responsivity to suggestive communications according to the model presented here. First, the hypnotic situation is associated with a high degree of ambiguity because the management of the situation is more or less handed over to the hypnotist when the induction begins; in addition, any expectations that the participating individual has are typically general and do not relate to specific behavioural or experiential responses (Kirsch, 1991). A high degree of situational ambiguity leads to an increased sensitivity to information within the external environment for the activation of schemata (i.e. suggestibility). Arguably, however, this may not necessarily lead to significant increases in responsivity to suggestions in the hypnotic context compared to that of a waking suggestibility context, as the latter is also likely to be associated with a relatively high degree of situational ambiguity for the same reasons.

Second, there are certain features of the hypnotic situation that, taken together, strongly indicate that the individual should adopt an uncritical mode of responding and allow themselves to be influenced by the suggestions presented to them during the hypnotic session. This is not only an expectancy that the individual may bring to the hypnotic situation but something that is both implied and explicitly stated in a typical hypnotic induction and the preamble which often precedes it. As Spanos and Gorassini (1984) have noted, typical hypnotic inductions tend to be worded in a passive style which emphasises that hypnotic effects are something that happen to the individual rather than something that they actively do themselves. The induction included in the Harvard susceptibility scale, for example, instructs the subject not to think about what is occurring during hypnosis and "... just let whatever is happening ... happen by itself" (Shor & Orne, 1962). Although the individual may be asked to think along with the hypnotic instructions, it is made clear that he/she is not supposed to question them in any way, or critically analyse their experiences in order to assess their validity. As has been discussed already, the notion that the hypnotic individual relinquishes critical thought and accepts as veridical events that normally would be regarded as logically impossible, so-called 'trance logic' (Orne, 1959), is regarded by many as a defining feature of hypnosis, including proponents of both the ego-psychological and neuropsychophysiological theories (see e.g. Fromm, 1992; Crawford & Gruzelier, 1992). It is also a central component of virtually every major theory of suggestion (Gheorghiu, 1989a, b).

Through such situational and expectational cues the individual is encouraged to adopt a passive behavioural mode during the hypnotic session (cf. Bowers & Brenneman, 1981); such a behavioural stance, according to the model presented in the previous chapter, is associated with a reliance on predominantly lower level or fall-back cognitive processes for behavioural control. Whilst biased towards processing in this mode the automatic activation of memory representations is facilitated, making the activation of a suggested behavioural or experiential state of affairs more likely; as such, suggestibility is likely to be significantly increased for this reason also.

3.2.1.2 The role of absorption

In emphasising the relationship between suggestion, contextual cues and expectations in determining the nature and occurrence of hypnotic behaviours and experiences, I have so far described an account of hypnosis which has much in common with earlier sociocognitive theories such as those presented by, for example, Sarbin (1950, 1956) and Spanos (e.g. 1982, 1986). I have extended these accounts by describing the concepts of suggestion, role-playing and tacit interpretation in cognitive terms, as well as specifying how expectational and situational factors might contribute to hypnotic responding on a functional level. However, the present model of hypnotic responding departs significantly from the general theme of sociocognitive theories in its emphasis on the importance of understanding the state changes associated with hypnosis as well as its more contextual and expectational features. In the previous section it was argued that certain contextual and expectational features in the hypnotic situation are important because they encourage the subject to adopt a passive mode of responding where behavioural control is biased towards lower level processes. This interaction between contextual and state factors during hypnosis was cited as one of the primary mechanisms underlying the increased suggestibility associated with the hypnotic situation. In this section the role of state changes in the hypnotic situation will be examined in more detail.

As was discussed in chapter one, one of the most commonly reported experiences during the hypnotic situation is one of intense but effortless concentration or 'absorption' in whatever it is the participating individual has been asked to do during the hypnotic session. In a discussion of the closely related concept of imaginative involvement, J. Hilgard (1974) describes the hypnotic individual's experience of hypnosis as one of "...almost total immersion in the [imaginal] activity, [and] with indifference to distracting stimuli in the environment" (p.5). This state of extremely focused attention or absorption is, in many respects, the modern-day equivalent of the hypnotic 'trance' notion, and, as we saw in chapter one, there is a good deal of cognitive and psychophysiological evidence is favour of such a concept. Accordingly, the concept has enjoyed considerable support within the field, being embraced by theorists from across the conceptual spectrum. Indeed, in a review of the state of hypnosis research, Spanos and Barber (1974) identified these constructs as being the single most significant point of convergence between the state and non-state positions. Such conceptual overlap in many ways underlines the futility of the on-going debate between state and non-theorists: not only does no-one really disagree as to whether or not hypnosis involves state changes, there is also considerable agreement concerning what the nature of those changes might be. Theories may differ in the relative explanatory emphasis that is placed upon state and non-state variables in the explanation of hypnotic phenomena, but they can no longer be delineated by whether they regard hypnosis as an altered state[35] or not (Kirsch & Lynn, 1995; see Wagstaff, 1998, and the accompanying commentaries for a recent treatment of these issues).

According to the present model, absorption is a common aspect of the hypnotic situation and one which has important functional significance in determining the frequency and nature of hypnotic responses. However, it is assumed that similar episodes of absorption are common-place outside the hypnotic situation also, as in cases of reverie or 'highway hypnosis' (Hilgard, 1973a). As such, the present model adopts a 'neo-state' view of hypnosis (Oakley, 1998), or what Kirsch (1998) has described as a 'weak' version of the hypnotic state hypothesis. Given what has already been said about the nature of suggestion and the cognitive system, what influence might a state of extremely focused attention have on the degree to which individuals will respond to suggestions during hypnosis?

In the model described above, suggestion is conceived as a process by which memory representations are automatically activated by cues within the internal and external environment following monitoring by low level attentional systems. For a given suggestive communication to be effective in bringing about the desired reaction the representations associated with it must reach a certain level of activation for them to be triggered as behaviours or selected as a valid perceptual hypothesis by low level

[35] Although they may differ in whether or not they regard those state changes as being unique to hypnosis; even this position, however, is no longer widely held within the field.

attentional systems. Given that representations receive activation through attention[36] being paid to things associated within them in the environment, it follows that the more attention a stimulus receives then the more likely it is that its associated representation will reach appropriate activation levels for its execution or selection. When the individual is in a state of extremely focused attention, therefore, whatever it is that the given suggestion calls them to attend to will receive greater activation than when they are not. In addition, by focusing strongly on one particular thing to the exclusion of all else, there are fewer competing representations for low level attention to monitor or choose from, also increasing the likelihood of selection of the suggestion-related representation.

According to the current model absorption is inextricably linked to the shift towards low level processing that is regarded as central to the increased suggestibility characteristic of hypnosis. By this view, the demand to inhibit critical thought, which is both explicitly and implicitly part of the hypnotic situation, helps to achieve a state of absorption by maximising the degree of focal attention paid to the induction and the suggestions given during and thereafter[37]. In turn, the state of absorption[38] that is subsequently achieved helps maintain a reduction in critical thought thus biasing the control of behaviour and experience towards low level cognitive processes[39]. Such a

[36] The notion of 'paying attention' to something is perhaps less clear when a distinction between high and low level attentional systems is made as in the model here. Unless otherwise stated, in the current model 'paying attention' to something corresponds to the monitoring of information by high level attentional systems. As high level attentional systems monitor information from low level attentional systems, use of the former always implies use of the latter in any case; however, as the converse is not always true (in that information may be 'noticed' by low but not high level attentional systems), some qualification of terms is required here.

[37] The assertion that critical thought might interfere with the attainment of absorption corresponds closely to the original conception of absorption which proposes that it is achieved through the inhibition of reality testing (Tellegen & Atkinson, 1974).

[38] It should be noted, however, that there are probably many levels of absorption; saying whether someone is 'absorbed' or not will therefore always be a relative judgement involving a certain degree of arbitrariness.

[39] The notion that highly focused attention may lead to a state of mind characterised by a passive mode of attending appears, on the face of it, self-contradictory. A contradiction only arises, however, if one assumes that highly focused attention is the exclusive product of high rather than low level cognitive systems, an assumption explicitly rejected here. According to the current model, the focus of attention is controlled by both high and low level attentional systems depending on dispositional factors and the nature of on-going processing concerns. Although high level systems may be responsible for sustaining this focus over time in many cases, a similar effect may be produced by the persistent reactivation of appropriate low level representations. While the overall product may be similar (i.e. a state of sustained, focused attention), there may be important experiential differences between the two processes. Whereas sustaining attention through the operation of high level systems may be associated with perceived intention and mental effort, it is likely that similar states achieved through low level processes will be experienced as more passive and automatic (cf. P. Bowers, 1979).

processing bias in itself leads to an increased responsivity to suggestions, which is further maximised by preventing the activation of competing representations through the operation of critical thought processes.

By this line of reasoning, the degree to which individuals will respond to suggestions outside the hypnotic situation will also vary according to the relationship between absorption, critical thought and processing bias. It is only if we have reason to believe that absorption is greater during hypnosis than outside it that the idea becomes useful. There are several reasons why one might expect attentional focus to be particularly strong during hypnotic relative to non-hypnotic conditions. It is conceivable, for example, that individuals believe that extremely focused attention is an inherent part of the hypnotic experience. Even if they do not possess it before hand, they are often explicitly provided with this belief during the hypnotic induction and its preamble. In the introduction to the Harvard susceptibility scale, for example, the participating individuals are informed that hypnosis is a state of intense interest in whatever it is they are doing, and is compared to those occasions when one becomes so involved in a book or a film that one is no longer aware of our surroundings. During the induction to the Harvard more explicit suggestions to achieve a state of focused attention are delivered, with the individual being requested to concentrate solely on the voice of the hypnotist to the exclusion of all else.

By the present model, therefore, certain state changes associated with the hypnotic situation (*viz.* absorption, reduced critical thought and a low level processing bias) play a fundamental role in determining the degree to which individuals respond to suggestions during hypnosis. However, the way in which these state changes are brought about is intimately linked to social, contextual and expectational factors; thus, understanding the interaction between state and non-state variables is, according to this model, of primary importance in the explanation of hypnotic behaviours and experiences (cf. Nadon, Laurence & Perry, 1991).

One final point concerning absorption is worth mentioning here. In recent years, it has been argued that absorption is not necessary for the successful execution of hypnotic suggestions (see e.g. Bartis & Zamansky, 1990; Hargadon *et al* 1995). Hargadon *et al* (1995), for example, found comparable levels of pain reduction following hypnotic analgesia in a group of subjects who were absorbed in imagery and a group that was not. This in itself does not refute the notion that absorption is central to hypnotic responding, however. What the Hargadon *et al* study has shown is that absorption in *imagery* is not essential for successful hypnotic responding; it has not refuted the notion that absorption *per se* is essential. It is quite conceivable that the subjects in the no-imagery group in the Hargadon *et al* study were just as absorbed as the subjects engaging in imagery (e.g. in words, ideas or even, perhaps, 'nothingness'); without any measure of whether or not this is the case we have no way of knowing whether absorption *per se* has any affect on suggestibility levels.

3.2.2 Hypnotic suggestibility

Having provided a model of suggestion and an account of how hypnosis fits within this explanatory scheme, the discussion will now turn to the concept of hypnotic suggestibility. What is it that makes some individuals more responsive to suggestions during hypnosis than others? Since the development of reliable scales to measure hypnotic suggestibility in the late 1950s and early 1960s, considerable efforts have been made to provide an answer to this question, with the relationship between suggestibility and a plethora of personality, cognitive, expectational and situational factors being assessed during this time. Rather than reviewing this substantial body of research pointing out which findings support the model presented here, I will approach the issue from the opposite direction. As such, I will address what individual difference factors are likely to be of importance according to the current model and cite supporting evidence where appropriate.

In brief, the position offered here is that suggestion is the process by which memory representations are automatically retrieved following low level attention to stimuli within the internal and external environment. For a suggestion to be successful in bringing about the desired response, the representations associated with it must reach threshold activation and, in the case of suggestions for perceptual alterations, be selected by low level attention as the most appropriate account of the environment. So far we have examined the influence that a number of factors will have on this process, including attentional absorption, a bias towards low level cognition, expectation and context. Presumably, any situational variations in these factors which have an impact on suggestibility will be moderated by individual differences in these domains also. These will be considered in turn.

In the previous section, it was argued that a state of extremely focused attention or absorption significantly increases the likelihood of representations reaching threshold levels and hence suggestions being successfully executed. One might anticipate, therefore, that the ability to sustain focused attention, and hence become absorbed, would be positively related to the ability to respond to suggestions. As we saw in chapter one, there is a good deal of evidence to suggest that this is the case. In addition to the wealth of evidence demonstrating that high suggestibles experience more episodes of absorption in everyday life than lows (see Roche & McConkey, 1990), studies by Van Nuys (1973), Wallace, Knight and Garrett (1976), Graham and Evans (1977), and Crawford, Brown and Moon (1993) have all shown that highly suggestible individuals are significantly better at performing tasks requiring sustained focal attention than their low suggestible counter-parts. Furthermore, a number of physiological studies have demonstrated that highs show greater left-frontal cerebral activation outside hypnosis than lows indicative of superior higher level supervisory attentional functioning (e.g. Gruzelier *et al*, 1984; Cikurel & Gruzelier, 1990; Gruzelier & Warren, 1993; McCormack & Gruzelier, 1993).

In the discussion of absorption in the previous section, it was suggested that one of the processes underlying the attainment of an absorbed state might be the inhibition of critical thought. It was proposed that such an inhibition of critical thought would also bring about an increase in suggestibility because it would necessitate a reliance on lower level cognitive processing and therefore the automatic retrieval of representations for the control of behaviour. In addition to such manipulated shifts towards lower level processing, an everyday preference or bias for processing at this level might also be associated with responsivity to suggestions[40]. There is some evidence to suggest that this is the case. For example, studies by Dixon, Brunet and Laurence (1990) and more recently Dixon and Laurence (1992) have shown that highly suggestible individuals process language more automatically than low suggestibles, indicative of an everyday bias towards low level processing in the former. In addition, the significant correlation between suggestibility and Gestalt closure performance found by Crawford (1981) might be interpreted as suggesting that highly suggestible individuals have a greater preference for a holistic, and therefore lower-level, processing style compared to low suggestibles.

Work concerning the 'fantasy-prone personality' (Wilson & Barber, 1981, 1983; Crawford, 1982b; Lynn & Rhue, 1986) may also be viewed as supportive of the relationship between suggestibility and lower level processing preference. On the basis of work using the Inventory of Childhood Memories and Imaginings, Wilson and Barber (1981) have demonstrated a strong relationship between abnormally high levels of hypnotic suggestibility and a constellation of personality traits that converge on fantasy involvement. In particular, these individuals are likely to engage in disproportionately large amounts of image-based day-dreaming, become intensely absorbed in imaginative

[40] It is also presumably easier to undergo a shift (e.g. through absorption) towards lower level processing if one is biased towards processing in this mode in the first place.

activities such as reading books or watching films and show high levels of imagery vividness (Crawford, 1982b). Furthermore, they are far more likely to experience physical reactions such as nausea to observed violence on television or in films, suggesting that fantasy-prone individuals are more sensitive to unconsciously evaluating stimuli on the basis of emotional valency than those who are less prone to fantasy. It is thus apparent that this group of so-called hypnotic virtuosos are prone to a lower level processing bias in every-day life: according to Lynn and Rhue (1991a) these individuals "...seem able to respond to non-hypnotic activities that require a temporary diminution of rational, reality-bound analytical thinking " (p. 203).

The ability to sustain attention and a preference or bias towards lower level processing are both variables that are likely to influence how responsive one is to suggestions, both in the hypnotic context and outside it. Other variables are more likely to be specifically related to the actual testing situation itself, however. For example, the attitudes and expectancies which the subject brings to the hypnotic situation are likely to influence suggestive responding in that context but probably not outside it. Thus, if the participating individual comes to the hypnotic situation with a resistant attitude due to their belief that responding to hypnosis is indicative of a weak character, they may deliberately display extremely low levels of suggestibility in order to demonstrate their strong mindedness. As such, both their attitude and belief are likely to be related to the level of suggestibility exhibited in the hypnotic context; outside of the hypnotic context, however, any predisposition to respond to suggestions will be unrelated to the individual's beliefs concerning hypnosis. This might explain why some individuals are actually more responsive to suggestions outside of the hypnotic context than within it (Kirsch, 1997).

3.3 General issues

3.3.1 An *integrative* theory of hypnosis?

One of the central aims of this thesis is to provide a theoretical account of hypnosis that serves to integrate the major contemporary theories of the phenomenon into a single nomological network. To what extent has this goal been achieved?

The fundamental guiding principle throughout the theorising presented here is that hypnotic behaviours and experiences are normal phenomena entirely explicable by general psychological priniciples. Accordingly, the current theory is based on a model of the cognitive system derived from contemporary cognitive psychological research. As such, the theory narrows the gap between hypnosis research and psychology in general, something which is essential if the study of suggestion and hypnosis is to progress successfully. Moreover, this account of the cognitive system is, in itself, an integrative model that combines the theoretical work of Norman and Shallice (1986), Logan (1988), Sloman (1996) and Marcel (1983) into a single general framework with greater parsimony and explanatory power.

On the basis of this cognitive framework, it has been argued that responses to both hypnotic and non-hypnotic suggestions operate according to the same fundamental and mundane psychological mechanisms. In this regard, the model presented here is consistent with sociocognitive accounts of hypnosis such as those offered by Sarbin (1950) and Spanos (1982, 1986). Moreover, the present theory adopts the basic sociocognitive position by emphasising the profound role that attitudes, beliefs and contextual cues play in determining the degree and nature of suggested responses. In addition, the notion that automatic memory retrieval represents the principle underlying suggestive phenomena has much in common with the sociocognitive model of hypnotic involuntariness presented by Kirsch and Lynn (1997). The view that hypnotic involuntariness is the product of a *post hoc* interpretation of the causes of hypnotic behaviours is also similar to that offered by Kirsch and Lynn (1997). However, the current model extends existing sociocognitive theory by providing a more detailed explanation of how these processes operate; in this regard, an explicit cognitive account of suggestion, role-theory and the tacit interpretation of situational demands has been provided. Furthermore, the model of suggestion provided here serves to integrate some of the ideas offered by Gheorghiu and Kruse (1992) within a general account of the cognitive system and applies them to the understanding of both hypnotic and non-hypnotic suggestion.

Although, following sociocognitive theory, the present model places considerable emphasis on the importance of situational, expectational and dispositional factors in suggestive responding, it also embraces the notion that there are important state changes occurring during the hypnotic situation that are responsible for the increased suggestibility displayed therein; as such, the present model also embraces a number of concepts fundamental to more state-oriented theories of hypnosis. The notion that the hypnotic situation typically engenders a state of extremely focused attention or absorption is central to accounts of hypnosis from across the theoretical spectrum. In particular, it is regarded by ego-psychological theory as one of the mechanisms by which adaptive regression can occur during hypnosis. In addition, sustained focal attention (as evidenced by increased cortical and sub-cortical activity in frontal regions) in the early stages of the hypnotic induction represents the first step in the neuropsychophysiological model of hypnosis. Secondly, the notion that absorption is bound up with a reduction in critical thought not only preserves the core of the original formulation of the concept (Tellegen & Atkinson, 1974), but also corresponds to (i) the ego-psychological position that hypnosis involves a reduction in generalised reality orientation (Shor, 1959), a notion also embraced by Nash (1991); (ii) the dissociated control view that hypnosis involves an inhibition of higher level systems; (iii) the second stage of the neuropsychophysiological model where the hypnotic subject 'lets go' by abandoning reality testing and conceding executive control to the hypnotist, as evidenced by reduced activation in frontal sites particularly in the left hemisphere. Third, the notion that absorption and a reduction in critical thought bias cognitive and behavioural control towards lower level processing corresponds closely to (i) the ego-psychological notion that hypnosis involves a shift towards primary process mentation; (ii) the neuropsychophysiological view that the process of 'letting go' involves a shift towards more holistic forms of information processing (stage 3 of the model where activation in right hemispheric sites increases); and (iii) the dissociated control position concerning the processes involved in the execution of suggested responses. Thus, through the use of three related 'state' concepts the current model ties together these different positions into a single explanatory framework. Moreover, the model extends these previous formulations by providing a more detailed account of the processes involved, their inter-relationships and how they might be operationalised (see chapter 2).

Finally, by providing a detailed account of how state and non-state factors interact during hypnosis to produce the behaviours and experiences exhibited therein, the present theory provides an extension to the interactionist position advocated by Nadon, Laurence and Perry (1991).

3.3.2 What is hypnosis?

Despite having provided an account of hypnotic and non-hypnotic suggestion, the question asked at the beginning of the first chapter still remains: what is hypnosis? In answering this question it is typical to begin by stating which side of the state vs. non-state divide one falls upon. In the context of the present theoretical model this is not an option, however. By incorporating elements from both state and non-state theories of hypnosis, the current model attempts to provide some way of straddling the boundary between these previously disparate camps. On the one hand, the current model suggests that hypnotic behaviours and experiences are perfectly normal phenomena explicable in terms of everyday psychological processes and without reference to the notion of a unique altered state. However, the model also suggests that the use of hypnotic procedures may bring about certain non-unique state changes, such as absorption and a shift towards lower level cognitive processes, which make suggested phenomena more likely to occur. As the existing definition of hypnosis seems to emphasise only the procedural aspects of hypnosis as a compromise between the state and non-state theorists (see Kirsch, 1994 and the accompanying commentaries; see also Fellows, 1994), whereas the current model aims to find the middle ground between these two camps, an attempt at revising the APA definition on the basis of this model seems appropriate in this context. As such, the following description[41] of hypnosis is proposed:

Hypnosis is a procedure during which suggestions for alterations in sensations, perceptions, thoughts or behaviour are given. Although successful responses to such suggestions are common outside the hypnotic situation, the extent to which this occurs may be elevated following hypnotic procedures for a number of reasons. Of primary importance in this regard is the belief that hypnosis involves increased responsivity to suggestions. Other beliefs may play a profound role in shaping suggested responses although this is true for hypnotic and non-hypnotic situations alike. In addition, certain alterations in the subject's psychological state that can be brought about by hypnotic procedures, such as a state of extremely focused attention or absorption, may also increase responsivity to suggestions. The induction of these state changes by hypnotic procedures is related to the belief that this is appropriate in the hypnotic situation coupled with instructions to help subjects experience them. However, such state changes are not unique to hypnosis and may be displayed in a number of different contexts otherwise unrelated to hypnosis. Nevertheless, it is the interaction between state changes and subjects' beliefs and expectations that shapes the nature and occurrence of suggested behaviours in the hypnotic context. The degree to which individuals respond to suggestions during hypnosis is a product of their propensity to respond to suggestions in non-hypnotic situations, their beliefs concerning hypnosis, and their capacity to experience the state changes called for in the hypnotic situation.

[41] For comparative purposes the full APA definition of hypnosis is presented in appendix I. Those paragraphs of the original definition referring to the misconceptions surrounding hypnosis and the use of hypnosis in clinical and research settings are endorsed by the current author and no revision of these will be offered here. In contrast to the position advocated by the APA, the term *description* is regarded as more appropriate than *definition* and is endorsed here.

Clearly, much work needs to be done to refine and extend this definition and, in its present form at least, it is sure to engender some level of disagreement from workers within the field. Nevertheless, it represents an attempt to move away from the purely procedural definition currently endorsed by the APA, and emphasise the more psychological aspects of suggestion and hypnosis. As recent discussions concerning the APA definition have shown (see Kirsch, 1994 and the accompanying commentaries; see also Fellows, 1994), many hypnosis researchers and practitioners would prefer to see such an approach adopted; this definition hopefully represents at least a step-forward in this regard.

3.3.3 General implications of the model

One of the primary purposes of developing a model of the cognitive system derived from contemporary cognitive psychological research and theory was to allow an exploration of the possible insights that research into suggestion and hypnosis could offer psychology in general. Although empirical substantiation for the model is required before any firm conclusions can be drawn, a brief examination of the possible implications of the model in this regard is nevertheless appropriate here.

One of the most noteworthy features of the current model is its assertion that suggested behaviours and experiences (both hypnotic and non-hypnotic) are, on a functional level at least, no different to many normal behaviours and experiences. What makes responses in the suggestive context different from those outside it is simply the fact that the suggestive context typically demands unusual behaviours and experiences, whereas so-called normal situations typically require normal behaviours and experiences. The fact that unusual requests, reinforced by beliefs, expectations and situational features, are able to produce such unusual responses underlines the lability of conscious experience and offers an insight into how it may be manipulated with a view to further understanding its nature. Indeed, arguably the biggest growth area within hypnosis research at present is in the psychophysiological arena, where research is often not directed at hypnosis itself but rather uses hypnotic suggestions as a tool to manipulate conscious experience (see, for example, the recent neuroimaging work of Rainville, Duncan, Price, Carrier, & Bushnell, 1997, and Szechtman, Woody, Bowers & Nahmias, 1998). Such an approach offers a powerful way of examining the relationship between brain activity and specific aspects of phenomenology, with the present model offering a framework by which such research can be related to more general cognitive and psychological issues. Few, if any, other areas within psychology have provided such powerful tools by which conscious experience can be manipulated, underlining the increasing importance of research into suggestion and hypnosis based on a general psychological framework.

On the clinical side, the current model may have important implications for the understanding of a number of conditions where disturbed phenomenology is a primary symptom. Possible explanations of certain aspects of post-traumatic stress disorder, functional amnesia and other conversion and somatoform symptoms such as paralysis, blindness and pseudoseizures are potentially within the remit of the current model, although such an analysis extends outside the theoretical goals of the present undertaking. Nevertheless, recent work by the present author indicates the potential value in such an endeavour (R. Brown & Trimble, 1999, in preparation).

Suggestion and hypnosis are not just tools by which the nature of conscious experience can be examined, however. According to the current model, the induction of absorption and reduction of critical thought occurring during hypnosis brings about a processing shift towards lower level cognitive control. Although great strides have been made in understanding the nature of higher level systems (see e.g. Burgess & Shallice, 1996a, b; Shallice & Burgess, 1996), very little is known about lower level cognition and its relationship to behaviour, thought, experience and high level processing itself. Given the functional importance of lower level processes it is essential that this area is addressed in future research; the possibility that hypnotic interventions are capable of bringing about a shift towards this type of processing suggests one way in which future research could approach this issue.

3.4 Summary

In this chapter an account of hypnotic and non-hypnotic suggestion was provided, based on the model of the cognitive system outlined in chapter two. The model is an attempt to provide an integrative position which encompasses the central elements of the ego-psychological, dissociated control, neuropsychophysiological and sociocognitive theories of hypnosis in a single nomological network. The basic structure of the model may be summarised as follows:

(i) Suggestion is the process by which perceptual and behavioural representations are automatically triggered by cues from the internal and external environment to control experience and action.

(ii) The nature of suggested responses will vary according to the pattern of activation spread across the representational network and the nature of the network itself; thus, they will vary according to the interaction between prior expectancies and the cues present in the suggestive context.

(iii) The degree to which an individual responds to suggestions is multiply determined by (a) motivation; (b) a complementary pattern of representational activity; (c) the degree of attentional absorption; (d) the level of critical thought; (e) predominant processing mode; and (f) the relationship between (c), (d) and (e).

(iv) Responses to suggestions, both hypnotic and non-hypnotic alike, are governed by the same fundamental and normal psychological mechanisms; thus, an hypnotic induction is not required for successful suggestive responding.

(v) Responsivity to suggestions is typically increased during hypnosis due to (a) the belief that that is what hypnosis involves; (b) a reduction in critical thought; (c) absorption; (d) a bias towards the low level control of behaviour; (e) the relationship between (b), (c) and (d).

(vi) Individual differences in suggestibility (regardless of context) will vary according to (a) the ability to sustain focused attention and avoid critical thought; and (b) an everyday propensity towards the low level control of behaviour; these will, in turn, be moderated by positive expectancies and attitudes concerning the particular suggestive context under examination (e.g. the hypnotic situation).

On the basis of this model, a revision to the existing APA definition of hypnosis, emphasising both procedural and psychological aspects, was proposed. The implications of the model for the understanding of consciousness, certain types of psychopathology and the nature of lower level processing were then discussed. In the next chapter, some of the predictions of the model will be examined and the practical issues that they raise will be discussed. This discussion will serve as a general introduction to the empirical work, designed to assess the validity of the current model, reported in chapters five to nine inclusive.

CHAPTER 4: Introduction to empirical work

4.1 Introduction

In chapter three a novel model of hypnosis and suggestion was outlined; the task now turns to the empirical assessment of its validity. In this chapter, the main predictions of this model will be examined and the practical issues that they raise will be discussed. On this basis, four hypotheses will be formulated and four studies designed to assess these hypotheses will be described; this discussion will serve as a general introduction to the empirical work reported in chapters five to nine inclusive.

4.2 Model predictions and empirical assessment

The model of hypnosis and suggestion outlined in chapter three was formulated to provide an explanatory framework by which existing research within the field could be organised as a basis for the generation of new hypotheses. In many respects the model provides an original perspective on suggestion and hypnosis and, where this is the case, novel predictions are made; the empirical examination of some of these predictions will be one of the aims of the research described in this thesis. Being based on existing theories within the field, however, some of the predictions of the current model also follow those of its theoretical precursors. Nevertheless, where this is the case the present model provides new, potentially more valid, ways of addressing these hypotheses empirically; accordingly, the examination of some of these hypotheses is the second aim of the research reported here.

According to the model of suggestion outlined in the previous chapter, suggested behaviours and experiences are the product of the automatic activation (and, in the case of cognitive suggestions, attentional selection) of low level representations following the receipt by low level attentional systems of cues from the internal and external environment. A number of factors which may affect the efficacy of this process have been described, including the triggering input received from environmental sources and the nature and activation levels of the representations in question. In addition, the model proposes that control influences from higher level attentional systems may also have a significant effect on the activation of representations involved in suggestive responding. For example, if an individual is biased towards the higher level management of everyday behaviour, the operation of such higher level processes in the suggestive context may interfere with the activation of the representations required for the successful execution of the suggested response. For instance, high-level rumination on negative thoughts such as "This is not working" during the presentation of the suggestion will serve to activate, in a top-down fashion, representations which conflict with those whose activation is required for the suggestion attempt to be successful. Through the process of lateral inhibition, the activation of these conflicting representations serves to reduce the activation of the suggestion representations, thereby making the suggestive attempt less likely to succeed. One prediction from such an account would be that individuals who have a predisposition towards higher level behavioural control will be less likely to respond successfully to suggestions than those who do not, due to the possible inhibitory effect that higher level cognition may have on the activation of appropriate representations. Conversely, one might predict that those individuals who do not possess good higher level abilities will be more suggestible than those who do, as these individuals are less likely to be predisposed towards the higher level control of behaviour. On the face of it, such hypotheses appear at odds with the findings of previous research indicating that hypnotic suggestibility is associated with a number of apparently higher level abilities (see chapter one). A number of studies have shown, for example, that hypnotic suggestibility is associated with cognitive flexibility (e.g. Priebe & Wallace, 1986; Wallace *et al*, 1994) and the capacity to sustain attention over time (e.g. Graham & Evans, 1977; Crawford *et al*, 1993). Moreover, the neurophysiological work of Gruzelier and colleagues indicates that highly suggestible individuals have greater baseline cerebral activity in brain areas associated with high level attentional processing than low suggestibles (e.g Gruzelier *et al*, 1984; Gruzelier & Warren, 1993). The first hypothesis, that hypnotic suggestibility is negatively associated with a high level processing preference, is not contradicted by this research, however, unless one assumes that processing preference is inexorably linked to processing ability. Although it is likely that there will be a relationship between the two, it is equally likely that there will also be considerable variation in processing preference between individuals of comparable processing ability. Moreover, we have no reason to assume that increased levels of blood flow in brain areas associated with high level attention will be associated with any particular cognitive bias. The validity of the second hypothesis rests not upon the distinction between preference and ability, however, but on the distinction between different types of high level processing. Whereas previous research has shown that suggestibility is linked to high level attentional abilities, the present preposition relates more to high level cognition and problem solving. As Shallice and Burgess (1996; Burgess & Shallice, 1996a, b) have demonstrated, the supervisory attentional system is composed of a diverse array of processing components which work in tandem as a higher level control structure. Although a functional relationship exists between individual sub-components of the system, there is likely to be a high degree of relative specialisation such that some components operate more (or less) efficiently than others. As such, an individual may possess the ability to sustain their attention or switch between cognitive strategies, for example, but be relatively unable to engage in effective problem solving due to the absence of appropriate processing algorithms. It would not be conceptually invalid, therefore, to hypothesise a negative relationship between hypnotic suggestibility and certain aspects of higher level processing ability other than cognitive flexibility or the sustaining of attention.

As the successful execution of suggestions directly involves the processes involved in the low level management of everyday behaviour, one can also predict that those individuals who have a general predisposition towards such low level behavioural control will be more responsive to suggestions than those who do not[42]. In each case, only the model of suggestion outlined in this thesis makes such predictions explicitly and therefore research designed to assess them provides a direct test of the current model.

However, assessing which type of processing (high vs. low) individuals have a positive bias towards as a basis for the everyday control of behaviour is not an easy task, as it is difficult to diagnose whether a particular behaviour is based on the automatic activation of memory representations or higher level processing algorithms (Logan, 1988); this is particularly so given the fact that most behaviours involve both automatic and controlled components anyway. Even in the case where a behaviour is comprised mainly of automatic elements, one cannot be sure of this simply by, as is commonly done, assessing whether or not the behaviour in question requires intention, awareness or attentional effort. Although such attributes (or the lack of them) may be characteristic of many, if not all, automatic behaviours, being independent qualities that may or may not co-vary according to the nature of the behaviour in question they do not provide a suitable foundation on which to base an operationalisation of automaticity. While information concerning whether or not a behaviour requires attention, effort, awareness or intention for its management is certainly important, one must seek additional ways of addressing which processing mode is predominant in any given situation or individual.

[42] It is important to note that a positive attitude or bias towards low level behavioural control need not necessarily imply that an individual will therefore have a negative attitude or bias towards high level behavioural control. Thus, rather than viewing higher and lower level control as opposite ends of a unipolar processing style construct, attitudes towards the two may also be regarded as individual dimensions in their own right. In this case, an individual's position on either dimension need not be related to their position on the other dimension. Nevertheless, some of the measures used in this thesis do adopt a unipolar view and any discussion of findings obtained using these measures will reflect this fact.

Through the accumulation of converging lines of evidence one will hopefully be able to state with some certainty which processes are involved in suggestion and which are not; work concerning the attention, effort or awareness involved in suggested behaviours, although it may contribute, cannot by itself provide this information.

In order to assess empirically which type of processing a particular individual or situation is biased towards, a different operationalisation of each type of processing is therefore required. However, as the distinction between higher and lower level modes of processing outlined in chapter two is novel, its generality is as yet unknown; thus, although it is highly likely that individuals will differ in the relative degree to which they prefer higher or lower level processes for the management of behaviour, how such differences might manifest themselves is largely uncertain. It is possible, for example, that processing predisposition plays a profound role in shaping an individual's personality, their attitudes and their behaviour in general, to the extent that processing preferences will be clearly measurable on these levels. On the other hand, it is possible that differences in processing predisposition have more subtle manifestations that, for the time being at least, are observable only on a cognitive or physiological level. As such, an explorative approach addressing both of these possibilities is required. Accordingly, research and theory from a number of different psychological literatures which bears a close resemblance to the processing distinction made in this thesis has been examined, and a number of measures apparently assessing a different aspect of this distinction have been selected. These measures have been chosen for their coverage of the domain described above, addressing concepts as diverse as personality, reasoning, cognitive style, creativity, learning and perception, using both self-report and behavioural indices. In studies 1 and 2 the predictions concerning hypnotic suggestibility outlined above will be assessed through the use of these measures; these studies will be reported in chapters five and six respectively, where the conceptual and empirical origins of these measures will be described in detail. In chapter seven, the generality of the processing distinction made here will be assessed through an examination of the relationships between these measures.

In addition to making specific predictions concerning the person-situation interaction involved in suggestion, the current model also makes predictions concerning hypnosis itself. According to the model, the hypnotic situation is associated with increased suggestibility for two main reasons: (1) subjects believe that that is what hypnosis involves; (2) the induction of an absorbed state during the hypnotic situation brings about a reduction in critical thought (proposition 2a) and a resulting bias towards lower level behavioural control (proposition 2b). As has been discussed previously, there is a good deal of research pertaining to the first of these and, as such, no attempt to assess this prediction will be made here. With regards the second proposition, however, less research exists and that which does can often be criticised on methodological grounds (see chapter one). Accordingly, two studies designed to assess the two aspects of this proposition will be described in this thesis. In the first, described in chapter eight, the prediction that hypnosis is associated with a bias towards lower level processing will be assessed; in the second, described in chapter nine, the prediction that hypnosis is associated with a reduction in critical thinking ability will be assessed. In each case, a prediction made not only by the current model of hypnosis but also by existing theoretical frameworks such as those provided by the ego-psychological, dissociated control and neuropsychophysiological theories is being assessed. However, in these studies a novel[43] methodological approach based on the distinction between higher and lower level cognition will be adopted. In this way, the current research provides an answer to the methodological criticisms levelled at studies previously designed to assess these predictions. Moreover, as with the research concerning hypnotic suggestibility outlined above, the use of alternative methodological paradigms derived from general psychology allows an appreciation of the potential for cross-fertilisation between the present field and psychology as a whole.

4.3 Summary

In this short chapter the main predictions made by the model of suggestion and hypnosis outlined in chapter three were described and some of the methodological issues pertaining to their empirical assessment discussed. On this basis, four studies[44] designed to assess these predictions have been briefly outlined; these will be reported in chapters five to nine inclusive. The findings of these studies and their implications for the models outlined in chapters two and three will be discussed in some detail in the concluding chapter.

One final point is worthy of mention here. In contrast to many research projects, the empirical work described in this thesis does not follow a linear format but takes a broad, explorative approach investigating a number of related strands in parallel. As such, this thesis does not present a *series* of research studies with each new study building on the

[43] At least within this field.

[44] In each case, ethical approval has been sought and obtained from the relevant bodies.

methodological and conceptual insights of the last. Rather, each of the studies described here examines something of a separate issue and therefore each empirical chapter, to an extent at least, stands alone. The reasons for such a non-linear approach are twofold. First, the preliminary nature of the conceptual framework described in chapters two and three lends itself well to an explorative approach, a method that may yield more useful information in the early stages of theoretical development than alternative approaches. Second, and most importantly, practical issues have precluded the use of a linear approach to data collection in the current context. In the first instance, a considerable delay was encountered during the process of obtaining ethical approval for the research described here. Having obtained ethical approval, the compilation of hypnotic suggestibility data proved to be considerably more time consuming than anticipated, with suggestibility testing continuing throughout a two-year data collection period. As a result, obtaining sufficient numbers of study participants proved extremely difficult, meaning that the results of individual investigations were not available before the design and execution of further studies was required. Although running studies concurrently is clearly not the most ideal method of data collection, the explorative nature of this thesis fortunately allows for the pursuit of parallel lines of investigation. It is hoped that the strands of greatest potential interest may be identified in the work described here, which could then be followed up in a more linear fashion in future research.

<u>CHAPTER 5</u>: Empirical study 1

The relationship between hypnotic suggestibility and several self-report measures of thinking style.

5.1 Introduction

As discussed in chapters three and four, the model presented in this thesis predicts that suggestibility will be positively related to an everyday predisposition for low level cognition and negatively related to a predisposition for high level cognition. In this chapter, the first of two studies designed to assess the validity of these predictions will be described.

As discussed in chapter three, individual differences in high and low level processing preference may potentially manifest themselves in a number of ways, such as in the general information processing style of the individual, but also in their personality and behaviour in general. The validity of this assertion is supported by research and theory from general psychology which parallels the distinction between higher and lower level cognition outlined in this thesis. This distinction has played a central role in the psychological literatures concerning cognition, personality and cognitive style, with theoretical opinion within these spheres converging on a view of the cognitive system that has much in common with that offered here. As such, measures obtained from these literatures offer a way of investigating the predictions outlined in chapter three, which in turn further serves to bridge the gap between hypnosis research and psychology in general.

<u>5.1.1 Cognitive-Experiential Self-Theory</u>

The distinction between higher and lower level cognition is a fundamental element in the global theory of personality, Cognitive-Experiential Self-Theory (CEST; Epstein, 1973, 1980, 1990, 1994). According to CEST, conscious deliberation is not necessary for adaptive behaviour in familiar situations, and may often serve to delay or distort responses which the organism has learnt are appropriate through experience with the environment. By this view, the most efficient and adaptive way of responding to incoming data is to automatically process it prior to awareness, and select only that information of particular salience or novelty to the individual for more detailed conscious analysis. CEST postulates that these forms of information processing are carried out separately by two discrete systems - the experiential and rational systems respectively - with all behaviour being the product of the dynamic balance between the two. Table 5.1 presents a comparison of the attributes of these systems.

The experiential system is composed of a hierarchically organised set of schemata derived from emotionally significant past experience. It is both phylogenetically ancient and developmentally immature, and provides the basis for adaptive behaviour until the individual is sophisticated enough to process information consciously. Throughout the course of everyday life, information received by the individual is interpreted by the experiential system, and, depending on the degree and nature of the emotional salience of the event in light of previous experience, the results of this processing may be passed on to the rational system for further analysis. The rational system is the 'executive' of the organism; it is here that complex, analytical tasks that require delayed responses are performed under the jurisdiction of the conscious self. It is therefore associated with conscious attention and mental control. By this view, all behaviour is the result of the dynamic balance between the two systems: what is represented in the rational system has arrived there through processing performed by the experiential system; in turn, experiential processing is influenced, and may be over-ridden, by the operation of the rational system.

The similarities between CEST and the model of the cognitive system outlined in chapter two are readily apparent. In line with the model presented here, CEST postulates a hierarchical organisation to the cognitive system based on the distinction between higher (i.e. rational) and lower level (i.e. experiential) cognition. According to CEST,

Table 5.1: Comparison of the experiential and rational systems in CEST

Experiential system	Rational system
1. Holistic operation	1. Analytic operation
2. Affective: Pleasure-pain oriented	2. Logical: Reason oriented
3. Associationistic structure	3. Logical structure
4. Behaviour mediated by 'vibes' from past experiences	4. Behaviour mediated by conscious appraisal of events
5. Encodes reality in concrete images, metaphors and narratives	5. Encodes reality in abstract symbols (words and numbers)
6. Rapid processing: Oriented towards immediate action	6. Slower processing: Oriented towards delayed action
7. Slower to change: Changes with repetitive or intense experience	7. Changes more rapidly: Changes with speed of thought
8. More crudely differentiated: Broad generalisation gradient; stereotyping	8. More highly differentiated
9. More crudely integrated: Dissociative; context-specific processing	9. More highly integrated: Cross-context processing
10. Experienced passively and preconsciously	10. Experienced actively and consciously
11. Self-evidently valid: "Experiencing is believing"	11. Requires justification via logic and evidence

From "Cognitive-Experiential Self-Theory: An integrative theory of personality" by S. Epstein, In R.C. Curtis, *The relational self: Theoretical convergences in psychoanalysis and social psychology*, New York: Guilford Press. Copyright 1991 by Guilford press. Adapted by permission.

lower level processing is automatic, rapid, holistic, associationistic and preconscious, while higher level processing is controlled, slow, analytical and conscious. Such a description of the higher/lower level distinction closely parallels that described in the model of the cognitive system outlined in chapter two.

According to CEST, the fact that much of behaviour, including thought, is determined by a system outside of our conscious control has profound implications for any theory of personality. Effectively, and this is the essence of CEST, the individual comprises two 'selves' - the experiential self and the rational self - both of which have a stake in controlling thought and action; according to Epstein, an individual's personality is, in part at least, determined by the relative degree to which experiential or rational processing is 'favoured' by their cognitive system. Indeed, Epstein, Pacini, Denes-Raj and Heier (1994; Epstein, Norris & Pacini, 1995) have developed an instrument - the Rational Versus Experiential Inventory (RVEI) - to measure this dimension. Given the similarity between CEST and the model of the cognitive system outlined here, the RVEI represents one measure by which the predictions concerning the relationship between suggestibility and processing predisposition might be assessed.

5.1.2 Learning style and the creative personality

The distinction between higher and lower level cognition has also played a significant role in research concerning the strategies individuals use when learning information in an educational setting. More specifically, a distinction has been made within the learning styles literature between analytic and holistic learning strategies, the former involving the critical, rational analysis of information and the latter involving assessing the similarities and relationships between information. Such a distinction corresponds closely to that between higher and lower level modes of processing in the model described here.

The role of analytic and holistic processes in learning has been most extensively investigated by Schmeck and colleagues using the Inventory of Learning Processes (ILP; Schmeck, Ribich & Ramaniah, 1977). Over the course of a number of years, several factor-analytic studies have revealed a four factor structure of the instrument, based on four different clusters of learning strategies that together represent individual learning styles (Beyler & Schmeck, 1992); these styles have been described as deep processing, elaborative processing, fact retention and methodological study. Of these the first two are of interest here because they represent two measures of the degree to which individuals flexibly use both analytic and holistic strategies in the course of learning (Geisler-Brenstein & Schmeck, 1989; Beyler & Schmeck , 1992).

A number of studies have revealed that scores on the elaborative and deep processing scales of the ILP are related to a wide variety of cognitive skills (for a review see Schmeck, 1988). These findings would appear to indicate, as suggested, that high scorers on these scales are the most flexible processors, using both analytic and holistic strategies in learning situations to produce the most successful results. However, although these scales reportedly measure integrative cognitive functions, each would appear to be associated with a particular preference for either an analytic or holistic processing style. More specifically, high scorers on the deep processing sub-scale tend to engage in the critical evaluation of information and score more highly on measures of verbal ability than elaborative processors (Schmeck, 1983), indicative of an analytical preference. On the other hand, Schmeck and Ribich (1978) present data suggesting that elaborative processors score more highly on measures of academic curiosity and mental imagery than those scoring highly on the deep processing sub-scale, suggesting a more holistic orientation. As such, the ILP represents one further method for assessing the hypothesised relationships between suggestibility and processing predisposition.

In addition to learning style research, the distinction between analytic and holistic cognitive processes has also played an important role in research concerning creativity and the so-called 'creative personality' (Taggart & Torrance, 1984). A particularly influential account of creative problem-solving is that of Wallas (1926) who regarded the problem solving process as being composed of a series of discrete stages, termed preparation, incubation, illumination and verification. According to Wallas' account, once the individual has recognised the problem and made some cursory attempts to solve it, it is put aside and no longer thought about consciously. However, during this period of 'incubation', unconscious processes are at work on the problem until a solution is found, at which point the individual experiences a flash of insight or 'illumination' as a primitive form of the answer is delivered to consciousness. After this moment of insight, the rough solution is consciously refined and formalised in the verification stage of the process. By this view, therefore, problem solving is discontinuous and involves both analytic (in the verification stage) and non-analytic (in the incubation stage) cognitive operations.

The theory of creative problem solving provided by Wallas (1926) provides the basis for Taggart and Torrance's (1984) theory of creativity and the creative personality. In line with Wallas, Taggart and Torrance suggest that there are both analytical and non-analytical elements to the creative process which must both be used in a flexible fashion in order for the individual to be truly creative. According to this view, however, individuals often differ in the stages of the creative process to which they are best suited, with this difference affecting the type of creative products that they are most likely to produce. Some individuals are better suited to the verification aspects of the creative process and tend to create by improving existing material; Taggart and Torrance (1984) have described these individuals as possessing 'left-brain'[45] creativity. In contrast, other individuals are better suited to the more non-analytical elements of the process and tend to be creative by inventing entirely original products (see Torrance & Rockenstein, 1988); these individuals have been described as possessing 'right-brain' creativity. Taggart and Torrance (1984) have devised an individual difference measure, the Human Information Processing Survey (HIPS), designed to assess the degree to which individuals tend towards either left or right brain creativity, or the flexible integration of the two.

According to Taggart and Torrance (1984), left-brain creativity is characterised by an analytical, abstract, and temporal processing style and a preference for verbal material, while right-brain creativity is characterised by a holistic, concrete, spatial and intuitive processing style and a preference for non-verbal material (see also Torrance & Rockenstein, 1988). It is thus readily apparent that the distinction between left and right brain creativity styles bears a close relation to that between the higher and lower level processing modes respectively in the model of the cognitive system described in chapter two. As such, the HIPS offers, in addition to the RVEI and ILP, one further way that the predictions concerning the relationship between processing predisposition and suggestibility might be assessed.

5.1.3 The measurement of suggestibility

As was discussed in chapter three, the model outlined in the present thesis follows the work of Kirsch (1997) in its assertion that suggestive responding in both hypnotic and non-hypnotic situations is governed by the same fundamental psychological mechanism (i.e. memory retrieval). Given that this is the case, assessment of an individual's responsivity to suggestions may be carried out in either hypnotic or non-hypnotic

[45] The biological metaphor used by Taggart and Torrance (1984) was based on research indicating that the characteristics of the left and right brain creativity styles correspond closely to the functions of the left and right cerebral hemispheres (e.g. Springer & Deutsch, 1981; Ornstein, 1986). Although the validity of this metaphor has since been questioned, there is good evidence to believe that the theoretical constructs underlying the dimensions of the HIPS are sound (Beyler & Schmeck, 1992).

contexts with the same basic construct being addressed in each case; this is evidenced by the extremely strong correlation obtained between hypnotic and non-hypnotic suggestibility (Kirsch, 1997). Although assessing suggestibility in an hypnotic context may, to a certain extent, contaminate the suggestibility measure with attitudes and expectations concerning hypnosis, the vast majority of research within the field has assessed suggestibility within the hypnotic context, and so this practice was followed in the present thesis also. Such an approach maximises the generalisability of the current research, although the issue of possible contamination will be addressed in the discussion provided in chapter ten.

There is a considerable range of instruments developed to provide reliable and standardised assessments of hypnotic suggestibility, with at least fourteen distinct[46] measurement scales, varying in content and the context of their presentation, being available to researchers and clinicians working within the field (Perry, Nadon & Button, 1992). Given such a range it is not immediately obvious which scale is the most suited to the research issues addressed in the context of this thesis. Certain tests are rarely used and have little, if any, psychometric data reported for them (see Perry, Nadon & Button, 1992); as such, they will not be considered here. There are nevertheless three scales which, being widely used and requiring no special training to administer, are potentially appropriate for the current purposes, the Stanford Hypnotic Susceptibility Scale, form C (SHSS:C; Weitzenhoffer & Hilgard, 1962), the Harvard Group Scale of Hypnotic Susceptibility, form A (HGSHS:A; Shor & Orne, 1962) and the Carleton University Responsiveness to Suggestion Scale (CURSS; Spanos, Radtke, Hodgins, Stam & Bertrand, 1983).

The three scales all conform to a roughly similar structure whereby the individual receives an initial hypnotic induction followed by a series of test suggestions. The individual's response to these test suggestions (either behaviourally, subjectively or both according to the particular scale) determines their hypnotic suggestibility. The main points of difference between these measures are whether they are administered individually or to a group, how long they take to complete, how easy they are to administer, the amount of psychometric data available for them, and how often they have been used for research purposes within the field. It is on these points of difference, and certain issues concerning validity, that scale selection will be based for the purposes of the present studies.

[46] That is, if one regards separate forms of the same general test (e.g the Stanford Scale of Hypnotic Susceptibility forms A and B; Weitzenhoffer & Hilgard, 1959) as representing distinct scales.

Of the three scales, the SHSS:C and HGSHS:A are by far the most well researched and used (Fellows, 1988; Perry, Nadon & Button, 1992); the CURSS is a relatively new scale with the majority of the psychometric data pertaining to it having been obtained by its authors following its initial development. Both the SHSS and HGSHS take approximately one hour to administer, with the former being an individually presented scale and the latter being designed for group presentation. The CURSS takes about 25-30 minutes to administer and is also suitable for group presentation. Although the excellent psychometric properties of the SHSS:C have earnt it a reputation for being the 'gold standard' of suggestibility measurement (Kurtz & Strube, 1996), its individual administration format makes it an impractical choice where time constraints are of paramount concern (Kihlstrom, 1985); given the considerable time restrictions placed on the current research and the existence of more practical yet psychometrically acceptable alternatives, use of the SHSS:S must unfortunately be rejected here.

As such, the choice of suggestibility measure is limited to that between the HGSHS:A and CURSS, both suitable for group administration and therefore potentially appropriate for the current research purposes. On a practical level, the CURSS is the obvious choice taking approximately half the time to administer compared to the HGSHS:A. Practical issues are only one of the concerns in choice of suggestibility measure, however. Although both scales correlate more or less equally well with the SHSS:C (Perry, Nadon & Button, 1992) and demonstrate good psychometric properties in terms of internal consistency and reliability (Kihlstrom, 1985; Fellows, 1988), there is considerably more evidence pertaining to the HGSHS:A than the CURSS, an unsurprising fact given the respective ages of the two scales. Unlike the CURSS, normative data on the HGSHS:A has been collected in a variety of cross-cultural samples and over a considerable period of time. In all, norms have been provided for American (Shor & Orne, 1963; Coe, 1964), Australian (Sheehan & McConkey, 1979), Czech (Svoboda, 1989), Canadian (Laurence & Perry, 1982), German (Bongartz, 1985), Spanish (Lamas, del Valle-Inclan, Blanco & Diaz, 1989), Danish (Zachariae, Sommerlund & Molay, 1996) and Finnish (Kallio & Ihamuotila, in press) samples. An evaluation of this data suggests that the HGSHS:A is relatively stable across both culture and time (Perry, Nadon & Button, 1992). As such, the HGSHS:A would appear to be a more useful measure in terms of its generalisability than the CURSS, at least according to existing evidence; underlining its comparative value, the HGSHS:A is also probably the most widely used suggestibility measure within the field (Perry, Nadon & Button, 1992). While the CURSS may have the potential to supersede the HGSHS:A given its practical benefits, further evidence pertaining to it is required before this can be achieved. On the basis of both precedent and its sound psychometric properties, the HGSHS:A was used as the suggestibility measure in this thesis.

In summary, this study aimed to investigate the related hypotheses that suggestibility is positively related to a low level processing predisposition and negatively related to a high level processing predisposition. In order to do this, a number of self-report measures of low and high level processing predisposition taken from a diverse set of literatures within psychology were presented to a large group of individuals who had been screened on a widely used measure of hypnotic suggestibility.

5.2 Method

5.2.1 Subjects

Subjects were 209 graduate and undergraduate students from University College London, of which 60 were male and 149 female. The mean age of the entire sample was 21.39 years (s.d. 4.43 years; range 18-48 years). 119 of the subjects were volunteers who were recruited in response to advertisements placed around the University requesting participants for a study on hypnotic suggestibility and thinking style. Of this group of subjects, 42 were male and 78 were female. This sample had an average age of 22.47 years (s.d. 4.96 years; range 18-48 years). Informed consent was obtained from each of these subjects who received £5 for participating in the HGSHS:A and £3 for completing the questionnaires. The remaining 89 subjects participated in this study as one of the requirements of a laboratory class in statistics and research methods; they received no payment for participation. Of this group of subjects, 18 were male and 71 were female. This sample had an average age of 20.08 years (s.d. 3.18 years; range 18-35 years). This group of subjects was informed that they had the right not to participate if they so wished; three members of the laboratory group chose not to take part.

5.2.2 Materials

Harvard Group Scale of Hypnotic Susceptibility, form A (HGSHS:A): The HGSHS:A (Shor & Orne, 1962) was developed as a group version of the earlier Stanford Hypnotic Susceptibility Scales, forms A and B (Weitzenhoffer & Hilgard, 1959) and conforms to a similar testing format. Following a short standardised introduction presented by the experimenter in a bid to establish rapport, the group of subjects is played an audio-tape (to ensure control over possible multiple testing occasions) comprising the main body of the scale. The scale consists of an hypnotic induction followed by twelve different test suggestions, of roughly increasing difficulty, from across the domain of hypnosis (E. Hilgard, 1973b) including ideo-motor (e.g. hands moving together), challenge (e.g. finger lock) and cognitive (e.g. amnesia) items. After the de-induction of hypnosis, subjects are required to complete a response booklet indicating their responses to each of the suggestions following a dichotomous format (i.e. 'Yes, I behaved in the suggested fashion' vs. 'No, I didn't behave in the suggested fashion). Whether or not the amnesia suggestion has been passed is based on the number of test items that the subject records in the response booklet over a three minute interval following the termination of hypnosis but prior to the amnesia reversal cue. The individual's susceptibility score corresponds to the number of suggestions that they have successfully passed; susceptibility scores may therefore range from zero to twelve. Presentation of the scale and completion of the response booklet takes approximately one hour in total.

The HGSHS:A possesses good psychometric properties. According to the original norms, the scale has an internal consistency of 0.80 (Shor & Orne, 1963). In addition, Gwynn, Spanos, Gabora and Jarrett (1988) present findings indicating that it has a test-retest reliability of .55[47]. As was discussed in the previous section, the HGSHS:A has been assessed in a variety of cross-cultural contexts with results suggesting that the HGSHS:A is relatively consistent across both time and culture (Perry, Nadon & Button, 1992). The scale possesses reasonable convergent validity, yielding correlations of about 0.6 with the SHSS:C (Coe, 1964; Register & Kihlstrom, 1986), and 0.62 with the CURSS (objective scale; Spanos, Radtke, Hodgins, Bertrand, Stam & Moretti, 1983).

A number of investigators have examined the factor structure of the HGSHS:A and there is some evidence to suggest that the scale comprises a three factor solution corresponding to challenge, ideo-motor and cognitive suggestion items (e.g. Peters, Dhanens, Lundy & Landy, 1974; McConkey, Sheehan & Law, 1980). Such a three factor solution provides evidence for the notion that the three different types of suggestion operate according to fundamentally different psychological mechanisms, and studies investigating the relationship of the HGSHS:A to other personality or cognitive variables have often treated the three suggestion types as separate in analysis (e.g. Laidlaw & Large, 1997): clearly, if the three types of suggestion operate according to different psychological mechanisms, then they should show differential patterns of correlations between further individual difference dimensions which might be of considerable theoretical interest. Accordingly, the factor structure of the HGSHS:A will be analysed

[47] There is, however, some evidence to suggest that susceptibility as measured by the HGSHS:A may be modified through training (see Spanos & Coe, 1992).

for the present sample and, if evidence for the three factor solution is obtained, the cognitive, challenge and ideo-motor items will be treated as separate in analysis. If no evidence for such a solution is found then total HGSHS:A scores will be used instead.

Although the HGSHS:A is used in its unmodified form in many studies, a number of studies have been reported in which the scale has been modified in certain ways. In particular, a number of researchers have altered the wording of the induction, removing all references to sleep and replacing them with relaxation. It was decided that this would not be done in the present investigation in order to maximise the potential for comparison with other studies; as Perry, Nadon and Button (1992) have pointed out, such alterations are unlikely to significantly affect scores on the HGSHS:A in any case.

Rational Versus Experiential Inventory, Short Form (RVEI-S): The RVEI-S (Epstein, Norris, & Pacini, 1995), was developed as a measure of individual differences in the preference for experiential and rational modes of processing as embodied in Cognitive-Experiential Self-Theory (CEST; Epstein, 1973, 1980, 1990, 1994). The RVEI-S consists of four main scales divided into a further eight lower-order sub-scales; the core of the RVEI-S is formed by two of the main sub-scales, the experiential and rational scales (Epstein *et al* 1995), which are the scales used here.

The experiential scale evolved out of the sensing-intuiting sub-scale of the Myers Briggs Type Inventory (MBTI; Myers & McCauley, 1985) and is designed to assess the degree to which individuals prefer to rely on their emotions (e.g. 'I tend to use my heart as a guide for actions') and intuitions (e.g. 'A solution to a problem will often come to mind without having to consciously reason it out') when making decisions. The rational scales was derived from the Need For Cognition scale (NFC; Cacioppo & Petty, 1982) and is designed to assess the degree to which individuals enjoy engaging in intellectual activities (e.g. 'I prefer to do something that challenges my thinking abilities rather than something that requires little thought'), how good they believe themselves to be at them (e.g. 'I have no problem in thinking things through carefully'), and whether they rely on these capacities for decision making (e.g. 'I usually have clear, explainable reasons for my decisions').

Although the experiential and rational scales are divided into separate preference and ability dimensions there is some doubt as to the validity of such a split; for the sake of conceptual clarity and statistical power scores on the ability and preference dimensions will be combined to form superordinate experiential and rational processing scores. Each combined scale is composed of ten statements, to which subjects must rate the truthfulness as it relates to them on a five-point Likert scale ranging from zero ('completely false') to four ('completely true'). Five items on the rational scale are negatively scored, creating a range for this scale of -20 to 20; three items on the experiential scale are negatively scored, creating a range for this scale of -12 to 28.

Being a relatively new scale, very little research has been carried out on the RVEI-S, although the MBTI and the NFC from which it is derived have received rather more research interest. On this basis, there is good evidence to support the construct validity of the dimensions in question (see Cacioppo & Petty, 1982; Myers & McCauley, 1985). Nevertheless, there is some psychometric data on the RVEI-S including norms and internal consistency assessments; both experiential and rational scales have fairly good internal consistency, with alpha values of .73 and .80 respectively (Epstein *et al* 1995). In addition, the RVEI-S has been correlated in a large sample (N = 1145) with a number of other state and trait inventories, with results supporting the construct validity of the scale (Epstein *et al* 1995).

If suggestibility is related to a preference for low-level information processing one would predict a significant correlation between the HGSHS:A and the experiential scale of the RVEI-S. In addition, if a preference for high-level information processing militates against suggestive responding one would predict a significant negative correlation between the HGSHS:A and the rational scale of the RVEI-S.

Human Information Processing .Survey (HIPS): Developed out of the creativity and learning style literatures, the HIPS (Taggart & Torrance, 1984) was devised to assess what the authors have termed 'cerebral hemispheric preferences'. According to Taggart and Torrance (1984), individuals conform to one of three information processing styles which they have labelled left-brained, right-brained and integrated. Left-brain individuals are those that prefer processing information verbally, analytically and logically, while right-brain individuals prefer non-verbal, holistic and intuitive information processing. In contrast, integrated individuals have no preference for either type of processing but use both in an integrative and flexible fashion. The HIPS was devised as a measure of these putative processing preferences. It is comprised of 40 items presented in a multiple choice format with three possible responses, one each for left-brain, right-brain and integrated preferences; thus, the HIPS yields three scores corresponding to the three processing preferences, each of which has a maximum value of 40. The items cover a wide range of activities and events which the authors have identified as relevant to their model of creativity and learning.

Taggart and Torrance (1984) present evidence suggesting that the HIPS has good reliability, with internal consistencies of 0.84 for the right, 0.86 for the left and 0.82 for the integrated sub-scales being reported. Furthermore, although there is reason to doubt the biological metaphor on which it is based, the underlying processing-style constructs of the HIPS appear to be sound (Beyler & Schmeck, 1992). In addition, Taggart and Torrance (1984) present data indicating the good convergent validity of the scale, with scores on it significantly predicting a number of relevant personality and cognitive attributes.

If hypnotic suggestibility is related to a preference for low-level information processing one would predict a significant correlation between the HGSHS:A and the right-brain sub-scale of the HIPS. In addition, if a preference for high-level information processing militates against hypnotic responding one would predict a significant negative correlation between the HGSHS:A and the left-brain sub-scale of the HIPS.

Inventory of Learning Processes (ILP): The ILP consists of four main sub-scales, deep processing (named as such by Schmeck, 1983), elaborative processing, fact retention and methodological study. Of these the deep and elaborative processing sub-scales are of interest here: according to Beyler and Schmeck (1992) both scales, like the integrated scale of the HIPS, represent a flexible, integrated system of analytic and holistic processes. However the deep and elaborative processing modes differ in the relative emphasis they place on analytic and holistic processes: although they are entirely capable of both, deep processors demonstrate a general preference for analytic processing whereas those scoring high on the elaborative scale generally prefer to process holistically.

More specifically, in the revised version of the ILP (ILP-R; Schmeck, Geisler-Brenstein & Cercy, 1991) the deep and elaborative sub-scales have been further sub-divided into deep thinking, deep semantic memory, elaborative episodic memory and elaborative self-actualising sub-scales. Such a division draws heavily on the episodic-semantic memory distinction of Tulving (1985) - according to the model, elaborative processors rely more heavily on episodic memory systems by relating new materials to their own experiences, whereas deep processors prefer to organise material hierarchically without reference to themselves, thereby relying more heavily on semantic memory systems. A number of studies have supported this distinction (for a review see Schmeck, Geisler-Brenstein & Cercy, 1992) and the ILP-R clearly benefits from deriving its theoretical base from mainstream cognitive psychology. In all, the deep thinking, deep semantic, elaborative episodic and elaborative self-actualising scales each comprise five statements that subjects must rate the extent to which they agree with on a six-point Likert scale ranging from zero ('strongly disagree') to five ('strongly agree'); thus, each scale has a range from zero to 25, except the deep semantic scale which has a single negatively scored item making the range for that scale from -5 to 20.

The ILP has attracted a good deal of research within educational psychology and has been related to a number of cognitive and personality variables, including the intuitive sub-scale of the MBTI (Schmeck, in press) and the integrated sub-scale of the HIPS (Beyler & Schmeck, 1992). Furthermore, it has consistently yielded reliable test-retest results (r = .88 for the total deep processing scale; r = .80 for the total elaborative processing scale), good internal consistency (Cronbach's alpha = .82 for deep processing; Cronbach's alpha = .67 for elaborative processing), a reliable factor structure and incremental validity (Schmeck, Geisler-Brenstein & Schmeck, 1992).

If suggestibility is related to a preference for low-level information processing one would predict a significant correlation between the HGSHS:A and both of the elaborative processing sub-scales of the ILP. In addition, if a preference for high-level information processing militates against suggestive responding one would predict a significant negative correlation between the HGSHS:A and both of the deep processing sub-scales of the ILP.

Social Desirability Scale (SDS; .Crowne & Marlowe, 1965): Many of the statements forming the questionnaires used here have potentially socially desirable responses (e.g. 'I have a logical mind', an item on the rational scale of the RVEI-S); as such, the Crowne & Marlowe (1960) Social Desirability Scale (SDS) was used as a partial correlate to control for any potential influences of this sort. The scale is the most commonly used instrument for assessing the influence of individual differences in the need for good social presentation (A. Furnham, 1996; personal communication). It comprises thirty-three true-false statements of which each has a desirable and an undesirable response; the total score is given by the number of desirable responses made. Crowne and Marlowe (1960) present psychometric data on the SDS which indicates that is has good internal consistency (KR-20 = .88) and test-retest reliability (r = .89).

The SDS has been used before as a covariate in hypnosis research (e.g. Lynn & Rhue, 1986), although a small body of research has shown that there is little or no evidence in support of a relationship between suggestibility and social desirability (e.g. Kumar, Pekala & Cummings, 1996; Ost, Fellows & Bull, 1997). Nevertheless, there is some evidence pointing to a relationship between social desirability and compliant responding in the hypnotic situation (Spanos, Perlini, Patrick, Bell *et al*, 1990). Moreover, many sociocognitive theorists (e.g. Spanos, 1986) would regard positive self-presentation to be a fundamental aspect of hypnotic responding. Accordingly, a positive correlation between the HGSHS:A and the social desirability scale was predicted here.

5.2.3 Design and procedure

This study followed a basic correlational design. The questionnaires were placed in an envelope in a random order following a latin squares design. Subjects were requested to work through the questionnaires in the order that they were placed in the envelope to ensure randomisation. The subjects participating in the laboratory class completed the questionnaires as a group in supervised conditions; these subjects were separated from one another spatially in order to reduce the possibility of subjects being influenced by each others' responses. The laboratory class was jointly conducted by the experimenter and three confederates. The vast majority of the remaining subjects also completed the questionnaires in supervised conditions in small groups of 2-5 individuals; however, a small number (n = 24) completed the questionnaire package unsupervised. These individuals were requested to complete the questionnaires alone and in quiet conditions where they would not be disturbed. All subjects were asked to complete the questionnaires as honestly and accurately as possible; in order to maximise honest responding, all subjects were informed that their answers would be anonymous. Half of the subjects participated in the HGSHS:A before completing the questionnaire package while the other half received the HGSHS:A after completing the questionnaires. The lab class sub-sample completed the audio-taped HGSHS:A in a large, dimly-lit and quiet room in two groups each of about 45 individuals. Similar conditions were used for the remaining subjects who completed the HGSHS:A in small groups of 2-10 individuals. These sessions were jointly conducted by the experimenter and two confederates. At least one day separated questionnaire presentation and suggestibility measurement.

5.3 Results

5.3.1 Data screening and preliminary analyses

A small number of subjects (n = 18) failed to respond to single items on individual questionnaires. As the number of non-responses was small and appeared upon inspection to be randomly distributed the mean of the remaining items on the relevant sub-scale was calculated and the nearest whole integer was taken as the response on the missing item in

Table 5.2: Means and standard deviations for overall, lab class and non lab class samples (t-values and significance levels for the differences between the lab and non lab class samples are also shown; * refers to Z score calculated by Mann Whitney U).

Variable	Combined mean (N = 209)	Comb s.d.	Lab Mean (n = 89)	Lab s.d.	Non lab mean (n = 120)	Non lab s.d.	t value of diff.	Sig. of diff
HGSHS	6.54	2.72	6.43	2.58	6.63	2.83	.604	ns
Age	21.39	4.43	20.08	3.18	22.37	4.96	-4.94*	.000
SDS	11.90	5.01	12.51	4.79	11.45	5.14	-1.51	ns
RVEI-RAT	6.95	5.90	5.21	6.41	8.24	5.15	3.79	.000
RVEI-EXP	13.87	5.26	13.78	4.70	13.94	5.66	0.22	ns
HIPS-L	10.67	4.29	10.64	4.16	10.69	4.40	0.10	ns
HIPS-R	13.53	4.96	12.99	4.19	13.91	5.43	1.51	ns
HIPS-I	16.05	4.85	16.37	4.86	15.81	4.85	-0.10	ns
ILP-DS	18.42	3.04	17.93	3.06	18.78	2.99	2.01	ns
ILP-DT	12.47	3.75	11.70	3.26	13.04	4.00	2.60	ns
ILP-ES	18.44	3.14	18.65	2.62	18.29	3.48	-0.82	ns
ILP-EE	18.91	2.93	18.26	3.07	19.40	2.73	2.84	ns

KEY

HGSHS: Harvard Group Scale of Hypnotic Susceptibility; SDS: Social Desirability Scale; RVEI: Rational Versus Experiential Inventory (RAT = Rational scale; EXP = Experiential scale); HIPS: Human Information Processing Survey (L = Left hemisphere scale; R = Right hemisphere scale; I = Integrated scale); ILP: Inventory of Learning Processes (DS = Deep semantic scale; DT = Deep thinking scale; ES = Elaborative self-actualising scale; EE = Elaborative episodic scale).

these cases. Prior to analysis the data-set was screened for missing values. Three missing values were identified, one each for the social desirability scale, the RVEI rational scale and the RVEI experiential scale[48]. In each case the missing value was replaced by the mean for all cases within the particular sample in question (i.e. lab class vs. Not lab class). Inspection of the distributions for each of the samples on each of the variables revealed that all variables were normally distributed except age which showed a pronounced positive skew. Table 5.2 shows the descriptive statistics for each of the variables for the entire sample, and the lab and non lab class samples individually.

Independent samples t-tests (two-tailed) were performed on each of the variables comparing the lab and non lab class samples[49]; t-values and their significance levels are also shown in table 5.2. A Mann Whitney U test was used to assess differences in age between the two samples due to the non-normal distribution of the age variable. To take

[48] In each case the missing values arose from individuals failing to complete the entire scale or a significant proportion of it

[49] All analyses described in this thesis were performed using version six of the Statistical Package for the Social Sciences (SPSS).

into account multiple comparisons, a Bonferroni correction was made and an alpha value of 0.004 for each of the comparisons was used, preserving an overall alpha value of 0.05.

Inspection of table 5.2 reveals that the lab and non lab class samples show significant differences on only two variables, age and the Rational scale of the RVEI: the lab class sample was significantly younger and endorsed items on the Rational scale to a significantly lesser degree than the non lab class sample. As the rational scale of the RVEI is one of the central measures in this study, separate correlations will be performed for both lab class and non-lab class sub-samples for this variable. However, as age is not a variable of central importance to the present study differences between the two samples on this dimension will be ignored in this context. In order to maximise statistical power, therefore, the two samples will be collapsed into a single sample for all analyses not involving the RVEI-RAT variable.

The combined sample was screened for univariate and multivariate outliers and violations of the assumptions of multivariate analyses. One case with extremely high z scores for the HIPS-L and ILP-ES variables was found to be a univariate outlier ($p \leq 0.001$) and was deleted, leaving 208 cases for subsequent analyses. Calculation of mahalanobis distances revealed that no multivariate outliers were present in the data-set. Inspection of the resulting distributions indicated that each of the variables was normally distributed except for age which showed a pronounced negative skew. As age is not a factor of importance to the present study the non-normal distribution of this variable will be ignored here.

Table 5.3: Means and standard deviations for overall sample, plus male and female sub-samples (see table 5.2 for key).

Variable	Sample mean (N = 208)	Sample s.d.	Female mean (n = 148)	Female s.d.	Male mean (n = 60)	Male s.d.
HGSHS	6.52	2.72	6.75	2.51	5.97	3.12
Age	21.39	4.44	21.11	3.79	22.08	5.73
SDS	11.90	5.02	12.03	5.05	11.58	4.97
RVEI-RAT	6.94	5.91	6.29	5.75	8.53	6.05
RVEI-EXP	13.94	5.19	13.92	5.31	13.98	4.90
HIPS-L	10.61	4.18	10.98	4.27	9.68	3.86
HIPS-R	13.34	4.90	12.78	4.89	14.72	5.07
HIPS-I	16.05	4.88	16.24	5.03	15.60	4.48
ILP-DS	18.43	3.04	18.33	3.12	18.68	2.86
ILP-DT	12.47	3.76	12.25	3.63	13.00	4.05
ILP-ES	18.50	3.03	18.59	2.99	18.30	3.14
ILP-EE	18.92	2.93	18.87	2.98	19.03	2.83

Table 5.3 presents descriptive statistics for the entire sample and for the male and female subsets of the sample. In order to assess possible differences between men and women on each of the variables, independent samples t-tests (2-tailed) comparing the two were performed; as before, an alpha value of 0.004 for each of the analyses was used to correct for multiple comparisons. No significant differences were found between men and women on any of the variables. As such, male and female scores were combined and treated as a single sample in subsequent analyses.

Prior to analysis of the relationship between processing preference and suggestibility, an examination of the HGSHS data is required to assess the validity of the distinction between ideo-motor, challenge and cognitive suggestion items discussed previously. If such a distinction has both construct as well as face validity, then treating the three types of suggestion as separate in subsequent correlational analyses would be appropriate. If the three different types of suggestion operate according to different mechanisms, it is conceivable that a differential pattern of correlations will be found between each suggestion type and the variables under scrutiny in this study, a finding which could have great significance theoretically. If no evidence for a valid distinction between the three different types of suggestion is found, then drawing such a distinction would be entirely arbitrary and provide no meaningful basis for analysis.

The sample mean of 6.52 (s.d. 2.72; see table 5.3) is somewhat lower than the original normative score of 7.39 obtained by Shor and Orne (1963) with an American sample. However, this value is by no means exceptional, being comparable to the normative HGSHS:A mean values obtained previously for other European samples (see e.g. Bongartz, 1988; Kallio & Ihamuotila, in press). To provide a further index of the comparability of the HGSHS:A scores obtained from this sample, individual item difficulties were calculated by assessing the proportion of subjects passing the item in question. Item pass rates and their ranked difficulty are presented in table 5.4.

In line with most previous normative studies[50] of the HGSHS:A, the easiest item (i.e. most often passed) was item 3, hand lowering. Moreover, the second easiest item was item 7, hands moving together, in line with the normative data obtained from Danish, German and Australian samples. In line with the majority of previous research, the most difficult items were items 11 and 9, post-hypnotic suggestion and fly hallucination respectively. The remaining items fell between the two extremes.

[50] See section 5.1.3 for details of previous normative studies on the HGSHS:A.

Table 5.4: Pass rates, ranked difficulty (1 = difficult, 12 = easy) and corrected item-total correlations for HGSHS:A items.

(N = 208) HGSHS:A Item	Pass rate (%)	Ranked difficulty	Corr. item-total correlation
1. Head falling	74.9%	9	.2974
2. Eye closure	79.7%	10	.2328
3. Hand lowering	82.1%	12	.1321 (n.s)
4. Arm immobilisation	43.0%	3	.3433
5. Finger lock	59.4%	8	.5212
6. Arm rigidity	46.9%	5	.5240
7. Moving hands together	81.2%	11	.3660
8. Communication inhibition	50.7%	7	.4296
9. Fly hallucination	21.7%	2	.3669
10. Eye catalepsy	47.3%	6	.4642
11. Post-hypnotic suggestion	20.8%	1	.2567
12. Amnesia	46.4%	4	.3222

In order to assess the reliability of the individual scale items, point-biserial correlations between the item and the total HGSHS:A score minus that item were calculated. Given the large number of subjects, an alpha value of 0.0005 was taken as an acceptable alpha criterion for item reliability. The corresponding reliability estimates (corrected item-total correlations) are also shown in table 5.4. All item-total correlations were significant at $p \leq 0.0005$ (one-tailed) except item 3, hand lowering, which was non-significant ($p = 0.029$). This would appear to suggest that hand lowering does not provide a valid index of an individual's responsivity to suggestions. However, in order to maximise the generalisability of the findings obtained here, this item will not be removed from HGSHS:A scores used in subsequent analyses. The overall reliability of the scale (co-efficient alpha) was .7109 which is acceptably high and comparable to previous estimates (e.g. Gwynn *et al*, 1988).

In order to assess the assertion that the HGSHS:A has a three factor structure corresponding to the distinction between ideo-motor, challenge and cognitive items, a principal components analysis with varimax rotation was performed on the individual HGSHS:A item scores. Bartlett's test of sphericity confirmed the factorability of the data-set, while the Kaiser-Meyer Olkin measure of sampling adequacy established the validity of the principal components analysis (KMO = .76912). Four factors with an Eigen value greater than 1 were extracted, accounting for 55.3% of the total variance. Table 5.5 presents the communalities and factor loadings of the variables, plus the Eigen values and percentage of variance accounted for by each of the factors. Examination of table 5.5 reveals that there is little evidence for the hypothesised distinction between

Table 5.5: Factor loading, communalities, Eigen values and percentages of variance for principal components extraction with varimax rotation on HGSHS:A data.

HGSHS Item	Factor 1	Factor 2	Factor 3	Factor 4	Communality
Head falling		.78409			.62665
Eye closure			.62947		.62857
Hand lowering					.59495
Arm immobilisation	.74370				.56075
Finger lock	.50208				.48354
Arm rigidity	.62610				.56933
Moving hands together		.71846			.56055
Communication inhibition			.69511		.60357
Fly hallucination					.37480
Eye catalepsy			.71357		.67087
Post-hypnotic suggestion				.80392	.65141
Amnesia	.51610				.31568
Eigen value	3.08	1.42	1.10	1.04	
% of variance accounted for	25.7	11.8	9.1	8.7	

Note: All factor loadings less than 0.50 have been omitted for ease of interpretation.

ideo-motor, challenge and cognitive suggestion items of interest here. Rather, it seems far more likely that the factor structure obtained here is a spurious one formed on the basis of item difficulty rather than any similarity in psychological mechanisms underlying the scale items. Factor 1, which accounts for 25.7% of the total variance, has relatively strong positive factor loadings for the arm immobilisation, finger lock, arm rigidity and amnesia items. Although the first three items are all of the challenge type, amnesia is clearly not, and the remaining challenge items (communication inhibition and eye catalepsy) also do not load on this factor. However, the four items correspond to the 3rd, 4th, 5th and 8th most difficult items on the HGSHS:A. Similarly, factor 2, which accounts for 11.8% of the total variance, comprises the 2nd and 4th easiest items on the scale (head falling and moving hands together respectively), while factor 3 (accounting for 9.1% of the variance) comprises the 6th, 7th and 10th most difficult items (eye catalepsy, communication inhibition and eye closure respectively). Factor 4, which accounts for 8.7% of the variance, has a relatively strong positive factor loading for the post-hypnotic suggestion (the most difficult item) only. Neither the hand lowering or fly hallucination items loaded strongly on any of the factors.

Regardless of the interpretation of the factor loading presented in table 5.5, the relatively low item communalities, factor loadings and total proportion of variance accounted for appear to indicate that the HGSHS:A does not possess a particularly robust factor structure in any case, at least in this sample. Accordingly, rather than separating the HGSHS into separate ideo-motor, challenge and cognitive factors the total HGSHS score will be used as the suggestibility measure for analysis in this thesis.

5.3.2 Main study analyses

In order to assess the predictions that suggesibility is positively related to a low level processing preference and negatively related to a high level processing preference, partial correlations (1 tailed) were calculated between each of the variables assessed. Social desirability was taken as a partial correlate in each case. Separate correlations were taken for the lab class and non-lab class sub-samples for the RVEI-RAT variable. The combined samples partial correlation matrix excluding the RVEI-RAT variable is presented in table 5.6. Partial correlations for the RVEI-RAT variable for both sub-samples are presented in table 5.7. Although, strictly speaking, Bonferroni corrected alpha values should be used where multiple correlations are being performed, in this context the precedent set by the majority of psychological research will be followed and an alpha value of 0.05 will be adopted for those correlations that have been predicted *a priori* i.e. those between hypnotic suggestibility, each of the putative low and high level processing preference measures, and the social desirability scale. Each of the remaining correlations will be assigned an alpha value of 0.0001.

Inspection of table 5.6 reveals that the HGSHS:A showed significant but very modest positive partial correlations with three of the four low level processing preference measures: the experiential scale of the RVEI (r = .2284; $p \leq 0.0001$), the elaborative episodic scale of the ILP (r = .1671; $p \leq 0.01$), and the right hemisphere scale of the HIPS (r = .1704; $p \leq 0.05$) as predicted. Inspection of the scatterplots for these correlations confirmed a linear relationship between the variables in each case. Contrary to prediction, the correlation between suggestibility and the elaborative self-actualising scale of the ILP was non-significant. The Pearson product-moment correlation between

Table 5.6: Partial correlation matrix showing full sample relationships between suggestibility and questionnaire variables after controlling for social desirability

N = 206	RVEI-EXP	HIPS-L	HIPS-R	HIPS-I	ILP-DS	ILP-DT	ILP-ES	ILP-EE
HIPS-L	-.2572**							
HIPS-R	.3466**	-.4262**						
HIPS-I	-.1247	-.4330**	-.6308**					
ILP-DS	.2177	-.2058	.0712	.1056				
ILP-DT	-.0100	-.0871	-.0326	.1072	.6174**			
ILP-ES	.4909**	-.2923**	-.2817**	-.0300	.1820	.0687		
ILP-EE	.1468	-.2331**	.2292**	-.0285	.5502**	.5075**	.2305**	
HGSHS	.2284**	-.0887	.1704*	-.0937	.0777	.0390	.1075	.1671*

* Significant at $p < 0.01$ ** Significant at $p < 0.0001$

KEY

HGSHS: Harvard Group Scale of Hypnotic Susceptibility; SDS: Social Desirability Scale; RVEI- EXP: Rational Versus Experiential Inventory - Experiential scale; HIPS: Human Information Processing Survey (L = Left hemisphere scale; R = Right hemisphere scale; I = Integrated scale); ILP: Inventory of Learning Processes (DS = Deep semantic scale; DT = Deep thinking scale; ES = Elaborative self-actualising scale; EE = Elaborative episodic scale).

Table 5.7: Partial correlations between RVEI-RAT and all other study variables for lab class and non-lab class sub-samples, taking social desirability as a partial correlate (for variable key see table 5.6)

	Sample	
Variable	Lab Class (n = 89)	Non-Lab Class (n =120)
RVEI-EXP	-.1978	-.0024
HIPS-L	-.0447	-.0142
HIPS-R	-.4269*	-.0531
HIPS-I	.4072*	.0695
ILP-DS	.5197*	.3471*
ILP-DT	.4205*	.4662*
ILP-ES	-.0731	-.0756
ILP-EE	.3980*	.2915
HGSHS:A	.0759	-.0480

* Significant at $p \leq 0.0001$

suggestibility and social desirability was also positive and significant as predicted ($r = .1776$; $p \leq 0.01$); confirmation of this relationship was provided by inspection of the scatterplot. However, no significant correlations were found between the HGSHS:A and any of the high level processing preference variables.

Of the remaining partial correlations for the combined sample, the experiential scale of the RVEI correlated significantly with both the left and right hemisphere sub-scales of the HIPS and the elaborative self-actualising scale of the ILP. The left hemisphere scale of the HIPS correlated significantly with the elaborative episodic and elaborative self-actualising scales of the ILP, while the right hemisphere scale correlated significantly with the elaborative self-actualising and elaborative episodic scales. The elaborative episodic scale also correlated significantly with all of the other ILP scales, as did the deep semantic and deep thinking scales, with the exception of the elaborative self-actualising scale in both cases. In addition, all three of the scales of the HIPS showed significant inter-correlations with one another. All of the remaining partial correlations were non-significant.

Regarding the partial correlations between the RVEI-RAT variables and the other study variables for lab and non-lab class sub-samples (see table 5.7), a number of differences were obtained. Whereas significant partial correlations with the RVEI-RAT variable were obtained for the ILP-DT and ILP-DS variables in both samples, only the lab class sample showed significant partial correlations between the RVEI-RAT and the HIPS-R, HIPS-I and ILP-EE variables. Such differences may be due to the increased endorsement of RVEI-RAT items in the non-lab class sub-sample. As no significant

Table 5.8: Means (and standard deviations) for high and low suggestibility groups on study variables.

Variable	Low suggestibles (n =49)	High suggestibles (n = 51)	Value of t
HGSHS:A	2.92 (1.30)	10.00 (1.06)	Not analysed
ILP-ES	18.33 (2.62)	19.25 (2.78)	-1.72*
ILP-EE	18.39 (2.76)	19.33 (3.04)	-1.63*
ILP-DS	18.22 (2.87)	18.76 (3.01)	-.92
ILP-DT	12.22 (3.89)	12.41 (3.74)	-.25
RVEI-EXP	13.22 (5.02)	16.33 (4.87)	-3.14***
RVEI-RAT	6.35 (5.48)	7.40 (6.04)	-.91
HIPS-L	10.47 (4.18)	10.59 (4.03)	-.14
HIPS-R	13.02 (4.81)	14.08 (5.16)	-1.06
HIPS-I	16.51 (4.94)	15.33 (4.08)	1.30
SDS	10.41 (4.84)	12.98 (4.88)	-2.64**

* Sig at $p \leq 0.05$ (one-tailed) ** Sig at $p \leq 0.005$ (one-tailed) *** Sig at $p \leq 0.001$ (one-tailed)

partial correlations were found between RVEI-RAT and HGSHS:A for either sub-sample, these differences will be ignored in this context.

As a further assessment of the relationship between processing predisposition and suggestibility, an interquartile split was performed on the HGSHS:A data. and groups of low (HGSHS:A ≤ 4) and highly (HGSHS:A ≥ 9) suggestible individuals were formed. The high suggestible group consisted of 12 males and 39 females while the low suggestible group consisted of 19 males and 30 females. Table 5.8 presents descriptive statistics for these two groups on each of the variables used in this study. In order to assess the differences between the high and low suggestible groups, independent t-tests were carried out on each of the variables (except suggestibility which will inevitably show a significant difference given group selection); t-values are also shown in table 5.8. Inspection of table 5.8 indicates that, with the exception of the HIPS-R, each of the variables previously showing significant correlations with the HGSHS:A (ILP-EE, RVEI-EXP, SDS) showed a significant difference between high and low suggestibles. Such a pattern of findings lends support to the observed relationships between the HGSHS:A and these measures although some doubt is cast on the relationship between suggestibility and the HIPS-R. In addition, the high and low suggestible groups also showed a significant difference on the ILP-ES, with high suggestibles scoring significantly higher than lows. Thus, although the correlation between the ILP-ES and the HGSHS:A was non-significant contrary to expectation, a comparison between high and low suggestibility groups clearly indicates that a relationship exists between suggestibility and low level processing preference as measured by the ILP-ES, in line

Table 5.9: Standard multiple regression of low level processing and social desirability variables on hypnotic suggestibility.

Variable	HGSHS (DV)	RVEI-EXP	ILP-EE	HIPS-R		B	β	sr^2 (unique)
RVEI-EXP	.2249					.0944*	.1803	.0284
ILP-EE	.1620	.1467				.1113	.1202	.0136
HIPS-R	.1402	.3429	.2287			.0435	.0785	.0051
SDS	.1776	.0005	-.0136	-.1448		.1030**	.1905	.0354
					Intercept	1.313		
	$R^2 = .1048^{\dagger}$		Adj. $R^2 = .0872$		$R = .3238^{***}$			

* Sig. at $p \leq 0.01$ ** Sig. at $p \leq 0.005$ *** Sig. at $p \leq 0.0005$

† Unique variability = .0825 ; shared variability = 0.0223

with prediction. Evidently, this relationship was obscured by the amount of irrelevant variation in suggestibility in the mid-range.

In order to address their independent contribution to variation in hypnotic suggestibility, the significantly correlated low level processing preference (i.e. RVEI-EXP, ILP-EE and HIPS-R) and social desirability variables were entered into a standard multiple regression with the HGSHS as the dependent variable. As the correlation between the ILP-ES and HGSHS:A was non-significant, the ILP-ES was not entered into the equation to preserve degrees of freedom. Table 5.9 shows the variable correlations[51], the unstandardised regression coefficients (B) and intercept, the standardised regression coefficients (β), the semi-partial correlations[52], R, R^2 and adjusted R^2. The multiple correlation coefficient R was significantly different from zero, $F_{(4,203)} = 5.94$, $p \leq 0.0005$, accounting for 10.48% of the variation in suggestibility. Inspection of table 5.9 reveals that only the RVEI-EXP and the social desirability scale accounted for a significant

[51] Correlation values refer to the Pearson product-moment correlation coefficient *r*, and not the partial correlations presented in table 5.6.

[52] The squared semi-partial correlation obtained here through multiple regression provides a better estimate of the importance of an independent variable than the partial correlation (presented in table 5.6) in most cases. This is because the squared semi-partial correlation only removes variance attributable to the nuisance variable (i.e. social desirability) in the IV and not the DV.

proportion of unique variance in suggestibility. The social desirability scale accounted for a unique 3.54% of the variance, $T_{(1,203)} = 2.834$, $p \leq 0.005$, making it the best predictor of suggestibility out of the variables used here. The experiential scale of the RVEI accounted for a unique 2.84% of the variance, $T_{(1,203)} = 2.539$, $p \leq 0.01$. Although non-significant, the ILP-EE accounted for a unique 1.36% of the variance, while the HIPS-R accounted for a unique 0.5%. The remaining 2.23% of the variance in suggestibility accounted for by the regression equation was shared amongst the four variables.

It is noteworthy that the unique proportion of variance in suggestibility (3.54%) accounted for by the social desirability scale is somewhat larger than the 3.15% that would be expected given the zero-order (i.e. unpartialled) correlation between the two (r = .1776). Such a finding appears to indicate the presence of a suppressor variable that is obscuring the relationship between the HGSHS and SDS, rendering the zero-order correlation between the two smaller than would be expected if no suppression were occurring. This was confirmed by a comparison of the beta weight for the social desirability variable and the correlation between social desirability and the HGSHS (see table 5.9). The negative correlations between the social desirability scale and the ILP-EE and HIPS-R (see table 5.9), all of which correlate significantly and positively with the HGSHS, suggest that one or both of the ILP-EE and HIPS-R variables are responsible for the suppression effect.

However, as the relationship between suppressor and suppressed variables is notoriously difficult to interpret adequately (see Darlington, 1968; Cohen & Cohen, 1983), and the magnitude of the suppression effect is small and non-significant (as assessed through calculation of the F ratio for the increase in sr^2), it will be not be investigated further in this context[53].

In order to assess whether the increase in predictive power of the regression equation provided by the inclusion of the RVEI-EXP, ILP-EE and HIPS-R variables after controlling for the effects of social desirability is statistically significant, a hierarchical regression entering social desirability in the first block and RVEI-EXP, ILP-EE and HIPS-R in the second block of the regression equation was performed. The increase in R^2 brought about by the inclusion of the three low level processing preference variables was 0.0733 which is significantly different from zero, $F_{(3,203)} = 5.541$, $p \leq 0.05$. Thus, it

[53] It should be borne in mind, however, that any improvement in predictive power of the regression equation brought about by inclusion of the remaining variables after prior entry of the social desirability variable will, in part, reflect the operation of this effect. This is true for the hierarchical regression analysis performed here.

can be concluded that 7.33% of the variation in suggestibility is accounted for by the three low level processing preference variables used here, after controlling for the effects of social desirability (although see footnote 54).

In order to assess the relative power of the ILP-EE, RVEI-EXP and HIPS-R variables at predicting suggestibility, a mixed standard-statistical regression was performed taking the HGSHS as the dependent variable[54]. Social desirability was entered in the first block of the regression equation as a covariate, while the three low level processing questionnaires were subject to step-wise entry in the second block of the regression. On the basis of this method of variable entry-order, the RVEI-EXP entered the regression equation first, bringing about an increase in R^2 of .05054, which is significantly different from zero, $F_{(1,204)} = 11.2896$, $p \leq 0.005$. The ILP-EE entered the regression equation next, bringing about an increase in R^2 of .01765, which is significantly different from zero, $F_{(1,204)} = 3.9994$, $p \leq 0.05$. At this point the regression terminated, leaving the HIPS-R out of the regression equation. Thus, on statistical grounds alone, the best low level predictors of suggestibility are the RVEI-EXP followed by the ILP-EE.

If the low level processing preference variables used in this study are measuring the same underlying construct, as one might predict from the conceptual background to each of the measures, one would expect a pattern of strong correlations between the variables. However, examination of the correlation matrix in table 5.6 reveals that this is not the case; although the correlations between the low level processing questionnaires used here are, in most cases, statistically significant, the magnitude of the correlation co-efficients are relatively small and suggest that different, but related, constructs underpin these measures. The lack of a common latent variable between these measures may have important methodological and conceptual implications for the understanding of low level processing preference and further analysis of this possibility seems appropriate. As such, an exploratory principal components analysis with varimax rotation was performed on the set of variables used in this study. An initial run of the analysis indicated the presence

[54] The significant positive inter-correlations between the ILP-EE, HIPS-R and RVEI-EXP supports the assertion that they are measuring related constructs, and validates their previous simultaneous entry into the regression equation as a functional set. No attempt has been made here to separate the three questionnaire scales (and their underlying constructs) as existing research is not sophisticated enough to identify how such a separation should be performed. Use of the standard-stepwise regression is therefore indicated.

Table 5.10: Factor loading, communalities, Eigen values and percentages of variance for principal components extraction with varimax rotation on questionnaire and suggestibility data.

Variables	Factor 1	Factor 2	Factor 3	Communalities
Harvard		.24656	.71901	.58144
HIPS-L		-.63357		.43187
HIPS-R		.74404		.55958
ILP-DS	.82076			.71851
ILP-DT	.83437			.71287
ILP-EE	.73522			.63699
ILP-ES		.71103		.51215
RVEI-EXP		.70931		.57183
RVEI-RAT	.73317			.62811
SDS			.77700	.65458
Eigen value	2.757	2.012	1.239	
% of variance accounted for	27.6	20.1	12.4	

Note: The loading of suggestibility on factor 2 has been included for illustrative purposes, despite being less than 0.50.

of singularity in the correlation matrix which was identified as resulting from the inclusion of the HIPS-I variable; accordingly, HIPS-I was dropped from the subsequent analysis. Bartlett's test of sphericity and the presence of several significant correlations within the correlation matrix confirmed the factorability of the data-set, while the Kaiser-Meyer Olkin measure of sampling adequacy established the validity of the principal components analysis (KMO = .71330). Three factors with an Eigen value greater than 1 were extracted, accounting for 60.1% of the total variance. Table 5.10 presents the communalities and factor loadings of the variables, plus the Eigen values and percentage of variance accounted for by each of the factors. Factor loadings of less than 0.50 have been omitted for ease of interpretation. An inspection of the pattern of factor loadings presented in table 5.10 suggests a tentative interpretation of the latent variables underlying the measures used in this study[55]. Factor 1, which accounts for 27.6% of the

[55]Any confidence in this interpretation must, however, be tempered by the relatively low communalities for a number of the variables entered into the analysis. In particular, the communality of 0.58144 for hypnotic susceptibility shows that only a relatively small proportion of the variance (58%) in susceptibility is accounted for by the three factors extracted here.

total variance, has strong positive loadings for the rational scale of the RVEI and the deep thinking, deep semantic and elaborative episodic scales of the ILP. With the exception of the ILP-EE scale, each of the remaining variables with strong loadings on factor 1 were included in this study as measures of a high level processing preference, suggesting that factor 1 corresponds to this latent variable. Factor 2, which accounts for 20.1% of the total variance, has strong positive loadings for the experiential scale of the RVEI, the right hemisphere scale of the HIPS and the elaborative self-actualising scale of the ILP. In addition, the left hemisphere scale of the HIPS shows a strong negative loading on factor 2.

Such a pattern of factor loadings suggests that factor 2 corresponds to the latent variable of low level processing preference. Thus, despite the low correlations between these variables, prinicipal components analysis appears to suggest that a single construct underlies each. It is worth noting that the loading of hypnotic suggestibility on this factor is a modest 0.24656. Factor 3, which accounts for 12.4% of the total variance, has strong loadings for only the social desirability and hypnotic suggestibility variables. Although the interpretation of factors with large loadings on only two variables can be somewhat speculative (see Tabachnick & Fidell, 1996), this finding appears to suggest that factor 3 represents a social desirability variable. However, it should be noted that only 30% and 40% of the variation in the hypnotic suggestibility and social desirability measures respectively is accounted for by factor 3. This would appear to suggest that, whatever the latent variable underlying factôr 3 may be, the social desirability scale is not a particularly good measure of it, underlining the tentative and speculative nature of the interpretation of this factor.

5.4 Discussion

Following principal components analysis of the HGSHS:A items, no evidence was found for the notion that the ideo-motor, cognitive and challenge suggestion items on the scale are subserved by distinct psychological mechanisms (cf. Peters *et al*, 1974; McConkey *et al*, 1980). Rather, it is apparent that the factor structure of the HGSHS:A, at least in this sample, is a spurious one reflecting differences in item difficulty that results from the use of principal components analysis on exclusively dichotomous variables (see e.g. Oakman & Woody, 1996). Accordingly, all reported correlations between suggestibility and the measures used in this study refer to the total HGSHS:A score.

The results obtained in this study provide partial support for the model of hypnosis outlined in chapter three. In support of the prediction that suggestibility is related to a low level processing preference, with social desirability controlled for the HGSHS:A (total score) correlated significantly and positively with the experiential scale of the RVEI, the right hemisphere scale of the HIPS and the the elaborative episodic scale of the ILP, all putative low level processing measures; however, the magnitude of these partial correlations was only very modest, ranging from .1671 to .2284. These correlation were all confirmed by analyses comparing high and low suggestibility quartiles. Contrary to prediction, no significant correlation was found between the HGSHS:A and the elaborative self-actualising scale of the ILP, which was also included in this study as a low level processing preference variable. However, a comparison of high and low suggestibility quartiles indicated that highs do actually score significantly higher on the ILP-ES than the lows

As predicted, a small but significant correlation between hypnotic suggestibility and social desirability was also found, supporting the sociocognitive assertion that high suggestibles have a need for positive self-presentation, and validating the inclusion of the social desirability variable as a partial correlate and covariate in this study.

Standard multiple regression analysis revealed that the best single predictor of HGSHS:A scores was the social desirability scale, followed by the experiential scale of the RVEI; neither the HIPS-R nor the ILP-EE predicted unique proportions of the variance in suggestibility. Hierarchical regression analysis revealed that the RVEI-EXP, HIPS-R and ILP-EE taken together significantly improved the predictive power of the regression equation after controlling for the effects of social desirability, accounting for a further 7.33% of the variation in suggestibility. However, the existence of a suppression effect indicated that the observed relationship between social desirability and the HGSHS:A was smaller than would be expected if no suppression were occurring; as such, a small (and non-significant) proportion of the increase in predictive power of the regression equation provided by the low level processing preference variables is attributable to social desirability also.

Thus, while there does appear to be some support for the notion that suggestibility is related to a low level processing predisposition, this support is not particularly strong. Nevertheless, although the proportion of variance in suggestibility accounted for by the low level processing preference questionnaires is relatively small, such a finding is not uncommon within hypnosis research generally, where the relationship between suggestibility and other personality or cognitive individual difference dimensions has been assessed. In addition, the large sample size obtained in this study suggests that this finding is quite robust.

No evidence was found for the hypothesis that suggestibility is negatively related to a high level processing preference: none of the high level processing preference variables (i.e. RVEI-RAT, HIPS-L, ILP-DS, ILP-DT) correlated significantly with suggestibility in this study. Such a finding clearly indicates that an empirical, as well as a conceptual, dissociation can be drawn between high and low level processing: rather than the two types of processing representing opposite ends of a cognitive continuum, the two appear to be discrete entities in their own right (cf. Epstein, 1995). The pattern of findings obtained in this study suggest that it is lower level rather than higher level processing (at least addressed by self-report) that is of importance in understanding the nature of suggestibility, a finding with potentially important theoretical implications.

The question remains as to why the experiential scale of the RVEI, the elaborative episodic scale of the ILP, and the right hemisphere scale of the HIPS all correlated significantly with suggestibility but not the elaborative self-actualising scale of the ILP. The fact that high and low suggestibility quartiles differ significantly on the ILP-ES seems to suggest that mid-range suggestibility scores are subject to greater irrelevant variation than those at the extremes and this obscures any relationship between the HGSHS and the ILP-ES. Nevertheless, this does not explain why the other low level processing scales should correlate significantly with the HGSHS and not the ILP-ES, unless the relationship between the latter is simply weaker than that between the former. This is certainly a possibility but why this should be the case is not clear, particularly given the strong correlations between the ILP-ES and the remaining low level processing predisposition questionnaires and their common factor loadings in the prinicipal components analysis. Clearly, more research is required before an answer to this question can be offered.

The preceding discussion highlights one of the central problems encountered in the present study. The questionnaires employed here were selected because they have all been cited as capturing in some way the distinction between, on the one hand, lower level, intuitive or holistic cognitive processes, and on the other higher level or analytical cognitive processes. However, despite the fact that on a descriptive level the similarities between the different research traditions embraced here are considerable, this distinction is often conceived quite differently from one area to the next. Although ego-psychological theory, for example, groups together emotion, intuition, holism and imagery within a common rubric labelled primary processing, the relationships between these constructs are more of a conceptual assumption than any kind of established empirical fact. This assumption has also been made here and the findings obtained in this study highlight the potential dangers of such a practice.

A second problem with the present study, and indeed all of the studies reported in this thesis, is the degree of measurement error associated with suggestibility testing. Although the Harvard group scale is generally regarded as a reliable and valid measure of suggestibility in an hypnotic context, suggestibility scores obtained through its use are subject to several significant sources of irrelevant variation, at least in this context. For example, subjects who have negative attitudes towards hypnosis are likely to have low suggestibility scores regardless of how suggestible they actually are (de Groh, 1989). In addition, the fact that suggestibility was measured here in several groups of differing size may be an additional source of measurement error; for example, those individuals tested in large groups may have been subject to greater social pressures than those tested in small groups (or vice versa), and their subsequent suggestibility scores may reflect these differences. Unfortunately, in the present context there is little that can be done to overcome these differences after-the-fact; future research involving the measurement of suggestibility should, nevertheless, take these points into account.

A third problem with the present study is that it uses only self-report measures of processing preference. While such measures may be able to provide information concerning an individual's perceived processing preferences, whether or not the individual's *actual* cognitive predilections and their perceptions of them correspond in a meaningful way is something of a moot point. Moreover, self-report instruments are notoriously sensitive to individual differences in response bias, the interpretation of questions, and, perhaps most importantly, perceptions of the questions' relevance to the study in hand. It is, for example, conceivable that the observed relationships between suggestibility and the low level processing measures have arisen through subjects' beliefs about the relationship of cognitive style to hypnotic suggestibility. It is possible that subjects believe that highly suggestible individuals will be those who are more in touch with their emotions and intuitions that those who are less suggestible, with such beliefs influencing subjects' subsequent responses on the questionnaires, suggestibility test or both. Future questionnaire research in the field would be well advised to present the non-hypnotic measures in an entirely non-hypnotic context (cf. Laurence, 1997), thereby preventing any such effects from occurring. Alternatively, measures which are not so transparent in what they are measuring (and how) should be used (see e.g. Dixon & Laurence, 1992b). In the next chapter, a study investigating the relationship between suggestibility and processing preference which takes this particular approach will be described. In addition, the study described in the next chapter utilises more objective behavioural measures of processing style, thereby insulating itself from the criticisms of self-report measures as outlined above.

CHAPTER 6: Empirical study 2

The relationship between hypnotic suggestibility and some behavioural measures of processing preference and ability

6.1 Introduction

In chapter five an empirical study assessing the prediction that hypnotic suggestibility is positively related to a low level processing propensity and negatively related to a high level processing propensity was described. In that study, moderate support for the theory of suggestibility outlined in chapter three was obtained in the form of significant correlations between suggestibility and three of the four putative low level processing scales used. In contrast, no evidence was found in support of the hypothesis that suggestibility is negatively related to a high level processing preference. One of the central problems with empirical study one, however, is that it employed only self-report measures of higher and lower level processing propensity. While such measures may be able to provide an index of the individual's *perceived* processing styles and propensities, they do not offer a way of objectively assessing how the individual actually processes information and the types of cognitive biases or predilections that may influence the nature of this process. In addition, the amount of uncontrolled variance associated with self-report measures is also likely to be relatively high, due to subjective differences in the interpretation of questions and the individual's beliefs about what an appropriate response might be.

In this chapter a second empirical study assessing the prediction that hypnotic suggestibility is positively related to a low level processing propensity and negatively related to a high level processing propensity will be described. In this study, however, only objective behavioural measures of processing preference and ability were used, thereby circumventing some of the problems associated with empirical study one, and, in so doing, extending the research base concerning the relationship between suggestibility and processing preference and ability.

6.1.1 Perceptual integrality and separability

The concept of higher and lower level 'modes' of processing which is central to the model of the cognitive system presented in chapter two is largely based on research and theory concerning the perception and categorisation of multidimensional stimuli. As discussed in chapter two, this line of research has demonstrated that multidimensional stimuli may be perceived and categorised in two different ways, depending on the nature of the dimensions in question, the processing circumstances of the time and the cognitive characteristics of the perceiving individual. On the one hand, a multidimensional stimulus may be perceived as an integrated perceptual unit with categorisation of that stimulus being based on its overall similarity or 'family resemblance' to other stimuli. Such an 'integral' mode of perceiving is regarded as being fundamental and basic to human cognition, acting as a default or fallback mode of processing when resources are scarce through situational or developmental constraints. On the other hand, a multidimensional stimulus may be perceived analytically as a combination of individual dimensions with its categorisation being based on relative dimensional values. Such 'separable' perception is regarded as a sophisticated mode of processing requiring higher level resources and a certain degree of developmental maturity. Although described as separate, purely integral and separable perception are typically viewed as opposite ends of a processing continuum, with the predominant mode at any one time varying according to a number of situational and individual factors (L.B. Smith & Kilroy, 1979; Foard & Kemler Nelson, 1984).

According to the model described in chapter three, hypnosis represents one situation where the individual is biased towards lower level processing for the control of behaviour; by this view, such a processing bias is responsible for the increased suggestibility observed during hypnosis. Following this account, suggestibility is related to the degree to which the individual relies on lower level processing for the control of behaviour in everyday life. Accordingly, one would expect highly suggestible individuals to display a predisposition towards integral perception, while their low suggestible counter-parts would show a preference for more separable perceptual processing. The most obvious, and the most valid, way of evaluating this prediction is to assess the relationship between suggestibility and some of the measures that have been used in research concerning perceptual integrality and separability. As the distinction between integral and separable perception is based on a set of converging operations (see Garner, 1974) there is no shortage of measures by which this might be done.

Possibly the most commonly used measure within research investigating perceptual integrality and separability is the triad classification task described in chapter two; as such it was included as a measure in this study also. In this task, subjects are presented with three stimuli that vary on two dimensions (see figure 6.1), such that two of the stimuli are identical on one dimension but very different on the other (pair A), and

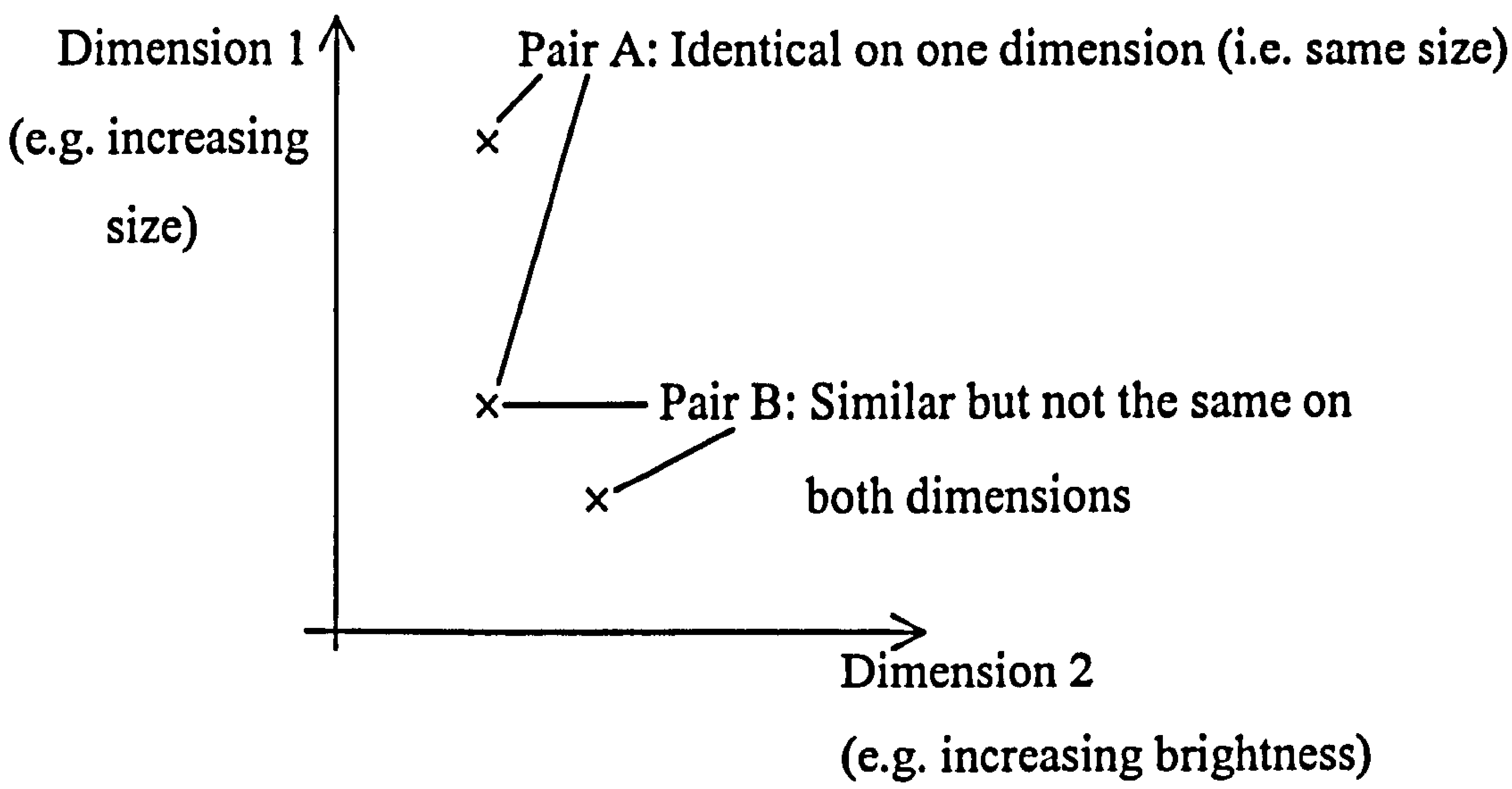

Figure 6.1: Schematic figure showing relationships between three hypothetical stimuli varying on two dimensions.

two of the stimuli have similar but not identical values on both of the dimensions (pair B); the third pairing have completely different values on both dimensions. The subject's task is to identify which two of the three stimuli 'go together the best'. An integral (i.e. lower level) response has been made if pair A is selected while a separable (i.e. higher level) response has been made is pair B is selected. If suggestibility is related to a lower level processing predisposition one would expect a significant positive correlation between suggestibility and the proportion of integral responses made on this task.

As we have seen, integral and separable processing are regarded as opposite ends of a continuum of sophistication with separable processing being effectively more difficult than its integral counter-part. The triad classification task offers only an index of the individual's preferred processing mode, however, and cannot tell us anything about their perceptual capabilities (J.D. Smith & Baron, 1981). It is conceivable that if high suggestibles have a low level processing predisposition it is because they are relatively incapable of higher level processing, rather than just preferring to process in that mode. As this inability will not reveal itself on the triad classification task, a second measure sensitive to such differences was included here to assess this possibility.

When an individual is asked to rapidly sort two-dimensional stimuli on the basis of only one of the dimensions, it has been shown that the speed and accuracy with which the subject is able to do this is affected by the nature of the dimensions in question (see Garner, 1974). In the case of separable stimuli, for example, variation on the irrelevant dimension tends not to affect how well the individual is able to sort on the basis of the relevant dimension. In the case of integral stimuli, however, the individual's sorting performance is adversely affected by variation on the irrelevant dimension; the assessment of such 'interference' effects by perceptual filtering tasks of this sort represents one of the original set of converging operations identified by Garner (1974) as defining the difference between integral and separable stimuli. The degree to which irrelevant variation affects the speed and accuracy of sorting is not just a function of the stimulus dimensions themselves, however, but also varies according to the individual's ability to ignore the irrelevant dimension. Such perceptual filtering tasks therefore represent one way by which an individual's ability to engage in higher level (i.e. separable) processing can be assessed; accordingly, a task of this sort was included here. If hypnotic suggestibility is related to a low level processing predisposition brought about by an inability to engage in higher level processing then one would predict that suggestibility will be positively related to the degree to which the interference effect is displayed on the perceptual filtering task.

In addition to the triad classification and perceptual filtering tasks described above, a number of other measures were included in this study. Each of these measures was selected on the basis of its relationship to the higher/lower level distinction and will therefore hopefully provide further information concerning the hypothesised relationship between processing mode and hypnotic suggestibility outlined in chapters three and four.

6.1.2 Reflection-impulsivity

In addition to research concerning perceptual integrality and separability, the distinction between higher and lower level modes of processing advanced here was derived from the literature concerning the cognitive style dimension of reflection-impulsivity (RI; Kagan *et al,* 1964). As was discussed in chapter two, research concerning RI has revealed that an impulsive cognitive style is characterised by a fast, holistic and error-prone response pattern in decision making situations involving high response uncertainty. In contrast, reflective individuals exhibit a more analytical, slow and accurate response pattern compared to impulsives. According to the model presented in chapter two, a reflective cognitive style is associated with higher level processing whereas an impulsive cognitive style is associated with lower level processing.

The most common way of assessing RI is through the use of the Matching Familiar Figures Test (MFFT; Kagan *et al*, 1965; Kagan, 1965); accordingly, the MFFT was included as a measure in this study. In the MFFT, the individual is presented with four, six or eight (according to age) variations of a relatively complex figure, and the task is to pick which variant exactly matches a target figure. A reflective strategy is evidenced by long response latencies and few errors on the tasks, while an impulsive strategy is evidenced by short response latencies and large numbers of errors. Following the hypotheses outlined in chapter four, one would predict that highly suggestible individuals will display a more impulsive cognitive style (quick, error-prone) than less suggestible individuals who will display a more reflective (slow and accurate) cognitive style.

6.1.3 Higher level reasoning

According to the model of the cognitive system developed in chapter two, higher level systems tend to calculate appropriate responses in novel situations by the controlled analysis and manipulation of information according to abstract rules. If highly suggestible individuals possess a propensity towards lower level processing that is a result of their relative inability to engage in effective higher level processing, then one might expect a significant negative correlation between suggestibility and measures designed to assess such rule-based reasoning abilities. Accordingly, two rule-based reasoning measures were included in the present study: a syllogistic reasoning task and Raven's (1965) Advanced Progressive Matrices.

Syllogistic reasoning tasks represent one of the most commonly used instruments for the assessment of rule-based reasoning processes within the laboratory (Johson-Laird & Byrne, 1991). A typical syllogism requires the individual to arrive at a logical deduction on the basis of information provided in two initial premises; Alesandrini, Wittrock and Langstaff (1984) have described such tasks as measures of verbal analytic ability. In contrast, Raven's (1965) Advanced Progressive Matrices requires the use of analytical and deductive rules to solve complex problems involving illustrations rather than language. As such, it was included here as a measure of non-verbal rule-based reasoning performance. If hypnotic suggestibility is associated with a relative inability to carry out rule-based reasoning tasks then one would expect a significant negative correlation between suggestibility and both the syllogistic reasoning and Raven's matrices measures.

6.2 Method

6.2.1 Subjects

Subjects were 81[56] graduate and undergraduate students from University College London, of which 21 were male and 60 were female. Mean age was 23.35 years (s.d. 5.95 years; range 18 - 48 years). Of the 81 subjects, 74 had completed both the HGSHS:A and the questionnaires used in empirical study 1, while the remaining 7 had completed only the HGSHS:A. All subjects were volunteers who were contacted following their participation in the HGSHS:A; each received £5 for taking part. Informed consent was obtained from all subjects.

6.2.2 Materials

Following the recommendations of study one, social desirability was included as a partial correlate in all analyses performed here. For details of hypnotic suggestibility and social desirability measurement see section 5.2.2.

Filtering task: The perceptual filtering task used here follows the methodology employed by J.D. Smith and Baron (1981) and uses lines of varying size and angle. Three sets of filtering cards were constructed, two control sets, one for angles (where angle varies but size is kept constant), and one for size (where size varies but angle is kept constant), and an interference set where size and angle both vary together. The control angle (CA) set consisted of 24 cards each with a 2.54cm (1 inch) line drawn in a 1mm black pen in the middle of the card. For 12 of the cards, the line was drawn at 50° to the horizontal; for the remaining 12 cards the line was drawn at 65° to the horizontal. The control (CS) size set consisted of 24 cards each with lines drawn at 50° to the horizontal in the centre of the cards in a 1mm black pen. For 12 of the cards, the line was 2.2cm in length; for the remaining 12 cards the line was 2.5cm in length. The interference (IF) set consisted of 24 cards, 12 with 2.5 cm lines (6 each at 50° and 65° to the horizontal), and 12 with 2.2cm lines (6 each at 50° and 65°).

Subjects were given a set of cards and asked to sort them, as quickly but with as few errors as possible, into two piles. For the CA and CS sets, subjects were asked to sort the cards into piles of small and large angles and short and long lines respectively. For the IF set, subjects were asked to sort into small and large angles or short and long lines

[56] It was originally hoped that considerably more participants could be obtained for this study (i.e. 120 or more) to make certain multivariate analyses (e.g. factor analysis) possible. Unfortunately, however, only 81 participants could be persuaded to take part, despite the best efforts of the experimenter.

depending on the particular instructions given. An interference effect is evidenced by a difference in sorting time between the control and interference sets; thus, a subject exhibiting an interference effect for the size dimension would sort the CS set significantly faster than the IF set with size instructions.

The interference effect is most reliably studied at sorting time asymptote (Kemler Nelson, 1996, personal communication). For this reason, subjects were required to make 20 sorts in all, 10 for size categorisation and 10 for angle. This procedure differed slightly from that of Smith and Baron (1981) in that those investigators used 12 sorts for each primary dimension, making 24 sorts in all. It was decided that 20 sorts would be used in this context on the basis of pilot work using five undergraduate subjects which indicated that (a) 24 sorts was not necessary to achieve asymptotic performance on this task; and (b) subjects quickly lose motivation on the task with this effect increasing dramatically over sorts. As such, 20 was regarded as a suitable number of sorts to achieve a suitable balance between performance and motivation. The order of sorting dimensions was counter-balanced across subjects. Within each 10 sorts, subjects alternate between control and interference sets completing 5 sorts with each. If the subject was alternating with the CS set, they were instructed to sort into different lengths with the IF set; if they were alternating with the CA set they were instructed to sort into different angles with the IF set. The alternation between control and interference sets was also counter-balanced across subjects. In order to remove the possible influence of practice effects, the first four sorts within each dimension were timed but not included in the analysis. Subjects received feedback concerning the number of errors they made for the non-practice sorts only. The average length of time taken to sort the control and interference packs (ignoring practice times) for each dimension was recorded, as well as the average number of errors made on each. Calculation of the magnitude of interference effects on the basis of this data will be addressed in the results section.

All subjects received the standardised instructions included in appendix II, which were read verbatim by the experimenter.

Triad classification stimuli: As triad classification data from this study will be used for comparison purposes in a subsequent within subjects design study with two further conditions, three sets of triad stimuli (sets A, B and C) were constructed. Although practice effects in the triad classification paradigm are fairly uncommon (Kemler-Nelson, 1996, personal communication), it was felt that the potential damage that such effects might cause was sufficiently high to justify the use of alternate sets in this

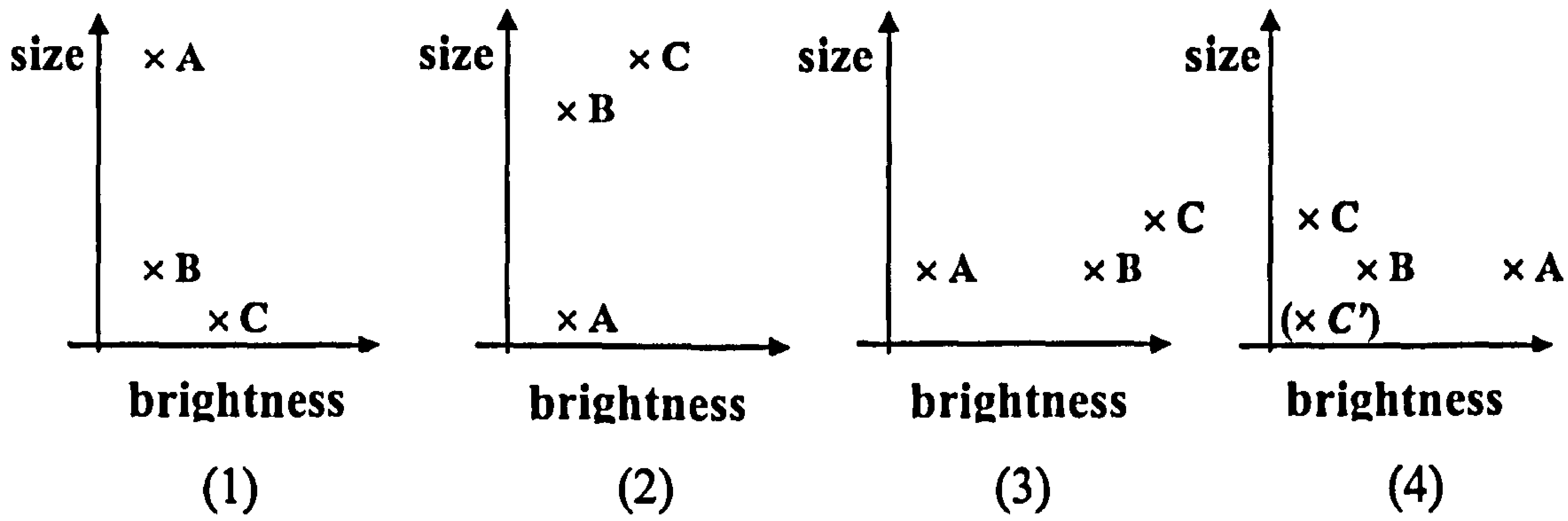

Figure 6.2: The four basic stimulus triad forms; x and y correspond to the two stimulus dimensions in question (e.g. size and brightness). N.B. In each case, the position of stimulus C can be on either side of stimulus B, as long as it is no nearer stimulus A (see *C'* in diagram 4).

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context. In order to secure the validity of such a procedure, a concerted effort has been made to ensure that the alternate sets are equivalent in every way possible (see below). In addition, possible significant differences between the sets will be assessed, and, if necessary, separate analyses will be conducted for different triad sets.

Each set consisted of thirty triads conforming to the general structures shown in figure 6.2, ten each from the three dimensional combinations of (i) size and brightness; (ii) colour and form; and (iii) angle and length. Each of these dimensional combinations has previously been shown to yield different levels of separable responding on a response continuum from integral to separable (e.g. Torgerson, 1958; Shepard, 1964; L.B. Smith & Kemler, 1978; L.B. Smith & Kilroy, 1979; Foard, 1979); all three combinations were included to maximise the possibility of identifying possible individual and situational differences in triad classification.

Following J.D. Smith and Kemler Nelson (1988), a 5 × 5 stimulus space[57] was drawn for the dimensional combination of size[58] and brightness (i.e. shade of grey). The five values of size were 1, 1¼, 1½, 1¾ and 2 inches. The five values of brightness corresponded to the Colaraid achromatic paper values of 1, 2, 4, 5 and 7, ranging from almost white to almost black; pilot data from five undergraduates demonstrated that subjects are able to correctly order the colours in terms of brightness, validating the selection (cf. L.B. Smith & Kemler, 1978). Thus, there were 25 different stimulus

[57] In this context, a 'stimulus space' simply corresponds to a graph with axes corresponding to the particular dimensions in question (see e.g. figures 2.2, 6.1 and 6.2). Thus, a 5 × 5 stimulus space for size and brightness has one axis for size comprising 5 values and one axis for brightness comprising 5 values.

[58] The term size refers to the length of the side of a square.

squares of systematically varying form (e.g. squares of side 1 inch with brightness values of 1, 2, 4, 5 and 7, squares of side 1¼ inches with brightness values of 1, 2, 4 ,5 and 7 etc). Sampling both dimensions equally and completely yields 32 possible triads of squares conforming to the general structures in figure 6.2, 16 for each primary dimension (i.e. the dimension on which two of the squares, A and B, share a value). Of these 32 possible triads, two were randomly selected (one for each primary dimension) and discarded, leaving 30 triads. These 30 triads (consisting of 30 × 3 squares cut from the appropriate Coloraid papers) were mounted on the central vertical axis of white cards of width 11½ cm and length 20cm, such that the top and bottom squares were 1.5cm from the top and bottom edges of the card respectively; the centre square was placed equidistant between the top and bottom squares. The positions of the squares that would yield separable (i.e. A and B), integral (i.e. B and C) or haphazard classifications (i.e. A and C) was counter-balanced according to a latin squares design.

A 6 × 6 stimulus space was drawn for the dimensional combination of colour and form[59]. The six values of colour ranged from yellow to red and corresponded to the Coloraid paper values of Y, Yw, Yo, O, Ro, Rw; pilot data on five undergraduates indicated that subjects are able to correctly order the colours supporting the system used here. The six heights which provide the basis for variations in triangular form were 3/4, 7/8, 1, 1 3/8, 1 5/8 and 2 inches. Thus, there are 36 stimulus triangles of systematically varying colour and form. Sampling both dimensions equally and completely yields 40 possible triads of triangles conforming to the general structures in figure 6.2, 20 for each primary dimension. Of these 40 possible triads, 10 were pseudo-randomly selected (5 for each primary dimension: 1 from each triad form, plus one extra) and discarded, leaving 30 triads. These 30 triads (consisting of 30 ×3 triangles cut from the appropriate Coloraid papers) were mounted on the central vertical axis of white cards of width 11½ cm and length 20cm, such that the uppermost point of the top triangle and the base of the bottom triangle were 2cm from the top and bottom edges of the card respectively; the centre triangle was placed equidistant between the top and bottom triangles. The positions of the squares that would yield separable, integral or haphazard classifications was counter-balanced according to a latin squares design.

Following J.D. Smith and Baron (1981), an 8 × 8 stimulus space was drawn for the dimensional combination of angle[60] and length. The eight values of angle were 20°, 25°,

[59] Form refers to the shape of a triangle of constant area which varies according to triangle height.

[60] Angle refers to the angle of the line as measured from the horizontal.

30°, 35°, 40°, 45°, 50° and 55°. The eight values of length were 1.7, 1.9, 2.2, 2.5, 2.9, 3.3., 3.8 and 4.3cm. Thus, there are 64 stimulus lines of systematically varying angle and length. Sampling both dimensions equally and completely yields 56 possible triads of lines conforming to the general structures in figure 6.2, 28 for each primary dimension. Of these 56 possible triads, 26 were pseudo-randomly selected (13 for each primary dimension: 3 from each triad form, plus one extra) and discarded, leaving 30 triads. These 30 triads were drawn with a 1mm black pen on the central vertical axis of white cards of width 11½ cm and length 20cm, such that the lower end of the top and bottom lines were 5cm from the top and bottom edge of the card respectively; the centre line was placed equidistant between the top and bottom lines. The positions of the lines that would yield separable, integral or haphazard classifications was counter-balanced according to a latin squares design.

The 90 triad cards were pseudo-randomly divided into three sets (A, B and C) of thirty cards, such that each set had ten cards from each type of dimensional combination. The 30 cards within each set were then randomly ordered to produce the final set versions. Presentation of set was counter-balanced across subjects for this study. For each subject, the proportion of similarity-based responses for each of the dimensional combinations was calculated, with each score having a possible range from 0 to 1.

All subjects received the instructions included in appendix III, which were read verbatim by the experimenter.

Raven Advanced Progressive Matrices Test (RPMT): There are four main versions of the RPMT, the simpler Standard Progressive Matrices Test and Coloured Progressive Matrices Test, and the more complex Raven Advanced Progressive Matrices, sets I and II. The simpler versions of the RPMT are typically used as measures of intellectual capacity within the general population, while the high mean and low standard deviation of intelligence within college populations requires the use of the more difficult advanced matrices tests to provide the necessary discriminative power (Raven, 1965). Of the advanced tests, set I consists of 12 problems and typically takes less than 10 minutes to complete; in contrast, set II consists of 36 problems and usually takes 30-40 minutes to complete. Although set II, which has a greater proportion of more difficult items, has greater discriminative power than set I (see Hunt, 1974; Carpenter, Just & Shell, 1997), it was decided that the shorter and more practical set I would be used here given the relatively large number of tests involved in this study.

The Raven Advanced Progressive Matrices Test Set I consists of 12 problems conforming to a similar presentation format. Each problem consists of a 3 × 3 matrix of elements of which the bottom right-hand element is missing. Based on the nature and organisation of the elements in the completed part of the matrix, the subject must determine which of the eight possible alternatives represents the missing element. In order to be able to do this, the subject must analyse the matrix and induce the set of rules which governs the organisation of the elements within it. Subjects score one point for each problem correctly solved giving a possible range of total scores from 0 to 12.

Although both overall score and average time per problem are normally measured in the Advanced Matrices test, in this context it was decided that only score data would be collected. Despite the fact that response time data is important in determining an individual's intelligence level as measured by the test, in this context it is the general capacity to solve abstract reasoning problems which is of interest, and not how quickly those problems are solved. Given that a demand to respond quickly might increase the probability of impulsive responding on the test (i.e. saying the first answer that comes to mind) and thus artificially increase error rates, it was felt that such an alteration to the original testing format was justified.

All subjects received the instructions included in appendix IV, which were read verbatim by the experimenter. In order to reduce any loss of motivation that might result from incorrect responding, subjects were not given feedback concerning the accuracy of their answers.

Matching Familiar Figures Test (MFFT; Kagan, 1965): The MFFT was devised as a measure of the cognitive style dimension of reflection-impulsivity (Kagan, 1965). In the MFFT, subjects are presented with a simple line drawing of a familiar figure on the top page of an 8½ × 11-inch loose-leaf notebook. On the bottom page, eight very similar simple line drawings are presented, only one of which is identical to the top figure; each of the remaining drawings differs from the top figure in a subtle yet discernible fashion. The subject's task it to identify the identical figure as quickly as they can, but making as few errors as possible. There are twelve items in all, preceded by two practice figures with only six response alternatives. The experimenter measures the time from the initial presentation of the item to the subject's first response, with the average first response time across all twelve items being taken as the overall latency score. The experimenter also counts the number of errors (if any) that the subject makes on each item, with the average number of errors across all twelve items being taken as the overall error score.

In research using the MFFT (e.g. Smith & Kemler-Nelson, 1988), latency and error rates are used to classify subjects on the reflection-impulsivity cognitive style dimension. Subjects who score above the median latency and below the median error rate are classified as reflectives; subjects who score below the median latency and above the median error rate are classified as impulsives. In order to assess the possibility that reflective and impulsive cognitive styles are associated with suggestibility, a chi-squared analysis based on this double median split procedure will be performed here. In this analysis one would expect to find significantly more high suggestible subjects falling into the impulsive cell (as defined by the double-median split) than low suggestibles, with the converse being true for the reflective cell. In addition, the individual time and error scores for the MFFT will also be included as correlates in the analyses performed here. By preserving the richness of the MFFT data, the inclusion of these variables allows a greater understanding of the relationship between cognitive style and suggestibility. In this analysis one would predict a significant negative correlation between suggestibility and time scores on the MFFT (i.e. high suggestibles are quicker on the MFFT than low suggestibles, indicating an impulsive cognitive style), and a significant positive correlation between suggestibility and MFFT errors (i.e. high suggestibles make more errors than lows, also indicating an impulsive cognitive style). Subjects received the standard instructions (see appendix V) for the task which were read verbatim by the experimenter.

Syllogistic reasoning task: Although syllogistic reasoning is well studied within cognitive psychological research, there are no standardised syllogistic reasoning tasks available within the literature. As such, it is common for investigators interested in syllogistic reasoning to construct their own tasks, based on the existing literature, and in accordance with the particular factors under scrutiny. This approach was adopted here.

A syllogistic reasoning task comprising 15 different syllogisms was constructed (see appendix VI). These syllogisms were pseudo-randomly selected from the list of 27 possible syllogisms with valid conclusions (i.e. with a correct answer) provided by Johnson-Laird and Byrne (1991) to capture a range of difficulty levels, as assessed by the proportion of subjects providing correct answers to the syllogisms in previous research. The choice of 15 items was semi-arbitrary, though based on pilot work suggesting that 15 items yielded an adequate range of scores but did not take an impractical amount of time to complete (approximately 10-15 minutes). The 15 items were presented in a response booklet with 5 items to a page, with room to write an answer beneath each syllogism. Each item consisted of two premises (e.g. *All painters are teachers* and *Some painters are not cyclists*) and subjects were asked to state what could be logically concluded on the basis of those premises (in this case the only valid conclusion is *Some teachers are not cyclists*). It was decided that subjects should be required to provide their own responses to the syllogisms rather than respond to a set of multiple choice options as has often been the case in previous research. It is possible that the latter format may allow subjects to complete the syllogisms without making any inferences, whereas the alternative format cannot. Subjects scored one point for each problem correctly solved giving a possible range of total scores from 0 to 15.

All subjects received the instructions included in appendix VII, which were written on the front page of the response booklet for the task.

Mood measures: In addition to the cognitive measures used in this study it was decided that state measures of happiness and relaxation would be included. Happiness was included as a mood variable because it has been shown to have a significant effect on reasoning performance which is under scrutiny in this study (e.g. Oaksford, Morris, Grainger, Williams & Mark, 1996). Using happiness as a partial correlate for syllogistic reasoning and Raven's matrices scores will hopefully provide a picture of performance on these tasks that is undistorted by relevant mood variations. Relaxation was included as a mood variable because a relaxed attitude has been shown to significantly affect triad classification performance (e.g. Ward, Foley & Cole, 1986). In addition, relaxation was included because of its potential relevance to study 3 which includes scores on the triad classification and filtering tasks obtained here as a baseline measure of performance on these tasks. Using a relaxation measure as a covariate in study 3 may serve to eliminate any differences in performance across conditions that are simply the product of relaxation and not hypnosis *per se*.

Both mood/state variables were measured using visual analogue scales (see appendix VIII) comprising lines 138mm in length[61] with anchors of 'As unhappy/unrelaxed as I can be' and 'As happy/relaxed as I can be'. Subjects were presented with the scales and the statement 'At this moment in time, how happy/relaxed do you feel? Please indicate on the line below'.

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[61] In line with tradition, the VAS employed here was originally constructed using a length of 100mm. However, as a result of a change in word processing software, the length of the VAS was inadvertently increased to 138mm, an increase that was not noticed until a number of subjects had already been assessed. As the actual length of the VAS is arbitrary unless one wishes to compare across studies, this was not considered a problem in this context.

6.2.3 Design and procedure

This study followed a basic correlational design. Upon entering the experimental situation, subjects were thanked for their interest in the study and given a brief description of what would take place during the session. They were informed that the study was an investigation into the relationship between thinking style and hypnotic suggestibility and that they would receive five tasks designed to assess their style of thinking. Subjects were reassured that the purpose of the study was not to assess the relationship between intelligence and hypnotic suggestibility, and that their responses on each of the tests would be kept strictly confidential. Answers to any questions were then provided and consent forms were completed by each of the subjects, followed by the mood rating scales. Subjects then completed the triad classification and filtering tasks in that order. These tasks were presented first to enable comparison with other experimental conditions in study 3 where Raven's matrices, the MFFT and the syllogistic reasoning test were not included. The triad classification task was presented prior to the filtering task for all subjects because of pilot work indicating that subjects tend to respond more quickly on the classification task when it is preceded by filtering than when it is not. Rapid responding on free classification tasks has been shown to produce an abnormal number of similarity based responses across subjects (J.D. Smith & Kemler Nelson, 1984); such an effect might increase the likelihood of ceiling effects for similarity classification, thereby reducing the probability of observing possible task motivated and individual differences in classification performance.

After completing the triad classification and filtering tasks, subjects completed Raven's matrices, the syllogistic reasoning task and the MFFT. The order of presentation of these tests was counter-balanced across subjects according to a latin squares design. Following completion of the tasks, which in total took approximately one hour, subjects received payment and thanks for their participation. It was decided that subject debriefing was inappropriate in this context because many of the subjects would be required for participation in subsequent studies where subject naivete may be an important factor.

Finally, a note about blind-testing is in order. Obviously, every possible effort was made to ensure that the experimenter was blind to the suggestibility scores of the subjects participating in this study. While this was relatively easy in the early stages of subject testing, towards the latter stages this became more difficult to achieve with complete satisfaction. As participation in the present study was a prerequisite for participation in studies three and four (each of which included only high and low suggestible subjects), an increased effort had to be made in the latter stages of this research to specifically recruit high and low suggestible subjects; as such, the experimenter could not be entirely blind to suggestibility scores in the present study. However, as the experimenter could remain blind to whether the individuals recruited in the latter stages were high or low in suggestibility, it is hoped that any such deviations from complete blindness will not affect the results in a significant or systematic fashion.

6.3 Results

6.3.1 Calculation of interference on the filtering task

In order to obtain a valid measure of the interference effect on the filtering task, subject times and errors in the control and interference conditions were standardised (i.e. converted to *z* scores). Each subject's standardised time and error scores within each condition were then added to produce a composite measure of performance for the two conditions. The difference between the composite measures for each condition (i.e. interference condition performance - control condition performance) was than calculated. This value was taken as the interference effect for each subject (see J.D. Smith & Baron, 1981, for details concerning the calculation of interference effect magnitude from which this was taken). As the particular dimension used as a basis for speeded sorting may have an effect on the magnitude of interference, the dimensions of angle and size were treated as separate.

6.3.2 Data screening and preliminary analyses

Prior to analysis the data-set was screened for missing values. Thirteen missing values were identified, seven for the social desirability variable, four for syllogistic reasoning and two for Raven's matrices. The seven missing values for the social desirability variable corresponded to the seven individuals who had completed the HGSHS:A but had not completed the questionnaires used in empirical study one. One of the missing values on the syllogistic reasoning task arose from a dyslexic subject who had difficulty in appreciating the syntax of the questions, making appropriate responding impossible. The remaining six missing values were a product of time limitations that arose from unusually slow subject responding on the other measures. The thirteen missing values were replaced with the variable mean[62] in each case.

[62] The conservative nature of this approach ensures validity but potentially reduces the amount of variation for the variable in question (Tabachnick & Fidell, 1996). As validity is of paramount importance, any loss in variance brought about as a result of this procedure was considered acceptable.

The data-set was then screened for univariate and multivariate outliers and violations of analysis assumptions. Five univariate outliers were identified, one for the syllogistic reasoning variable (extremely low *z* score) and two each for the Raven's matrices (both with extremely low *z* scores) and filtering interference (angles) variables (one with a high and the other with a low *z* score). In order to reduce the impact of the Raven's matrices outliers on subsequent analyses while retaining the remaining data from these subjects, the two scores were changed to one unit below the next most extreme score in the distribution, following the recommendations of Tabachnick and Fidell (1996). Accordingly, both scores were changed from four to six. This procedure was also performed for the outlier on the syllogistic reasoning variable; accordingly, the outlying case score of 0 was changed to 2. As this procedure is not suitable for the filtering interference variable due to the nature of the measurement scale used, the two outlying cases on this variable were deleted, leaving an overall sample size of 79 for further analysis. Calculation of mahalanobis distances indicated that no multivariate outliers were present in the data-set.

Distributions of the variables were normal in most cases. However, the triad classification (angles), syllogistic reasoning and Raven's matrices variables were all significantly negatively skewed ($p \leq 0.001$). Accordingly, the syllogistic reasoning and Raven's matrices variables were reflected and logarithmically transformed to produce normality. The more seriously skewed triad classification (angles) variable was reflected and then inversely transformed.

Table 6.1 presents descriptive statistics for the entire sample and for the male and female subsets of the sample. In order to assess possible differences between men and women on each of the variables, independent t-tests (2-tailed) comparing the two on each variable were performed. To take into account multiple comparisons for non-predicted differences, an alpha value of 0.004 was adopted, preserving an overall alpha value of 0.05. Males and females differed significantly on only the interference (size) variable, $t_{(77)} = -3.01$ ($p \leq 0.004$), with women showing a significantly greater interference effect for the dimension of size than men. In order to assess possible influences of gender, separate analyses for males and females will be performed for this variable.

Prior to further analysis, the three triad classification sets were compared to assess whether any differences between the packs in terms of proportion of similarity based responses were present (see table 6.2 for descriptive statistics). The triad classification sets were compared using one-way multivariate analysis of variance (MANOVA), taking the three stimulus types (i.e. angles, squares and triangles) as dependent variables. Using

Table 6.1: Means and standard deviations of study 2 variables for the entire sample and the male and female sub-samples.

Variable	Sample: mean (s.d.) (N = 79)	Male: Mean (s.d.) (n = 21)	Female: Mean (s.d.) (n = 58)
HGSHS:A	6.38 (2.94)	5.05 (3.06)	6.86 (2.76)
Interference: Ang.†	-.132‡ (1.02)	-.171‡ (1.08)	-.097‡ (1.01)
Interference: Size	.81‡ (1.21)	-.057‡ (1.25)	.341‡ (1.12)
Triad: Angles	.88 (.14)	.90 (.15)	.87 (.14)
Triad: Squares	.35 (.24)	.32 (.20)	.35 (.26)
Triad: Triangles	.48 (.28)	.53 (.28)	.47 (.28)
Ravens†	10.17 (1.56)	10.25 (1.44)	10.14 (1.61)
Syllogisms†	10.63 (2.43)	10.73 (3.21)	10.60 (2.12)
MFFT: Time	31.67 (17.14)	37.79 (20.41)	29.45 (15.39)
MFFT: Errors	11.29 (6.61)	8.76 (5.83)	12.21 (6.69)
SDS	11.71 (5.02)	10.69 (4.92)	12.08 (5.05)
Mood: Relaxed	82.03 (26.55)	82.17 (27.21)	81.98 (26.55)
Mood: Happy	88.42 (24.26)	83.83 (21.77)	90.04 (25.08)

† Refers to untransformed scores

‡ For both interference dimensions the median rather than the mean is shown; this is because the scores are comprised of standardised values and therefore have a mean of zero.

KEY: HGSHS = Harvard Group Scale of Hypnotic Suggestibility; Interference = Interference effect on filtering task (Ang = angles); Triad = triad classification; Syllogisms = Syllogistic reasoning task; Ravens = Ravens Advanced Progressive Matrices, set I; MFFT = Matching Familiar Figures Test; SDS = Social Desirability Scale.

Wilks' criterion, the three triad sets differed significantly on the combined DVs, $F_{(3,74)} = 4.180$, $p \leq 0.001$. Univariate F tests revealed that the triad sets did not differ significantly on either the angle or square stimuli; however, a significant difference between the triad sets was found for the triangle stimuli, $F_{(2,76)} = 4.371$, $p \leq 0.05$ (see appendix XVI, summary table 2A). An examination of the descriptive statistics in table 6.2 indicates that the source of this difference is the inflated level of similarity based responding for the triangle stimuli in triad set C. Accordingly, triad set will be accounted for in subsequent analyses.

6.3.3 Main study analyses

In order to assess the prediction that low level processing measures will be positively related to suggestibility and high level processing measures will be negatively related

Table 6.2: Descriptive statistics for the proportion of similarity responses on the three triad classification sets and the three stimulus types.

Triad set	Mean proportion of similarity responses: Squares	Mean proportion of similarity responses: Triangles	Mean proportion of similarity responses: Angles†
Set A	.31 (.24)	.45 (.25)	.90 (.11)
Set B	.41 (.25)	.39 (.33)	.84 (.17)
Set C	.33 (.23)	.60 (.22)	.89 (.15)
All sets	.35 (.24)	.48 (.28)	.88 (.14)

Note: Standard deviations are included in parentheses.

† Untransformed scores are presented for triad classification (angles) in table 6.2, although ANOVA for this variable used the transformed scores.

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to suggestibility, partial correlations were calculated between each of the variables assessed. Following the recommendations of study one, social desirability was used as partial correlate in all analyses. For Raven's matrices and the syllogistic reasoning variable, mood (happiness) was included as a partial correlate. For the triad classification variables, mood (relaxed) was taken as an additional partial correlate. The resulting partial correlation matrix is presented in table 6.3. In order to account for gender differences on the filtering interference (size) variable, squared semi-partial correlations (sr^2) were calculated via hierarchical multiple regression[63], taking gender as an additional covariate on the first block of the regression equation. In order to account for differences between triad sets on the triad classification (triangles) variable, squared semi-partial correlations were calculated via hierarchical multiple regression, taking triad set as an additional covariate on the first block of the regression equation. Accordingly, table 6.3 values for these variables refer to $\sqrt{sr^2}$ (semi-partial correlation) to enable comparison with the partial correlations obtained for the other variables. As in study one, an alpha value of 0.05 will be adopted for those correlations that have been predicted *a priori* i.e. those between hypnotic suggestibility and each of the putative low and high level processing measures. The correlations between the different processing predisposition measures will be addressed in the next chapter.

[63] The triad set variable is unsuitable as a standard partial correlate due to its categorical nature. As such, hierarchical multiple regression taking triad set as a covariate is the most appropriate way of assessing the relationship between triad classification (triangles) and the other study variables

Table 6.3: Partial correlation matrix showing relationships between suggestibility and processing predisposition measures (for details of partial correlates see page 163). Figures for interference (size) and triad classification (triangles) refer to the $\sqrt{sr^2}$ derived from multiple regression.

N = 79	Triad (A)†	Triad (S)	Triad (T)	Interfere. (A)	Interfere. (S)	Syllogisms†	Ravens†	MFFT:Time	MFFT:Error.
Triad (S)	.3094								
Triad (T)	.3162	.6083							
Interfere. (A)	.0169	-.1603	.0447						
Interfere. (S)	.0775	.2588	.1581	.2429					
Syllogisms†	.1988	.0364	.1183	.0533	.1095				
Ravens†	-.0421	-.1697	.1897	.0718	.0000	.1025			
MFFT:Time	.0273	.0549	.0316	-.1244	.0000	-.1737	-.1549		
MFFT:Error	-.0540	.0651	.0707	.1186	.1183	.2133	.3488	-.6556	
HGSHS	.0562	.1958*	.0316	-.1180	.1581	.1929*	-.2358*	-.1961*	.1254

N.B. Only those partial or squared semipartial correlations pertaining to hypnotic suggestibility are highlighted here. See chapter seven for an examination of the relationships between the other study variables.

* Significant at $p < 0.05$ (one-tailed)

† Transformed scores have been used for these variables; as transformation involves reflection, the direction of any correlations with these variables should be reversed for correct interpretation (unless the correlation is between two variables that have both been reflected)

KEY: HGSHS = Harvard Group Scale of Hypnotic Susceptibility; Interference = Interference effect on filtering task (Ang = angles); Triad = triad classification; Syllogisms = Syllogistic reasoning task; Ravens = Ravens Advanced Progressive Matrices, set I; MFFT = Matching Familiar Figures Test (err = errors; perf = performance); SDS = Social Desirability Scale.

Inspection of table 6.3 indicates that hypnotic suggestibility correlated significantly with only three of the ten processing measures used. As predicted, hypnotic suggestibility correlated significantly and positively with the proportion of similarity based responses in triad classification for the square stimuli ($r = .1958$; $p \leq 0.05$, one tailed). Also as predicted, hypnotic suggestibility correlated significantly and negatively with MFFT time ($r = -.1961$; $p \leq 0.05$, one-tailed). Furthermore, the syllogistic reasoning task correlated significantly and negatively[64] with suggestibility ($r = .1929$; $p \leq 0.05$, one-tailed) also in line with prediction. However, contrary to prediction, the triad classification (triangle and angle stimuli), filtering interference (size and angles), and MFFT (errors) variables did not correlate significantly with suggestibility. Also contrary to prediction, rather than showing a significant negative correlation with hypnotic suggestibility, the Raven's matrices variable showed a significant positive correlation with suggestibility ($r = -.2358$; $p \leq 0.05$, two-tailed).

As a second test of the hypothesis that hypnotic suggestibility is related to processing mode preferences and abilities, an interquartile split of the hypnotic suggestibility data was taken as the basis for planned comparisons between high and low suggestibility groups. Such an approach has the advantage of precluding mid-range suggestibility scores where the associated error variance is likely to be high, a possible reason for the small correlations obtained between suggestibility and the processing measures. Descriptive statistics for the two suggestibility groups are presented in table 6.4.

Examination of table 6.4 reveals that the high (HGSHS ≥ 9) and low (HGSHS ≤ 4) suggestibility groups showed mean scores in the expected direction on only the triad classification (squares), syllogistic reasoning and Matching Familiar Figures Test (time and errors) variables. The upper and lower suggestibility quartiles were compared on each of the variables using one-way analysis of covariance (one-tailed). Social desirability acted as a covariate in each case, mood (relaxed) and triad set were taken as additional covariates in analyses involving the triad classification variables, mood (happy) was taken as an additional covariate in analyses involving the syllogistic reasoning and Raven's matrices variables, and gender was taken as an additional covariate in the analysis of filtering interference (size). The high and low suggestibility

[64] Despite the positive correlation coefficient the use of the reflected syllogistic reasoning variable means that this correlation is negative rather than positive. Similarly, the negative correlation between suggestibility and the Raven's matrices variables indicates a positive relationship between the two.

Table 6.4: Descriptive statistics for low and high suggestibility quartiles and the entire sample (standard deviations are shown in parentheses).

Variable	Total sample mean and s.d. (N = 79)	High suggestibility quartile mean and s.d. (n = 22)	Low suggestibility quartile mean and s.d. (n = 22)
HGSHS	6.38 (2.94)	9.91 (.87)	2.73 (1.39)
Triad (Angles)	.88 (.14)	.88 (.13)	.88 (.16)
Triad (Squares)	.35 (.24)	.39 (.27)	.32 (.18)
Triad (Triangles)	.48 (.28)	.48 (.29)	.51 (.28)
Interference (Ang.)†	-.132 (1.02)	-.234 (1.15)	-.082 (.93)
Interference (Size)†	.81 (1.21)	-.007 (1.23)	.064 (1.24)
Syllogisms	10.63 (2.43)	10.48 (2.15)	10.91 (2.98)
Ravens	10.17 (1.56)	10.50 (1.47)	9.56 (1.82)
MFFT:Time	31.67 (17.14)	25.88 (13.80)	37.78 (18.04)
MFFT: Errors	11.29 (6.61)	12.41 (6.85)	9.14 (6.99)
SDS	11.71 (5.02)	12.66 (4.88)	10.55 (4.56)

† Median scores are shown for the filtering task interference variables.

Note: All statistics shown here are based on the untransformed raw scores for each variable and have not been statistically adjusted for covariates.

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groups were also compared for differences on the social desirability variable using an independent t-test. As before, an alpha value of 0.05 was adopted for the assessment of *a priori* predicted differences. The high and low suggestibility quartiles were significantly different on only two of the ten variables on which they were compared, triad classification (squares; $F_{(1,39)} = 5.169$, $p \leq 0.05$) and MFFT (time; $F_{(1,41)} = 5.203$; $p \leq 0.05$). See appendix XVI, summary tables 2B to 2J inclusive.

The findings of the correlations and comparisons performed here concerning the relationship between suggestibility and the MFFT are of some interest and merit further analysis. As predicted, a significant negative correlation between MFFT (time) and suggestibility was found, indicating that high suggestibles perform more quickly on the MFFT that their low suggestible counterparts; this was confirmed through one-way ANCOVA. A low response time on the MFFT is typically taken as being indicative of an impulsive response set, which was the basis for the predicted relationship between this measure and hypnotic suggestibility. However, no significant relationship was found between suggestibility and MFFT errors, indicating that high suggestibles, although quicker on the MFFT, make the same number of errors as lows[65]. Such a finding runs contrary to the typical view of impulsivity as defined by the MFFT, which regards

[65] The correlation between suggestibility and MFFT (errors) did, however, approach significance.

Table 6.5: Contingency table showing number of high and low suggestible individuals in the four MFFT categories (defined by double median-split)

Suggestibility group	MFFT CATEGORY			
	Impulsive	Reflective	Efficient	Inefficient
Lows (n = 22)	7	12	2	1
Highs (n = 22)	12	6	1	3

KEY: Impulsive (high errors, low time); Reflective (low errors, high time); Efficient (low errors, low time); Inefficient (high errors, high time)

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impulsives as those who make large numbers of errors as well as respond quickly. In order to assess whether MFFT (time) still contributes to variation in suggestibility after the effects of MFFT (errors) have been statistically removed, a hierarchical multiple regression was performed on the HGSHS, taking MFFT (errors) on the first block and MFFT (time) on the second block. The squared semi-partial correlation coefficient for MFFT (time) was non-significant, $sr^2 = 0.024$, $p > 0.05$, indicating that MFFT (time) does not contribute significantly to any further variation in suggestibility after MFFT (errors) have been removed. Thus, the error score is clearly contributing to the relationship between suggestibility and MFFT time, a finding which provides some support for the interpretation that high suggestibles are more impulsive than lows, despite a significant correlation only being obtained between suggestibility and the MFFT (time) variable.

In order to further understand the relationship between suggestibility and cognitive style as measured by the MFFT, a chi-squared analysis was performed comparing the frequency of high and low suggestibility subjects in the four MFFT performance categories. The numbers of high and low suggestible subjects in the four MFFT categories are presented in table 6.5. Examination of table 6.5 indicates that, in line with expectation, a greater proportion of the high suggestible subjects fall into the impulsive category than the low suggestibles, who demonstrate a greater propensity towards reflective responding. However, there were no significant differences between the high and low suggestibility subjects in MFFT category placement, $\chi^2_{(3)} = 4.649$, $p > 0.10$ (one-tailed). Such a finding indicates that, although there is some evidence supporting the notion that high suggestibles are more likely to be impulsive than low suggestibles who are more likely to be reflective, this evidence is not particularly strong and does not provide a basis for categorising suggestibility groups according to cognitive style differences.

In order to further understand the relationship between hypnotic suggestibility and the significantly correlated processing predisposition variables, a sequential multiple regression taking hypnotic suggestibility as the dependent variable and simultaneously entering the social desirability, triad classification set, mood (relaxed) and mood (happy) variables as covariates on block one, and triad classification (squares), syllogistic reasoning, Raven's matrices and Matching Familiar Figures Test (time) variables on block two was performed. The multiple correlation coefficient R was significantly different from zero, $F_{(8,70)} = 2.722$, $p \leq 0.01$, accounting for 23.7% of the variation in suggestibility ($R = .48712$). Examination of the predicted scores against residuals and the distribution of standardised residuals confirmed the linearity of the regression equation. The increment in R^2 brought about by inclusion of the variables in block two was .13618, which was a significant increase in the predictive power of the regression equation, $F_{(4,70)} = 3.125$, $p \leq 0.025$. Thus, the four variables account for a further 13.6% of the variation in suggestibility after the effects of mood, social desirability and triad classification set have been controlled for. None of the variables in the regression equation accounted for a significant unique proportion of the variance, although Raven's matrices ($T = -1.906$; $p = .0608$) and triad classification with squares ($T = 1.787$; $p = .0782$) did approach significance.

In order to assess the relative predictive power of the four processing predisposition variables a mixed standard-statistical regression[66] was performed with the HGSHS as the dependent variable. After simultaneous entry of the social desirability, triad classification set and mood (relaxed and happy) variables as covariates in the first, standard block of the multiple regression equation, the four processing predisposition variables were entered in a stepwise fashion in block two. Only triad classification (squares) entered the regression equation on the basis of this method of variable entry; entry of this variable increased R^2 by 0.0517 which is significantly different from zero, $F_{(1,73)} = 4.455$, $p \leq 0.05$. Thus, the triad classification (squares) variable accounts for a further 5.2% of the variation in suggestibility after mood, triad set and social desirability have been controlled for.

[66] Given the exploratory nature of this research, the use of stepwise regression was considered more appopriate than the sequential alternative, particularly given the unexpected pattern of correlations between the HGSHS and the Raven's matrices and syllogistic reasoning variables.

6.4 Discussion

The findings obtained in this study, as with study one, provide only partial support for the prediction, derived from the model of hypnosis and suggestion outlined in chapter three, that suggestibility is positively related to a low level processing predisposition and negatively related to high level processing abilities. As predicted, a significant positive correlation was found between the HGSHS and triad classification (squares), suggesting that high suggestibles have a preference for more low level responding in triad classification than lows, at least using square stimuli. This finding was confirmed using one-way ANCOVA comparing high and low suggestibility quartiles. However, neither of the other triad classification stimuli (angles and triangles) were significantly correlated with suggestibility or yielded any differences between high and low suggestibility quartiles. It is conceivable that only the square stimuli yielded a significant correlation with suggestibility because the dimensions of size and brightness of which they are composed are typically regarded as a combination that yields analytical rather than similarity-based responses; in contrast, the angle and triangle stimuli are more biased towards similarity-based responding (see e.g. Foard & Kemler Nelson, 1984). As such, the square stimuli allow greater scope for response variation towards the similarity-based end of the scale, whereas the opposite is the case for the angle and triangle stimuli. Thus, the square stimuli may be a more sensitive index of individual variation in similarity based (i.e. low level) responding than either angles or triangles, something which should be taken into account in further research addressing the relationship between suggestibility and triad classification.

Also as predicted, a significant negative correlation was obtained between the HGSHS and MFFT (time) indicating that high suggestibles take less time to their first response on the MFFT than lows, suggestive on an impulsive response set. This difference was also confirmed using one-way ANCOVA. Despite finding no significant correlations or quartile differences for suggestibility and the MFFT error variable, hierarchical multiple regression indicated that the MFFT (time) variable was not a significant predictor of suggestibility once MFFT (errors) was partialled out of the analysis. Taken together these findings appear to confirm that high suggestibles are more impulsive (i.e. more biased towards low level processing) than their low suggestible counterparts. However, this finding is tempered by the chi-square analysis which revealed that the relative frequency of high and low suggestibles in the impulsive and reflective MFFT categories was not significantly different from zero.

A significant correlation between the HGSHS and the syllogistic reasoning variable appears to confirm the prediction that hypnotic suggestibility is negatively related to high level processing abilities. However, this conclusion appears to be contradicted by the positive relationship obtained between suggestibility and the Raven's matrices variable, which seems to suggest that suggestibility is associated with superior, and not inferior, high level abilities. In order to account for this somewhat surprising pattern of findings, the question of whether or not the syllogistic reasoning and Raven's matrices variables provide valid indices of high level processing abilities must be considered. While there is no apparent reason to assume that the syllogistic reasoning task does not provide a valid measure of high level processing ability, this is perhaps not the case for Raven's matrices. Hunt (1974), for example, has suggested that certain items on the advanced matrices test may be completed according to one of two problem solving algorithms, one of which involves an analytical (i.e. higher level) process, with the other being a more holistic (i.e. lower level) process. It is possible that the obtained positive relationship between suggestibility and Raven's matrices results from subjects successfully using low rather than high level mechanisms to complete the task. Future research designed to further investigate the relationship between suggestibility and processing preferences and abilities should take this possibility into account by a careful task analysis to ensure that only those items which can only be performed on the basis of higher level, analytical algorithms are included.

Contrary to prediction, neither of the filtering interference variables correlated significantly with the HGSHS, and no differences were observed between the high and low suggestibility quartiles. Despite high suggestibles showing a preference for low level processing, as indicated by the significant positive correlation between suggestibility and triad classification (squares), these findings appear to suggest that such a preference is not a product of the high suggestibles' inability to engage in analytical (i.e. higher level) perceptual processing.

The findings obtained in this study therefore provide limited support for the model of suggestibility outlined in chapter three, and indicate that research using a refined set of variables and a larger number of subjects is warranted. This conclusion is supported by the findings of the sequential multiple regression analyses taking the set of variables used here as predictors of suggestibility. With the variance attributable to mood (relaxed and happy), triad set and social desirability having been statistically removed, the remaining variables (Raven's matrices, syllogistic reasoning, MFFT time and square triad classification) added significantly to the predictive power of the regression equation, accounting for an extra 13.6% of the variation in suggestibility. Stepwise regression revealed that the best predictor of suggestibility out of the processing predisposition and ability variables was triad classification (squares).

The question remains as to why the findings obtained in this study, while warranting further investigation, are so equivocal. First and foremost, the number of subjects assessed is relatively low, particularly given the number of variables under examination. Any correlation would have to be quite strong for it to reach significance at the alpha values adopted here, and it is conceivable that the relationships between suggestibility and the variables of interest in this study (should they exist at all) are only relatively modest. Secondly, as discussed in chapter five, the amount of measurement error associated with hypnotic suggestibility assessment is likely to be relatively high, which would automatically make any correlations between it and other variables lower than would be expected if measurement error was smaller. Thirdly, on the basis of the insights obtained through running this experiment, it is apparent the measurement error associated with some of the variables used here is also likely to be fairly high. The majority of subjects found the filtering task to be extremely tedious, for example, and it is possible that a lack of motivation may have increased the amount of measurement error for this variable, particularly if motivation is more important for the interference trials of the task than the control trials, which seems plausible given the greater difficulty of the former compared to the latter.

A different problem is faced by the Matching Familiar Figures Test. The original scoring format of the test states that the average number of errors on the task plus the average time to the first response be recorded. However, in some cases an individual might make their first response very quickly and then spend a long time deciding between the remaining alternatives having made this mistake. This approach was frequently observed during the running of this experiment. Such an approach is, for all intents and purposes, relatively reflective in comparison to that of the genuinely impulsive individual who also makes their second, third, fourth etc. responses very quickly; however, both individuals will record a low timing score, despite this strategy difference. Timing every response for each item would be one possible way of overcoming this potential problem, and is recommended for future research using the MFFT.

There are also methodological concerns about the syllogistic reasoning task used here. According to Johnson-Laird and Steedman (1978), responses to syllogistic reasoning problems can be quite sensitive to subjects' beliefs and expectations about the material included in the premises and solutions used. In particular, subjects' tend to endorse or suggest solutions to syllogisms that seem likely rather than those that seem unlikely; thus, even though the valid conclusion for a given syllogism might technically be correct, it may not be endorsed because it seems unlikely in the real world. However, as the author was unaware of this research at the time that the syllogistic reasoning task was constructed, no effort was made to take this issue into account; future research of this sort should be aware of this potential problem and accommodate it accordingly. Indeed, chapter nine presents an empirical study investigating syllogistic reasoning performance in hypnosis and relaxation conditions which takes this potential problem into account.

A second problem with the syllogistic reasoning task used in this study was that no measure of completion time was taken here. Clearly, an individual who completes the task as accurately as another individual who takes twice the time to complete it is better at the task than their slower counterpart. However, as only total reasoning scores were taken in this study, the correlation between suggestibility and reasoning performed here may not provide an adequate test of the hypothesis that suggestibility is associated with a relative inability to carry out higher level tasks[67].

The studies described in this and the previous chapter provide some support for the notion that suggestibility is positively related to a low level processing preference, as assessed by both self-report and behavioural measures. The question remains, however, as to the generality of the high and low processing mode constructs which form a central part of the theoretical framework presented here. In the next chapter, the data obtained from this and the previous study will be combined to assess the relationship between self-report and behavioural measures of processing preference and ability in an attempt to address this issue.

[67] Not taking a time measure for the Raven's matrices test used here is considered valid because a set of possible responses is available to the respondent. As such, the possibility of impulsive responding resulting from time constraints is far more apparent for this task than the syllogistic reasoning task.

CHAPTER 7: Empirical study 2b

The relationship between behavioural and self-report measures of high and low level processing preference and ability.

7.1 Introduction

In chapters five and six, two studies designed to assess the relationship between suggestibility and a number of self-report and behavioural measures of processing style and preference were described. In both cases partial support for the model of hypnosis and suggestion presented in chapter three was found: using both self-report and behavioural measures there is some evidence to suggest that suggestibility is positively related to a low level processing preference, as predicted. However, contrary to prediction, there is no evidence to suggest that self-reported high level processing preference is negatively related to suggestibility, although a significant negative correlation between the HGSHS and syllogistic reasoning suggest that susceptibility is related to a relative inability to perform high level processing operations.

The theoretical work presented in this thesis is not limited to the sole explanation of hypnosis and suggestion, however. The model of suggestion and hypnosis presented in chapter three is based on a novel model of the cognitive system outlined in chapter two, and the validity of the former rests to a considerable degree on that of the latter; it is therefore essential that every attempt is made to assess the validity of this cognitive model where possible. Being derived from a number of other, better established, models of the cognitive system (e.g. Marcel, 1983; Norman & Shallice, 1986; Logan, 1988), existing research concerning those models provides solid support for the general structure of the present theory. However, the notion that there are more general behavioural and cognitive characteristics specifically associated with the lower and higher level control of behaviour is a novel idea which requires empirical examination in its own right. In chapters five and six, two studies investigating the relationship between suggestibility and processing predisposition were described. In each case, processing predisposition measures were selected on the basis of the *prima facie* similarities between the research and theory from which they were derived and the distinction between higher and lower level modes of processing outlined in chapter two. Due to the exploratory nature of the research presented in this thesis, a wide range of such measures were selected from a number of different psychological literatures, in a bid to maximise the chance of obtaining pertinent information concerning the relationship between suggestibility and processing predisposition. Given the apparent generality of the higher/lower level processing mode distinction which guided measure selection in this thesis, the question remains as to what extent this apparent generality translates into an empirical reality. For example, does the individual who self-reports a preference for low level processing also show a low level processing preference on more objective behavioural tasks purportedly assessing the same thing? Similarly, does the individual who self-reports a high level processing preference show superior performance on measures of high level processing ability? The answers to such questions would provide information concerning the generality of the higher/lower level processing mode distinction and the measures used in this thesis to assess it; such information could prove invaluable in guiding further theoretical development and suggesting the most appropriate methodological strategies for future research.

If, as has been assumed here, the different low (or high) level processing measures are measuring aspects of the same general construct (*viz.* low or high level processing predisposition), then one would predict that each of the measures will be significantly correlated with one another. Having collected data on both the self-report and behavioural measures of processing preference and ability for a number of subjects, an opportunity to perform this analysis presents itself; this will be the focus of the present chapter.

7.2 Method

In addition to the Harvard susceptibility measure, each of the low and high level processing preference and ability measures used in studies one and two were included in analysis here. Analysis was by correlation and multiple regression alone: the low cases-to-variables ratio renders the use of potentially profitable multivariate techniques such as factor analysis inappropriate in this context.

The two sets of measures are classified as follows: The low level processing variables were the elaborative episodic and elaborative self-actualising scales of the Inventory of Learning Processes (ILP-EE and ILP-ES), the right hemisphere scale of the Human Information Processing Survey (HIPS-R), the experiential scale of the Rational Versus Experiential Inventory (RVEI-EXP), and triad classification (angles, squares and triangles).

The high level processing variables were the deep thinking and deep semantic scales of the Inventory of Learning Processes (ILP-DT and ILP-DS), the left hemisphere scale of the Human Information Processing Survey (HIPS-L), the rational scale of the Rational Versus Experiential Inventory (RVEI-RAT), syllogistic reasoning and Raven's matrices.

The Matching Familiar Figures Test (MFFT; time and errors) and filtering interference (angles and size) variables were included as measures of relative (i.e. high vs low) processing predisposition; these measures were correlated with both high and low level processing variables.

For details of all of these measures see sections 5.2.2 and 6.2.2.

7.2.1 Subjects

74 subjects participated in both study one and study two; of these, 19 were male and 55 were female. Average age was 23.08 years (s.d. = 5.70 yrs; range 18-48 yrs).

7.3 Results and discussion

Prior to analysis the data-set was screened for missing values. Nine missing values were identified, three for the syllogistic reasoning variable, two for the Ravens matrices variable, one for the social desirability variable, and one each for the RVEI- EXP and RVEI-RAT variables (see sections 5.3 and 6.3). The missing values were replaced by the series mean in each case. The data-set was then screened for univariate and multivariate outliers. Four possible univariate outliers were identified, one for the ILP-EE variable which had a high z score, one for the syllogistic reasoning variable which had a very low z score, and two for the Raven's matrices variable which both had very low z scores. As the potentially outlying ILP-EE score had only a moderately high z score it was retained for analysis without alteration. However, following the recommendations of Tabachnick and Fidell (1996), the potential outliers for the syllogistic reasoning and Raven's matrices variables were replaced by the next highest values in their respective ranges. In the case of Raven's matrices two scores of 4 were replaced by a score of a 6. In the case of the syllogistic reasoning task, a score of zero was replaced by a score of 3.

Calculation of Mahalanobis distances revealed that there were no multivariate outliers in the data-set. The variables were then screened for normality. All of the variables were normally distributed except the triad classification (angles), syllogistic reasoning and Raven's matrices variables which all showed moderate negative skewness. In each case, the non-normal variables were transformed by reflection and square root. As in chapter six, the interpretation of any correlations with these variables should be reversed due to the reflection transformation.

In order to assess the relationships between the low level processing variables multiple partial correlations were carried out. Social desirability acted as a partial correlate in each case, while mood (relaxed) was used as an additional partial correlate for all correlations involving the triad classification variables. The resulting partial correlation matrix is presented in table 7.1. As in chapter six, for the interference (size) and triad classification (triangles) variables squared semi-partial correlations (sr^2) were calculated, taking gender and triad set respectively as covariates in hierarchical multiple regression. The values for these variables in table 7.1 refer to $\sqrt{sr^2}$ (semi-partial correlation) to enable comparison with the partial correlations obtained for the other variables. As in chapters five and six, individual partial-correlation (or squared semi-partial correlation) alpha values of 0.05 for *a priori* analyses were adopted. Unless otherwise stated, the linearity of the obtained correlations has been verified through inspection of the corresponding scatterplot.

Examination of table 7.1 reveals two notable departures from the results reported in chapter five and six. As in chapter five, the HGSHS correlated significantly and positively with the HIPS-R (r = 2163; $p \leq 0.05$), RVEI-EXP (r = .3351; $p \leq 0.005$) and ILP-EE (r = .2175; $p \leq 0.01$); in each case the magnitude of the correlation was higher than with the entire sample. However, with this subset of subjects, a significant positive correlation was also obtained between the HGSHS and the ILP-ES (r = .2731); indeed, with this sample, the magnitude of the correlation between the ILP-ES and the HGSHS was higher than those between the HGSHS and the HIPS-R and ILP-EE. Despite the fact that the obtained partial correlations are likely to be less robust than those obtained with the larger sample size reported in chapter five, the finding of a significant positive relationship between the HGSHS and the ILP-ES is nevertheless important and provides further tentative support for the prediction that suggestibility is related to a low level processing preference. Moreover, such a finding is consistent with the significant difference found between the high and low suggestibility quartiles on the ILP-ES in study one.

As in chapter six, a significant positive correlation between the HGSHS and triad classification (squares) was again obtained (r = .2000; $p \leq 0.05$); however, with the removal of the seven subjects who had not completed the questionnaires in study 1, the obtained partial correlation between the HGSHS and MFFT (time) was no longer significant at the 0.05 level. Such a finding seems to suggest that the relationship between suggestibility and MFFT (time) is not particularly robust, confirming the results of study two.

Table 7.1: Partial correlation matrix showing inter-relationships between self-report and behavioural measures of low level processing predisposition and hypnotic susceptibility (for details of partial correlates see page 174). Values for interference (size) and triad classification (triangles) refer to $\sqrt{sr^2}$.

Variable	HIPS-R	RVEI-EXP	ILP-EE	ILP-ES	T.C. (Ang)	T.C. (Squ)	T.C. (Tri.)	INTF (Ang)	INTF (Siz)	MFFT: Err	MFFT: Tim.
RVEI-EXP	.3096***										
ILP-EE	.3817†	.2639**									
ILP-ES	.3589***	.6346†	.4141†								
T.C. (Ang)	-.0339	-.1174	-.0476	-.0620							
T.C. (Squ)	-.1388	.0596	-.1833	.1807	-.2518*						
T.C. (Tri.)	.1000	.1224	.0316	.2191	.2074	.5882†					
INTF (Ang)	-.0312	-.0027	-.0584	-.0639	-.0145	-.1647	.0548				
INTF. (Siz.)	.3661**	.1549	.0000	.2236	.0447	.2236	.0894	.2345*			
MFFT: Err.	-.2399	-.0151	-.1073	-.0344	.0639	.0533	.0707	.1049	.1063		
MFFT: Tim.	.1680	.0001	.0377	-.0515	-.0197	.0627	.0000	.0000	-.0113	-.6636†	
HGSHS	.2163*	.3351***	.2175*	.2731**	-.1199	.2000*	.0548	.1581	-.1670	.1149	-.1673

* Significant at $p \leq 0.05$ ** Significant at $p \leq 0.01$ *** Significant at $p \leq 0.005$ † Significant at $p \leq 0.0001$

KEY: HIPS-R = Human Information Processing Survey - Right hemisphere scale; RVEI-EXP = Rational Versus Experiential Inventory - Experiential scale; ILP = Inventory of Learning Processes (EE = Elaborative episodic scale; ES = Elaborative self-actualising scale; TC = Triad classification (ang = angles; squ = squares; tri = triangles); INTF = filtering interference (ang = angles; siz = size); MFFT = Matching Familiar Figures Test (Err = errors; tim = time; perf = overall performance); HGSHS = Harvard Group Scale of Hypnotic Susceptibility.

The HIPS-R, RVEI-EXP, ILP-EE and ILP-ES all showed significant positive inter-correlations as predicted, ranging from a relatively small correlation between the RVEI-EXP and ILP-EE (r = .2639; $p \leq 0.01$), to a strong correlation between the RVEI-EXP and ILP-ES (r = .6346; $p \leq 0.0001$). Related and complementary findings have been reported by Beyler and Schmeck (1992). Such a pattern of inter-correlations appears to support the prediction that the four putative low level processing questionnaires all measure related aspects of a similar low level processing construct, a construct which is significantly and positively related to hypnotic suggestibility.

Within the triad classification variables, significant positive correlations were obtained between the square and the angle stimuli (r = -.2518; $p \leq 0.05$), while significant squared semi-partial correlations were obtained between the triangle and angle stimuli ($\sqrt{sr^2}$ = .2588, $p \leq 0.05$) and the triangle and square stimuli ($\sqrt{sr^2}$ = .5339, $p \leq 0.0001$). A similar pattern of findings have been reported by J.D. Smith and Baron (1981). Such a pattern of inter-correlations again suggests that the three triad classification tasks are differentially assessing a similar construct.

The MFFT time and error variables showed a strong negative correlation as expected (r = -.6636; $p \leq 0.0001$), indicating that quicker subjects tend to make more errors on the task; this is in line with previous uses of the MFFT (e.g. Kagan, 1965).

The two filtering interference measures showed a significant squared semi-partial correlation with one another ($\sqrt{sr^2}$ = .2345, $p \leq 0.05$), although the magnitude of this was fairly small given that the two measures are purportedly measuring the same construct. However, it is likely that a low or non-existent correlation between the two filtering dimensions is a product of the differential difficulty level between the two (cf. J. D. Smith & Baron, 1981).

Although the correlations within specific measure types (i.e. MFFT, filtering interference, triad classification) are all significant as expected, the inter-correlations between the different types of behavioural measure of low level processing preference do not provide support for the notion that a common processing construct is being assessed: none of the partial correlations between the different behavioural measure types was significant at the 0.05 level. However, the lack of a significant correlation between the triad classification and filtering interference measures, both of which derive from the same literature, is in line with those of J. D. Smith and Baron (1981). Such a finding clearly demonstrates the difference between processing abilities (as assessed by the filtering tasks) and processing preferences (as assessed by the triad classification tasks).

It is apparent that one may prefer either high or low level processing, but such a preference is independent of whether or not one is capable of processing in a particular fashion.

Having assessed the correlations within each general measure type (i.e. behavioural, self-report), the correlations between the measures types must now be addressed. Examination of table 7.1 reveals that there is only very modest support for the prediction that the self-report and behavioural low level processing variables are assessing related aspects of the same underlying construct. On the positive side, the correlation between the ILP-ES and triad classification (squares) variables approached, but did not reach, significance (r = .1807; p = 0.059). Similarly, the squared semi-partial correlation between the ILP-ES and triad classification (triangle) variables also approached significance ($\sqrt{sr^2} = .2191$, p = 0.060). However, the correlation between the ILP-ES and the triad classification (angles) variables was non-significant. None of the other self-report measures of low level processing preference correlated significantly with any of the behavioural measures, with one exception: that between the interference (size) and the HIPS-R variables ($\sqrt{sr^2} = .3661$, $p \leq 0.01$, two-tailed). However, examination of the scatter-plot between these variables indicates that this squared semi-partial correlation is in the opposite direction to that predicted, suggesting that a low level processing preference, as indexed by the HIPS-R, is actually related to a high level processing ability, as indexed by the filtering task. There is no immediately obvious interpretation for such a finding, although it again underlines the importance of drawing a distinction between processing preferences and abilities.

Thus, although there does appear to be some evidence in support of the relationship between self-report and behavioural measures of low level processing preference, such support is very modest and highly specific to certain measures. Nevertheless, it is noteworthy that the significant self-report/behavioural correlation obtained was between measures purportedly assessing a low level processing preference rather than ability. Such a finding validates, to an extent at least, the use of self-report measures as instruments for the assessment of processing style.

In order to assess the combined power of the self-report and behavioural measures in predicting suggestibility, those measures which showed significant correlations with suggestibility (the RVEI-EXP, ILP-ES, ILP-EE, HIPS-R and triad classification with squares) were entered into a hierarchical regression taking HGSHS scores as the dependent variable. Social desirability, mood (relaxed) and triad classification set were entered simultaneously into the first block of the regression equation as covariates, while the significantly correlated low level processing measures were entered simultaneously into the second block of the regression equation. The increment in R^2 brought about by inclusion of the low level processing variables was 0.18366, suggesting that the low level processing variables account for a further 18.4% of the variance in suggestibility after accounting for social desirability, triad classification set and relaxation. This increase was significantly different from zero, $F_{(5,65)} = 3.384$, $p \leq 0.01$. The only low level processing variables accounting for significant unique proportions of variance in suggestibility were RVEI-EXP and triad classification (squares). RVEI-EXP accounted for a unique 6.1% ($sr^2 = .06103$) of the variation in suggestibility, $F_{(1,65)} = 5.622$, $p \leq 0.025$. Triad classification (squares) accounted for a unique 5.4% ($sr^2 = .05408$) of the variation in suggestibility, $F_{(1,65)} = 4.982$, $p \leq 0.05$. The remaining proportion of variation in suggestibility (6.9%) accounted for by inclusion of the low level processing variables was shared. As there are no conceptual grounds for deciding which of the variables (self-report vs. behavioural) should be entered first in any subsequent hierarchical regression, an explorative mixed standard-statistical regression was performed taking HGSHS as the dependent variable. Social desirability, triad set and relaxation were simultaneously entered as covariates in the first, standard block of the regression equation while the five low level processing variables were subject to step-wise entry in the second block. Only the RVEI-EXP entered the regression equation on the basis of this method of variable entry-order; the inclusion of the RVEI-EXP brought about an increase in R^2 of .11865, which is significantly different from zero, $F_{(1,69)} = 10.624$, $p \leq 0.005$. Thus, on purely statistical grounds, the RVEI-EXP appears to be the best predictor of suggestibility, accounting for 11.9% of the variation after controlling for the effects of triad set, relaxation and social desirability. As such, it can be concluded that, taken together, the self-report and behavioural measures of low level processing preference predict a relatively large and significant proportion of the variation in suggestibility; moreover both behavioural and self-report measures uniquely contribute to the prediction of suggestibility, validating the use of both in any subsequent research addressing the hypotheses under investigation here. However, there is statistical evidence to suggest that the best predictor of suggestibility out of the all the low level processing predisposition variables is the RVEI-EXP.

In order to assess the relationships between the high level processing variables a second set of partial correlations was carried out. Social desirability acted as a partial correlate in each case, while mood (happy) was used as an additional partial correlate for all correlations involving the syllogistic reasoning and Raven's matrices variables. The

Table 7.2: Partial correlation matrix showing inter-relationships between self-report and behavioural measures of high level processing predisposition and hypnotic susceptibility (for details of partial correlates see pages 178-179). Values for interference (size) refer to $\sqrt{sr^2}$.

Variable	ILP-DS	ILP-DT	HIPS-L	RVEI-RAT	MFFT: Err.	MFFT: Tim	INTF (Ang)	INTF (Siz.)	Syllogisms	Ravens
ILP-DT	.6893***									
HIPS-L	-.2103	.0449								
RVEI-RAT	.3453**	.6412***	.0674							
MFFT: Err	.1589	.1521	.1329	.0812						
MFFT: Tim	.1246	.0638	-.1612	-.0191	-.6636					
INTF (Ang)	.0012	.0658	-.0228	.0121	.1238	-.1282				
INTF (Siz)	.1483	.2025	.1304	.1000	.1049	.0000	.2345*			
Syllogisms	-.0403	-.1146	-.2194	-.1244	.1941*	-.1844	.0684	.0632		
Ravens	-.0981	-.1467	.0149	-.1983*	.4279***	-.2285*	.0824	.0632	.2211*	
HGSHS	.1490	-.0611	.0090	-.1156	.1149	-.1673	-.1257	.1581	.0576	-.1883

* Significant at $p \leq 0.05$ ** Significant at $p \leq 0.005$ *** Significant at $p \leq 0.0001$

KEY: HIPS-L = Human Information Processing Survey - Left hemisphere scale; RVEI-RAT = Rational Versus Experiential Inventory - Rational scale; ILP = Inventory of Learning Processes (DT = deep thinking scale; DS = deep thinking scale; INTF = filtering interference (ang = angles; siz = size); MFFT = Matching Familiar Figures Test (Err = errors; tim = time; perf = overall performance); Syllogisms = Syllogistic reasoning task; Ravens = Ravens matrices; HGSHS = Harvard Group Scale of Hypnotic Susceptibility.

resulting partial correlation matrix is presented in table 7.2. For the interference (size) variable, squared semi-partial correlations (sr^2) were calculated, taking gender as a covariate in hierarchical multiple regression. The values for this variable in table 7.2 refer to $\sqrt{sr^2}$ (semi-partial correlation) to allow comparison with the partial correlations. As in chapters five and six, individual alpha values of 0.05 for *a priori* analyses were adopted.

An initial inspection of table 7.2 reveals that, contrary to the findings reported in chapter six, removal of the seven subjects who had not completed both behavioural and self-report processing measures renders the correlation between the HGSHS and Raven's matrices (r = -.1883) and the correlation between the HGSHS and syllogistic reasoning (r = .0576) non-significant. As in chapters five and six, none of the other high level processing variables correlated significantly with suggestibility. Such a pattern of findings clearly indicates, as with the relationship between the HGSHS and MFFT, that the relationships between the HGSHS, Raven's matrices and syllogistic reasoning are not as robust as was previously thought. Evidently, the correlations between these variables were subject to considerable leverage by the scores of the seven additional subjects included in the analysis described in chapter six, a finding which must cast doubt on the validity of the obtained relationships; in any event, it is clear that an attempt at replication must be made before any firm conclusions can be drawn about the relationship between these variables.

Examination of table 7.2 reveals a similar pattern of correlations between the high level processing questionnaires to those obtained and reported in chapter five. As predicted, strong significant positive correlations were obtained between the ILP-DS and RVEI-RAT variables (r = .3453; $p \leq 0.005$), the ILP-DS and ILP-DT variables (r = .6893; $p \leq 0.0001$), and the ILP-DT and RVEI-EXP variables (r = .6412; $p \leq 0.0001$). Such a pattern of correlations strongly supports the notion that these measures are tapping related aspects of a similar construct. However, the HIPS-L variable did not correlate significantly with the ILP-DS, ILP-DT or RVEI-RAT, indicating that the HIPS-L is not a valid measure of this construct. Moreover, the correlation between the ILP-DS and HIPS-L approached two-tailed significance indicating a potential negative relationship between these variables (r = -.2103). Such a finding has no obvious interpretation but at the very least proscribes the use of the HIPS-L as a measure of high level processing preference.

The inter-correlations between the putative high level processing variables suggests a greater degree of cross-measure consistency than was obtained for the low level processing variables discussed previously. A significant positive correlation between the syllogistic reasoning and Raven's matrices variables ($r = .2211$; $p \leq 0.05$) supports the assumption that the two are tapping, to an extent at least, a high level processing ability associated with reasoning. In addition, significant correlations were obtained between the MFFT errors measure, the syllogistic reasoning task[68] ($r = .1941$; $p \leq 0.05$) and Raven's matrices ($r = .4279$; $p \leq 0.0001$), as predicted. Such a finding indicates that those individuals who show good high level processing abilities, as indexed by the Raven's matrices and syllogistic reasoning variables, are less likely to make errors on the MFFT than those with inferior high level processing abilities. This again supports the prediction that these variables are tapping related constructs. A significant negative correlation was also obtained between the MFFT time measure and Raven's matrices ($r = -.2285$), suggesting that individuals with good high level reasoning abilities tend to take longer on the MFFT than those without. Taken together with the previous finding, this result suggests that good high level processors tend to have a more reflective cognitive style than relatively poor high level processors which leads to better performance on the MFFT.

None of the MFFT variables, Raven's matrices or the syllogistic reasoning task correlated significantly with either of the filtering interference tasks. Given the pattern of intercorrelations between the former variables, such a pattern of findings appears to question the assertion that the filtering interference tasks measure processing ability (cf. J. D. Smith & Baron, 1981). At the very least, if the filtering interference task does measure an aspect of processing ability it is not one that it is related to that associated with the MFFT, Raven's matrices and the syllogistic reasoning task; if this were the case then the notion of high and low level processing modes proposed in chapter two would clearly have to be rethought.

No evidence was found for a relationship between the self-report and behavioural measures of high level processing, with one exception: a significant correlation was found between the Raven's matrices and RVEI-RAT variables ($r = -.1983$; $p \leq 0.05$), suggesting that those individuals who claim to be rational thinkers are actually better at rational thinking than those who do not. Although the magnitude of this correlation is very modest, it does appear to support the notion that individuals have some insight into

[68] As with the triad classification (angles) variable, interpretation of correlations with the Raven's matrices and syllogistic reasoning variables should go in the opposite direction to that indicated by the sign of the correlation coefficient, due to reflection of these variables. However, as both the syllogistic reasoning and Raven's matrices variables have been reflected, interpretation of the correlation between these two variables follows the sign of the correlation coefficient.

their reasoning abilities, and validates, to an extent at least, the use of self-report measures to assess such things.

7.4 Summary

The results obtained here provide only very modest support for the generality of the distinction between higher and lower level modes of processing made by the model of the cognitive system presented in chapter two. As in chapter five, each of the low level processing mode questionnaires showed significant correlations with one another as predicted, suggesting that each is assessing related aspects of a similar construct. In addition, the three triad classification tasks all showed significant inter-correlations, as did the filtering interference tasks, and the different measures taken by the Matching Familiar Figures Test. Clearly, there is evidence to suggest that the different variations within a particular measure type are measuring similar constructs as predicted. However, contrary to prediction, no significant correlations were found between the different behavioural tasks and very few of the behavioural tasks correlated significantly with the self-report measures. The only possible exceptions were the relationships between the ILP-ES and triad classification (triangles and squares) variables that approached, but did not reach, significance. Such a pattern of correlations is encouraging and suggests that there is some degree of overlap between these different tasks. The fact that both the ILP-ES and triad classification measures are both purportedly addressing a low level processing preference rather than ability provides modest support for the distinction between higher and lower level processing modes presented in chapter two.

After removal of the seven subjects who had not completed the questionnaires in study one, the previously significant correlations between the HGSHS and the MFFT (time), Raven's matrices and syllogistic reasoning variables were reduced to non-significant levels. Such a finding suggests that the relationships between these variables are not as robust as the evidence presented in chapter six seems to indicate; clearly, attempts at replication of these relationships are required before any firm conclusions can be drawn. Nevertheless, results of hierarchical regression analysis revealed that both self-report (ILP-EE, ILP-EE, HIPS-R and RVEI-EXP) and behavioural (triad classification for squares) low level processing measures predict unique aspects of hypnotic susceptibility, indicating that both are potentially useful ways of investigating the nature of suggestion and hypnosis on the basis of the model presented in this thesis.

The pattern of inter-correlations between the high level processing measures are slightly more encouraging than those for the low level measures. The syllogistic reasoning task, Raven's matrices and the Matching Familiar Figures Test also showed significant inter-correlations as predicted, suggesting that each is measuring a related aspect of high level processing ability. However, none of these measure showed significant correlations with either of the filtering interference tasks, a finding which casts doubt on the notion that the filtering task is measuring an aspect of processing ability. A significant correlation was, however, obtained between the Raven's matrices and RVEI-RAT variables, suggesting that subjects have, to an extent, some insight into their high level processing abilities and are able to report them reliably.

Having addressed the related hypotheses that suggestibility is positively related to a low level processing predisposition and negatively related to a high level processing predisposition in chapters five and six, and the generality of the processing mode construct in the present chapter, our attention will now turn to the predictions of the current model concerning hypnosis itself. In the following two chapters, two studies designed to assess these predictions will be described.

CHAPTER 8: Empirical study 3

A comparison of perceptual integrality and separability in baseline, relaxation and hypnosis conditions.

8.1 Introduction

In chapters five and six, two empirical studies designed to assess the prediction that suggestibility is positively related to a low level processing propensity and negatively related to a high level processing propensity were described. These studies were designed as an empirical assessment of the predictions concerning suggestibility made by the model of suggestion and hypnosis outlined in chapter three. In this chapter and the next, two studies designed to assess the predictions of that model concerning hypnosis itself will be outlined. In each case studies designed to assess the related predictions that hypnosis is associated with a low level processing preference and a high level processing inhibition will be described.

In empirical study 2, baseline scores on a number of behavioural measures of processing predisposition and ability were obtained from 79 graduate and undergraduate students. In order to assess the effect of hypnosis on processing bias, scores from a subset of these subjects on two of these measures, the triad classification and filtering interference tasks, were be compared with two further sets of such measurements, one obtained following hypnosis and the other obtained following a relaxation control. The triad classification and filtering interference tasks were selected for use in this study for a number of reasons. First and foremost, the absence of significant practice effects on these measures (Kemler Nelson, 1996, personal communication) makes them suitable for use in a within subjects design which, due to its greater control and power, is preferred to the independent design alternative. In the case of the remaining measures, practice effects are either common or alternate forms are not available. Second, the relatively opaque nature of the triad classification and filtering interference tasks makes it difficult for subjects to appreciate what the tasks are actually measuring and how. As such, it is unlikely that subjects will be able to anticipate the purpose of the study and give responses on the tasks that they believe are appropriate and in line with the wishes of the experimenter. Such a response set has often been cited by sociocognitive theorists as responsible for the pattern of findings obtained in similar studies, a criticism which may be avoided by this approach. Third, both triad classification and filtering interference tasks are based on the assumption that higher and lower level processing are opposite ends of a processing continuum; as such, the data obtained from these tasks is much richer than if they were assessing the degree to which one or other of the types of processing were being used.

A relaxation control condition was included in this study to assess the effect of hypnosis itself on responses to these measures, independent of any effect that increased relaxation, typically brought about by the induction of hypnosis, might have. In order to establish that the degree of relaxation in the two conditions is comparable and to provide a manipulation check, a measure of relaxation identical to that used in study 2 was presented to subjects before and after relaxation/hypnosis. The inclusion of a baseline condition in this study allowed for an assessment of the possible role that relaxation *per se* may have on processing predisposition; as relaxation is typically a component of hypnosis and might contribute to the nature and frequency of suggested behaviours, the inclusion of a baseline condition was considered essential in this context.

If the predictions of the current model of hypnosis are correct, then one would expect a characteristic pattern of responding on the triad classification and filtering tasks across the three conditions. If, as predicted, hypnosis involves a shift from a high to a low level processing preference then one would expect individuals in the hypnosis condition to show significantly more similarity based responses on the three triad classification measures than when in the relaxation and baseline conditions. Furthermore, as triad classification is known to be affected by relaxation one would predict that a significantly greater proportion of similarity-based responses would be found in the relaxation condition than in the baseline condition. If there is a shift towards a low level processing preference during hypnosis and this is due to a relative inability to engage in higher level processing, then one would expect a significantly greater interference effect on the filtering task during the hypnosis condition compared to relaxation and baseline, as well as more similarity based responses in triad classification. Inclusion of both high and low suggestibility groups allowed us to identify whether such effects, should they be present, are confined to those individuals previously shown to respond to suggestions during hypnosis.

8.2 Method

8.2.1 Subjects

Subjects were 34 graduate and undergraduate students from University College London, of which 7 were male and 27 were female. All subjects were volunteers who were contacted following their participation in empirical study 2. Mean age was 23.85 years (s.d. 5.47 years; range 18-43 years). 17 of the subjects had scored between zero and five on the HGSHS:A (average HGSHS score of 2.88; s.d. 1.73) and had all failed the amnesia item; together they formed the low suggestibility[69] group, which consisted of 5 males and 12 females with a group average age of 25.76 years (s.d. 6.66 years; range 18-43 years). 17 of the subjects had scored between eight[70] and 12 on the HGSHS:A, with an average HGSHS score of 9.88 (s.d. = 1.11); together they formed the high suggestibility group, which consisted of 2 males and 15 females with a group average age of 21.94 years (s.d. 3.11 years; range 18-30 years). Each subject received £10 for taking part. Informed consent was obtained from all subjects.

8.2.2 Design

This study employed a 2 × 3 split-plot quasi-experimental design, using one within and one between subjects independent variable. The within subjects[71] independent variable was condition and had three levels, baseline, relaxation and hypnosis. The between subjects variable was suggestibility group and had two levels, high and low (see section 7.2.1). Five dependent variables (for details see section 6.2.2) were employed in this study (i) filtering interference (angles); (ii) filtering interference (size); (iii) triad classification (squares); (iv) triad classification (triangles); and (v) triad classification (angles). It was predicted that subjects in the hypnosis condition would show significantly more similarity based (i.e. integral) responses on all three triad classification stimuli (angles, triangles and squares) compared to the baseline and relaxation conditions. In addition, it was expected that the relaxation condition would be associated with significantly more similarity based responses than the baseline condition, due to the reported influence that adopting a relaxed mode of responding has on triad

[69] In the majority of research using hypnotic suggestibility as a grouping variable, a score of less than three or four on the HGSHS:A is typically taken as representing low suggestibility. While such a practice is ideal, the poor response rate of subjects scoring within this range meant that a more generous low suggestibility criterion had to be adopted in this study. Failing the amnesia item on the HGSHS:A, which is generally considered to be one of the most difficult items on the scale, was taken as a further rough criterion for inclusion in the low suggestibility group to increase the likelihood of valid subject selection.

[70] One subject with a score of eight on the HGSHS:A had to be included in the high suggestibility group due to a similar lack of willing volunteers. Most researchers take a score of nine or ten and above on the HGSHS:A as the criterion for high suggestibility.

[71] The use of within subjects designs for studies investigating the effect of hypnosis has previously been contraindicated due to the possibility of so-called 'holdback' effects (see e.g. Barabasz & Barabasz, 1992). However, as such holdback effects predict an improvement in performance for highly suggestible subjects during hypnosis due to increased motivation, this possibility was not considered a problem in the current context. This is because increased motivation should lead to more dimensionally based responses on triad classification and a smaller interference effect in filtering (Foard & Kemler Nelson, 1984), which is the opposite effect to the one predicted here. As such, adoption of the more powerful within subjects design was considered justified.

classification performance. It was also predicted that subjects in the hypnosis condition would show a significantly greater interference effect on the filtering task (for both angles and size) compared to the baseline and relaxation conditions. Furthermore, it was predicted that both of these effects would interact with susceptibility level, such that the effect would only be shown for highly susceptible subjects. Analysis was by three 2 × 3 mixed model analyses of variance[72] for the triad classification task (one for each type of stimulus) and two 2 × 3 mixed model analyses of variance for the filtering task (one for each primary dimension). Self-reported relaxation was compared across relaxation and hypnosis conditions in order to assess whether the two are comparable. The use of multivariate analysis of variance (MANOVA) was considered and rejected due to the predicted heterogeneity of the regression between covariates and dependent variables for the high and low suggestibility groups (i.e. it is predicted that the relationship between relaxation and scores on each of these measures will be different for the high and low suggestibility groups in the hypnosis condition).

8.2.3 Materials

See section 6.2.2 for details of the filtering and triad classification tasks and the mood measures used in this study. See section 6.3 for details concerning the scoring of the filtering task.

Hypnotic induction: A standardised hypnotic induction (see appendix IX) was presented via audio-tape to all subjects in the hypnosis condition to ensure control. Prior to the induction, all subjects received the instructions included in appendix X, which were read verbatim by the experimenter. The induction consisted of a set of progressive muscle relaxation instructions involving imagery aimed at tension-reduction (e.g. the image of elastic bands becoming looser), followed by 'special place' imagery which was left deliberately under-specified to allow the subject to adopt the images they felt most comfortable with. A descent image was then embedded into the special place imagery with the use of counting to accompany the descent. Followed by further elaboration of the new special place image, subjects were informed that the main part of the experiment would begin presently and told to wait for further instructions. Following completion of the experimental tasks the audio-tape was restarted and the deinduction routine (see appendix X) presented. The induction lasted approximately 14 minutes in total.

[72] The categorical nature of the triad set variable renders it unsuitable for inclusion as a covariate in the analyses presented here.

Relaxation control: It was decided that a formal relaxation procedure such as that at the start of the hypnotic induction (progressive muscle relaxation, imagery for tension-reduction etc.) would not be used as a control in this context: the subjects' knowledge of the experimenter's research interests and the nature of the laboratory setting used were deemed such that any relaxation procedure of this sort would in itself be regarded as an hypnotic induction. As the belief that a procedure is hypnosis is arguably the most critical element to any hypnotic induction, inadvertently engendering this belief would entirely contradict the purposes of including a relaxation control in this study. Accordingly, as an analogue of the hypnotic induction, it was decided that subjects in the relaxation control condition would be played a short edited excerpt of comparable length (14 minutes) from Lewis Caroll's *Alice in Wonderland* (see appendix XI). In order to maximise the congruence between the hypnotic induction and the relaxation control, subjects were asked to close their eyes, think along with the story and imagine the events as they were described to them on the tape; they were also instructed to allow themselves to become as relaxed as possible. It is hoped that by such procedures the hypnotic induction may be simulated as closely as possible, in that a comparable level of relaxation can be achieved and similar cognitive processes will be engaged by its presentation. The particular excerpt chosen was selected for its relatively simplistic language, its emphasis on the vivid description of the narrative events (rendering it easy to image), and its emphasis on fantastic rather than realistic events, making the similarity to an hypnotic induction as complete as possible; hopefully, however, it will do so without creating the belief that it is an hypnotic induction procedure.

Prior to the tape, all subjects received the instructions presented in appendix XII which were read verbatim by the experimenter.

8.2.4 Procedure

All subjects completed empirical study two prior to participation in this study, with study 2 scores on the triad classification and filtering tasks forming the baseline measures for use here. Following participation in study 2, subjects were contacted by letter and asked if they would like to take part in a study investigating the relationship between hypnosis and thinking style. They were informed that the study would consist of two sessions each of an hour in length, one of which would involve relaxation and two simple tasks and the other involving hypnosis and two simple tasks. All subjects were informed that the order of the sessions would be randomly determined on the day of the first session, and that a payment of £10 would be made following completion of the second session. Presentation of the hypnosis and relaxation conditions was counterbalanced across both suggestibility groups, such that approximately half of the low and half of the high suggestible subjects received hypnosis first and relaxation second, with the opposite order being used for the remaining subjects. Upon arrival at the first session (excluding baseline), subjects were again informed of the purpose of the study and the nature of the two sessions. Subjects were then given the opportunity to ask questions and written consent for participation was obtained. They were then told which session they would be participating in on that day, and given the appropriate instructions (see appendices X and XII). The baseline relaxation measure was then taken and the audio-tape was started. Throughout both sessions subjects were seated in a comfortable chair in a well-lit room. Following the hypnotic induction or the relaxation script, the post-tape relaxation measure was taken and the triad classification and filtering tasks were given in that order (see section 6.2.3). The triad classification set given was counterbalanced across the three sessions according to a latin squares design; the filtering task received first (i.e. angle or size) was kept constant across the three sessions but counterbalanced between subjects, such that half of the subjects in each group received angles first and half received size first. Following completion of the tasks and, in the case of the hypnosis condition, the taped de-induction routine, subjects were told that the session was over and arrangements were made for participation in the next session. After completion of both sessions, each of which lasted approximately one hour, subjects were thanked for their participation and paid £10.

The experimenter remained blind to suggestibility group for the majority of subjects in this study. Blindness was achieved with the assistance of a confederate who examined HGSHS:A records, identified subjects of high or low suggestibility and presented the experimenter with a randomised list of suitable individuals to contact for study participation. Although blindness was achieved in the vast majority of cases, two subjects of known suggestibility had to be included in the latter stages of testing to ensure an adequate low suggestible group size. Although such a practice is not ideal, in the present context it was unavoidable for practical reasons; it is hoped that the highly standardised procedures used in this study would minimise the possible effect that any loss of blindness might have on the results.

8.3 Results

8.3.1 Data screening and preliminary analyses

Prior to analysis the data-set was screened for missing values. Two missing values were identified, one each for the baseline relaxation and pre-tape relaxation (relaxation condition) variables. Each of the missing values were attributable to experimenter error; as the missing values appeared randomly distributed they were replaced by the series mean in each case. The data-set was then screened for univariate outliers; one case had a high *z* score on the baseline interference (angles) variable, making it a potential outlier. However, in order to preserve maximum power and avoid the problems associated with unequal group sizes, it was retained for analysis.

Each variable was then assessed for normality. Most of the variables were normally distributed, with a small number of exceptions: (i) the triad classification (angles) variable showed significant negative skewness ($p \leq 0.01$) for both groups in all conditions except hypnosis for the high suggestibles; and (ii) the interference (angles) variable showed significant negative skewness in the hypnosis and relaxation conditions for the low suggestibles and significant positive skewness for the high suggestibles in the baseline condition. In order to account for these deviations from normality, the triad classification (angles) variable in each[73] condition for both groups was transformed by reflection and inversion. In addition, the interference (angles) variable in each condition for both groups was reflected and logarithmically transformed.

Prior to the main body of the analysis, the pre- and post- tape relaxation scores in the hypnosis and relaxation conditions were compared to assess the impact of the interventions on self-reported levels of relaxation. Table 8.1 provides descriptive statistics for pre- and post-tape self-reported relaxation in the relaxation and hypnosis conditions; figures 8.1 and 8.2 provide graphic representations of these data for the relaxation and hypnosis conditions respectively. Inspection of table 8.1 and figure 8.1

[73] In order to ensure consistency and hence interpretability it is necessary to perform transformations on all of the levels of a variable rather than just one or two, regardless of whether or not all of the levels show a non-normal distribution. This is, of course, assuming that the transformation itself does not make a previously normal distribution non-normal.

Table 8.1: Mean pre- and post-tape relaxation scores for high and low suggestible subjects in relaxation and hypnosis conditions.

CONDITION	TIME Pre-tape	Post-tape
Relaxation		
Low suggestibles (n = 17)	87.75 (26.62)	105.82 (23.11)
High suggestibles (n = 17)	84.35 (29.88)	116.35 (18.70)
Hypnosis		
Low suggestibles (n = 17)	83.18 (23.77)	114.82 (25.53)
High suggestibles (n = 17)	92.18 (31.71)	122.06 (23.06)

Note: Standard deviations are shown in parentheses

Figure 8.1: Mean pre- and post-tape relaxation scores for high and low suggestibles in relaxation condition

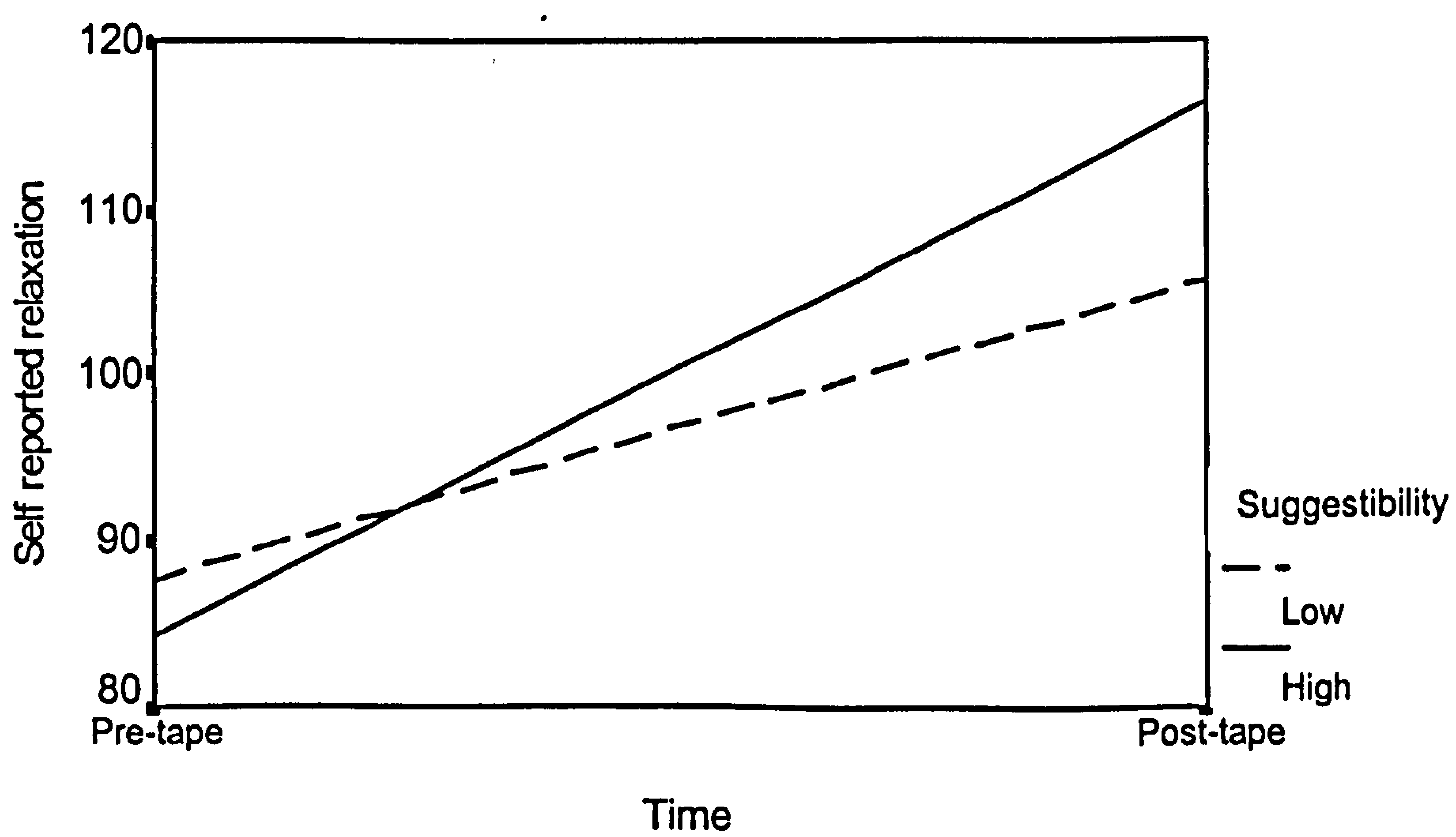
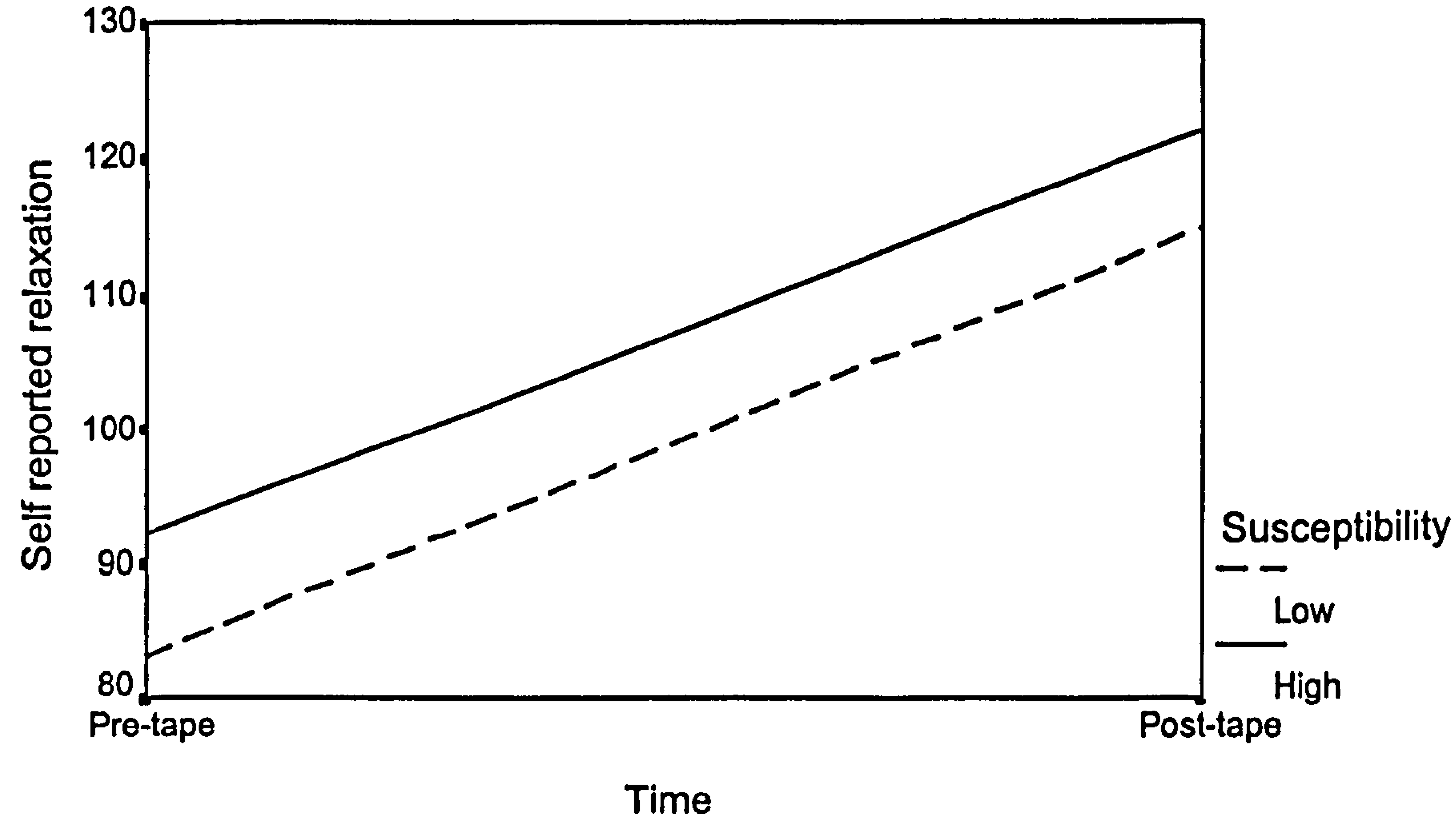


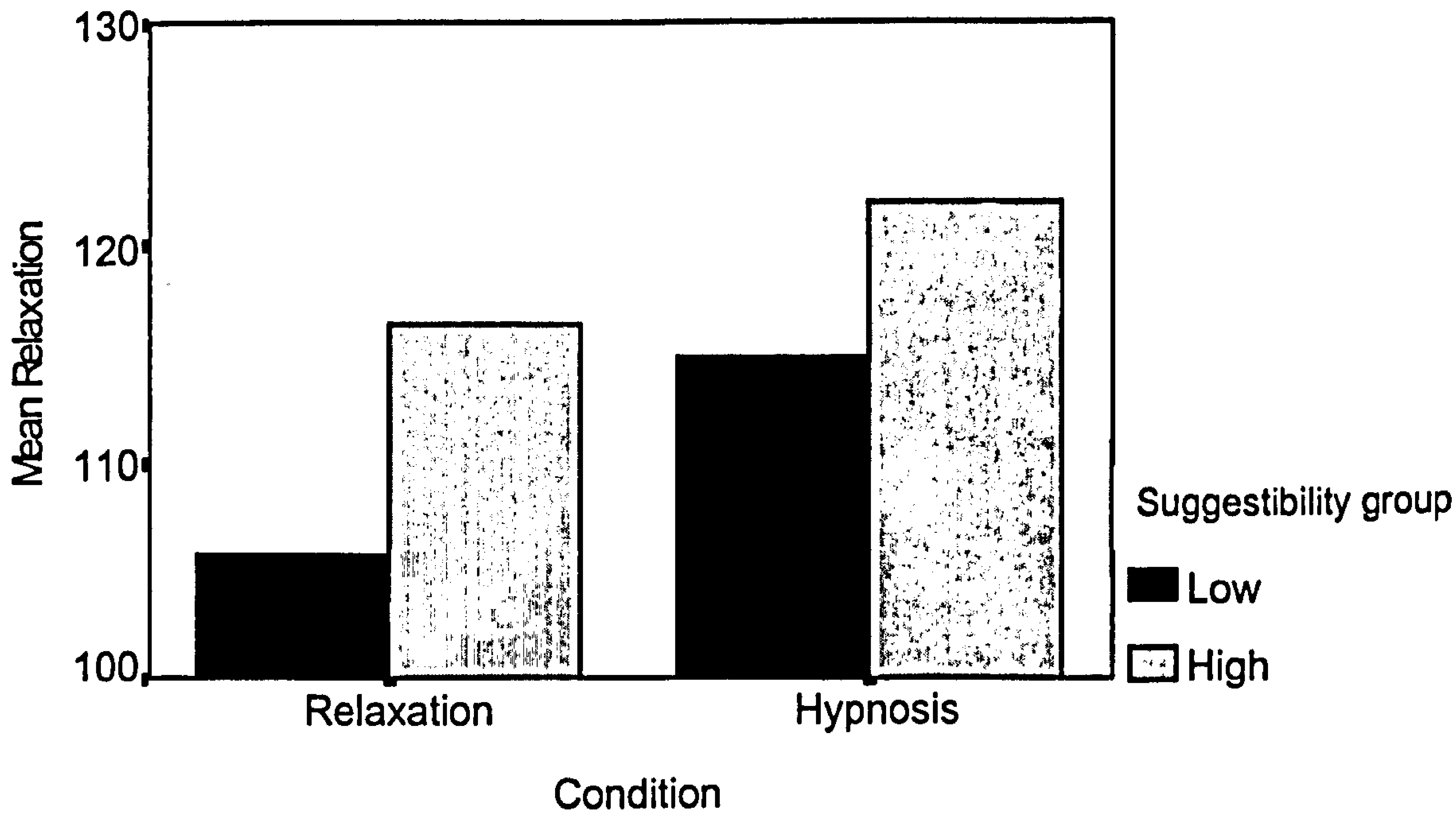
Figure 8.2: Mean pre- and post-tape relaxation scores for high and low suggestibles in hypnosis condition



indicates that both high and low suggestible groups show comparably high levels of self-reported relaxation prior to the tape in the relaxation condition, and both groups show large and comparable increases in relaxation post-tape. In order to examine this observation statistically, a 2 × 2 mixed model analysis of variance with one between (suggestibility group: high and low) and one within subjects variable (time: pre-tape and post-tape) was performed on the relaxation scores for the relaxation condition. A significant main effect for time was found, $F_{(1,32)} = 42.92$, $p \leq 0.0005$ (one tailed), indicating that self-reported relaxation is significantly higher following the relaxation tape compared to before the tape (see appendix XVI, summary table 3A). Neither the main effect for suggestibility group or the group × time interaction was significant.

Inspection of table 8.1 and figure 8.2 indicates that both high and low suggestible groups show comparably high levels of self-reported relaxation prior to the tape in the hypnosis condition, and both groups show large and comparable increases in relaxation post-tape. In both cases, however, the highly suggestible group showed higher levels of relaxation than the low suggestibles. A second 2 × 2 mixed model ANOVA with suggestibility group as a between subjects variable and time as a within subjects variable was performed on the relaxation scores for the hypnosis condition. A significant main effect for time was found, $F_{(1,32)} = 45.35$, $p \leq 0.0005$ (one tailed), indicating that self-reported relaxation is significantly higher following the hypnosis tape compared to

Figure 8.3: Mean post-tape relaxation in hypnosis and relaxation conditions for high and low suggestibles



before the tape. Neither the main effect for suggestibility group or the group × time interaction was significant (see appendix XVI, summary table 3B). It can therefore be concluded that levels of self-reported relaxation for high and low suggestible subjects were significantly higher following both hypnosis and relaxation tapes as predicted.

Having ascertained that both hypnosis and relaxation tapes bring about significant increases in self-reported relaxation for both groups of subjects, we must now address the question of whether or not the overall levels of relaxation in the hypnosis and relaxation conditions are comparable as intended. Figure 8.3 shows the comparison between the post-tape relaxation scores in the relaxation and hypnosis conditions for both high and low suggestible subjects. Inspection of table 8.1 and figure 8.3 indicates that for both high and low suggestible subjects the overall level of relaxation in the relaxation condition is somewhat lower than in the hypnosis condition, with this difference being more marked for the low suggestible subjects. In order to assess these differences statistically, a 2 × 2 mixed-model ANOVA with condition as a within subjects variable and group as a between subjects variable was performed on the post-tape self-reported relaxation data. A significant main effect for condition was found, $F_{(1,32)} = 6.89$, $p \leq 0.05$ (one-tailed), indicating that self-reported relaxation is significantly higher in the hypnosis condition compared to the relaxation condition. Neither the main effect for group or the group-condition interaction was significant (see appendix XVI, summary table 3C). Although the relaxation condition was included to control for relaxation induced by hypnosis, this finding indicates that control has not been fully achieved. Unfortunately, this variable cannot be included as a covariate in statistical analysis due to the fact that it varies across levels of the within-subjects factor. As such, the interpretation of any results obtained here must be tempered by the lack of perfect control achieved in this study.

Finally, an assessment of the differences between the three classification sets for the triad classification (triangles) variable is required. As was demonstrated in chapter 6, the three triad classification sets do not yield the same proportion of similarity based responses, and it is possible that counterbalancing of set across conditions was not sufficient to completely remove any systematic influence of this variable in this study. Accordingly, the proportion of similarity based responses for the triangle stimuli across the three triad sets within each condition were compared using three separate one-way analyses of variance. No significant differences were found between any of the sets in any of the conditions, indicating that we can be relatively confident in assuming that triad set has not systematically influenced the findings of the present investigation.

Having performed all data-screening and preliminary analyses, the main body of the analysis can begin. For the sake of explanatory ease, the data from the triad classification and filtering tasks will be examined separately.

8.3.2 Main study analyses

Triad classification: Table 8.2 presents descriptive statistics for the triad classification task in baseline, relaxation and hypnosis conditions and for the high and low suggestibility groups. Inspection of table 8.2 indicates that there are few differences between conditions for any of the triad classification stimuli. For the low suggestible group, there is a degree of variation across conditions in the proportion of similarity based responses for angle classification, with similarity based responses highest in the relaxation condition followed by the hypnosis and baseline conditions (see note 2). This trend is not apparent for the highly suggestible subjects, however. For both high and low suggestible subjects there is an apparent trend in similarity based responses for triangle classification, with the most similarity based responses being made in the baseline condition, followed by the relaxation and hypnosis conditions for both groups. Neither high nor low suggestibles show any trend across conditions for square classification,

Table 8.2: Mean proportion of similarity-based responses for triad classification stimuli in baseline, relaxation and hypnosis conditions for low and high suggestibility groups.

	CONDITION		
STIMULI/GROUP	Baseline	Relaxation	Hypnosis
Angles			
Lows	.96 (.05)	.87 (.17)	.89 (.15)
Highs	.93 (.09)	.93 (.11)	.93 (.08)
Squares			
Lows	.36 (.18)	.31 (.30)	.34 (.27)
Highs	.46 (.27)	.44 (.29)	.42 (.27)
Triangles			
Lows	.52 (.23)	.40 (.35)	.39 (.29)
Highs	.57 (.29)	.51 (.25)	.46 (.30)

Note 1: Standard deviations are shown in parentheses

Note 2: Values for the angle stimuli correspond to the transformed data; as transformation involved reflection, relatively small scores refer to relatively large proportions of similarity based responses.

Note 3: Table contains descriptive data for the triad classification task without adjustment for relaxation or triad classification set.

however. Finally, high suggestibles in general appear to show a greater proportion of similarity based responses for all types of classification stimuli compared to low suggestibles.

Three 2 × 3 mixed model analyses of variance with one between subjects factor (suggestibility group: high and low) and one within subjects factor (condition: baseline, relaxation and hypnosis) were performed on the proportion of similarity based responses in triad classification, one each for the angle, square and triangle stimuli. Transformed data for the angle stimuli was used, rather than the raw scores. As in the previous chapters, an alpha value of 0.05 was adopted for these *a priori* analyses. At this level, none of the main effects or interactions were significant for the angle and square triad classification stimuli (see appendix XVI, summary tables 3D and 3E); however, a significant main effect for the triangle stimuli was found, $F_{(2,64)} = 3.865$, $p \leq 0.05$ (see appendix XVI, summary table 3F). In order to ascertain the location of this effect, a planned orthogonal contrast comparing the proportion of similarity based responses (collapsed across susceptibility groups) in the baseline condition with the combined relaxation and hypnosis conditions was performed. The baseline condition differed significantly from the combined relaxation and hypnosis conditions, $F_{(1,33)} = 6.405$, p

Table 8.3: Mean filtering task interference effect for size and angle dimensions in baseline, relaxation and hypnosis conditions for low and high suggestibility groups.

STIMULI/GROUP	CONDITION		
	Baseline	Relaxation	Hypnosis
Angles			
Lows	.47 (.09)	.47 (.12)	.44 (.17)
Highs	.40 (.37)	.45 (.15)	.45 (.20)
Size			
Lows	.09 (1.29)	.25 (1.25)	-.13 (.83)
Highs	-.09 (1.12)	-.25 (1.07)	.13 (1.55)

Note 1: Standard deviations are shown in parentheses

Note 2: Values for the angle dimension correspond to the transformed data; as transformation involved reflection, relatively small scores refer to a relatively large interference effect.

0.05 (two-tailed), indicating that there is a significantly higher proportion of similarity-based responses in triad classification for triangles in the baseline condition than in the other two conditions (see appendix XVI, summary table 3G); such a finding runs in the opposite direction to that predicted. The contrast between the relaxation and hypnosis conditions was not significant (see appendix XVI, summary table 3H).

Filtering task: Table 8.3 presents descriptive statistics for the filtering task. Inspection of table 8.3 indicates that there are no apparent differences between any of the conditions or the high and low suggestible groups for either of the dimensions. Two 2 × 3 mixed model analyses of variance with susceptibility group as a between subjects factor and condition as a within subjects factor were performed on the interference data for the angle and size dimensions. A per-comparison alpha value of 0.05 was again adopted. For ANOVA involving the angle dimension transformed data was used. None of the main effects or interactions were significant for either of the dimensions, confirming that no differences in the interference effect exist between any of the conditions or groups (see appendix XVI, summary tables 3I and 3J).

8.4 Discussion

No significant predicted differences between any of the conditions or groups on any of the tasks employed in this study was found, leading to the rejection of both experimental hypotheses. The findings obtained in this study therefore contradict the predictions laid out by the model of hypnosis presented in chapter three: there is no evidence to suggest that hypnosis is characterised by an increased low level processing preference as indicated by a similar proportion of similarity based responses for all triad classification stimuli across baseline, relaxation and hypnosis conditions for all types of stimuli used. Similarly, there is no evidence to suggest that hypnosis is characterised by a relative inability to engage in higher level processing, as indicated by a similar degree of filtering interference for both size and angle dimensions in the three conditions. This latter finding also contradicts dissociated control theory which makes a similar prediction to the present theory regarding higher level inhibition during hypnosis. Furthermore, both findings contradict the assertion made by the ego-psychological and neuropsychophysiological theories that hypnosis involves a shift towards holistic forms of cognition, at least by the definition of holistic processing adopted in the literature concerning perceptual integrality and separability. The absence of a significant main effect for suggestibility also contradicts the earlier finding (see chapter six) indicating a relationship between suggestibility and triad classification (square stimuli). While the absence of such an effect is disappointing, it may be the product of the relatively liberal suggestibility criteria used for subject selection in this study.

In the case where there was a significant difference between conditions, that for triad classification with the triangle stimuli, there was a significantly greater proportion of similarity based responses in the baseline condition compared to the relaxation and hypnosis conditions, a difference which is in the opposite direction to that anticipated. Moreover, for these stimuli there was no difference between the hypnosis and relaxation conditions, despite there being a significant difference in self-reported relaxation between the two. It has previously been shown that instructing individuals to adopt a relaxed response set increases the proportion of similarity-based responses in triad classification (see Foard & Kemler Nelson, 1984). However, this result appears to suggest that the converse is true: asking someone to relax actually *decreases* the proportion of similarity-based responses in triad classification using triangle stimuli. There is no immediately obvious interpretation for this finding, although it is possible that subjects in the relaxation and control condition are simply more focused on the task due to their increased relaxation and display less similarity-based responses for this reason. Such an explanation raises the possibility that a distinction needs to be drawn between simple physical relaxation and a relaxed response set.

One possible explanation for why no differences were found between any of the conditions on the filtering task specifically might be the procedural differences between the use of the task in this study compared to previous research. J. D. Smith and Baron (1981), whose research provided the basis for the filtering methodology employed in this study, employed six trials each for the interference and control sets on each dimension, whereas this study employed only five. The use of only five filtering trials was decided upon following pilot research which indicated that subjects very quickly lose motivation on this tedious task, often after only four or five trials in total. Such a loss of motivation was regarded as counter-intuitive to the rationale behind the task (in that it could differentially affect performance on the control and interference sets which vary in difficulty) and would consequently distort any findings obtained on it; accordingly, fewer trials were used than in previous research. However, it is possible that reducing the number of filtering trials in this study prevented subjects from reaching asymptotic performance on the task which is essential if valid interference effects are to be observed (Kemler Nelson, 1996, personal communication). If this task is to be used again in future research it is essential that this potential problem is countered by maximising the number of trials used, regardless of how unmotivated subjects become whilst completing it. It is suggested that any motivational problems arising through the use of this task might be minimised by presenting it as computer-based task, which would reduce the amount of time between trials and have the added benefit of reducing measurement error resulting from human-based timing.

Finally, some mention should be made of the relaxation control condition used in this study. A relaxation control was included here to enable inferences to be drawn about the effect of hypnosis on processing ability and preference independent of the effects of relaxation and imaging brought about by the hypnotic induction. The validity of such a control condition rests on its ability to induce the same level of relaxation as the hypnotic induction without actually engendering the belief in subjects that hypnosis is being used. However, a comparison of the post-tape relaxation scores in the hypnosis and relaxation conditions indicated that equivalent levels of self-reported relaxation had not been achieved in the two conditions, with the hypnotic induction bringing about significantly greater levels of relaxation than its non-hypnotic counter-part. However, as none of the predicted findings were obtained the importance of controlling relaxation across conditions is less pressing[74]. While such a difference in self-reported relaxation somewhat undermines the usefulness of the relaxation control condition used here,

[74] Unless, of course, one believes that these non-significant differences are the product of relaxation obscuring the effect that hypnosis would otherwise have had on the study measures. As there are no theoretical grounds on which to base such a view it is rejected here.

results nevertheless revealed that the control was successful in bringing about significantly greater levels of self-reported relaxation, with the difference in relaxation between hypnotic and non-hypnotic conditions actually being relatively small. Although it is conceivable that a more formal relaxation procedure would be more successful in inducing comparable levels of relaxation to an hypnotic condition than the control used here, if to do this requires instilling the belief that hypnosis is being used, then the relaxation control used here, although not perfect, still seems the most suitable alternative.

In summary, the findings of this study contradict the prediction made by the model of suggestion and hypnosis outlined in chapter three: no evidence was found indicating that hypnosis is associated with an increased preference for low level processing or a high level processing inhibition. It is nevertheless conceivable that the non-significant findings obtained in this study are due to the use of tasks that are insensitive to the cognitive changes occurring as the result of an hypnotic induction. In the next chapter, a second study designed to assess the prediction that hypnosis is associated with high level processing inhibition will be described. In that study, high level processing ability will be assessed using a different methodology that provides an alternative approach to the research questions under examination here.

CHAPTER 9: Empirical study 4

A comparison of critical thinking ability in relaxation and hypnosis conditions.

9.1 Introduction

In chapter eight, a study designed to assess the related hypotheses that hypnosis involves a shift towards low level cognitive processing and a high level processing inhibition was described. In this chapter, a second study designed to assess the latter of these hypotheses (i.e. that concerning high level inhibition) from a different perspective will be presented, in a bid to further understand the relationship between hypnosis and cognitive processing. The use of alternative methodologies to assess this hypothesis is important given the evidence reported in chapter seven indicating that the relationship between different measures of putative processing predisposition is not as high or pervasive as predicted by the model presented in chapter two. In addition, the application of alternative methodologies in this context extends the research base addressing the model presented here, and provides a more rigorous examination of the high level inhibition hypothesis.

According to the model of hypnosis presented in chapter three, one of the mechanisms underlying the shift towards low level processing regarded as responsible for the more efficient operation of suggestion during hypnosis might be the reduction in critical thought assumed to be brought about by a state of intense absorption. The notion that hypnosis brings about a reduction in critical thought is central to the ego-psychological and neuropsychophysiological theories of hypnosis, and is implicitly adopted by the neodissociation and dissociated control theories in their assertion that hypnosis involves the inhibition of higher level cognitive processes. Moreover, the notion is central to the concept of absorption (see Tellegen & Atkinson, 1974), which has been embraced by accounts of hypnosis from across the theoretical spectrum, both state and non-state alike. As such, it represents one of the most enduring elements of hypnosis theory to date.

The idea that hypnosis involves a reduction in critical thought which is central to the production and maintenance of hypnotic behaviours stems, to a considerable extent, from the research of Martin Orne into the concept of so-called 'trance logic', or the tolerance for logical incongruities apparently displayed by susceptible subjects during hypnosis. In the original demonstration of the phenomenon, a susceptible subject given a suggestion for the visual hallucination of an experimental confederate expresses surprise, but no obvious concern, when the confederate steps into view and they see both real and hallucinated individuals simultaneously, the so-called double-hallucination effect. The fact that the hypnotic individual expresses no concern at the clearly logically incongruous dual-presence of the experimental confederate seems to suggest that the subject is thinking in an unusual fashion, or displaying 'trance logic'. Having demonstrated that this trance logic effect in visual hallucination is not shown by subjects instructed to simulate hypnosis, Orne (1959) concluded that the suspension of logical reality is part of the essence of hypnosis, and might be responsible for the seemingly unusual behaviours displayed therein.

However, as was discussed in chapter one, the evidence for the trance logic effect has been widely criticised on both methodological and conceptual grounds, and alternative explanations which do not rely on the trance logic concept have been advanced for these findings. Furthermore, regardless of one's interpretation of the trance logic data, the methods that have been used to assess the validity of the concept have only examined the nature and incidence of apparently logically incongruous behaviour; such studies cannot therefore provide any information regarding whether or not the susceptible individual is actually capable of engaging in critical thought during hypnosis. If the temporary suspension of critical thought is one of the mechanisms underlying the greater suggestibility of hypnotic subjects as suggested by many hypnosis theorists, then one would expect such subjects to display not only logically incongruous behaviour but also a relative inability to perform logical tasks during hypnosis. However, a rigorous search of the literature using currently available software reveals that no direct test of this notion has been published, which, given the ubiquity of the trance logic notion, is perhaps somewhat surprising. In a bid to remedy this situation, the study reported in this chapter provides such a test.

One of the commonest ways by which logical or critical thought is assessed is through the use of syllogistic reasoning tasks, such as that employed in study two. Accordingly, in this study syllogistic reasoning performance in hypnotic and non-hypnotic conditions was compared for both high and low suggestible individuals. Whereas in study two, only total score was taken as a measure on the syllogistic reasoning task, in this study the amount of time taken to complete the task was also measured. As was discussed in chapter six, not including such a measure was an important oversight in study two that may have reduced any potential correlation between suggestibility and syllogistic reasoning performance. The inclusion of a time variable acknowledges the fact that an individual who correctly answers as many syllogisms as another, when the latter takes twice the time to complete them, has actually performed better on the task. In order to reduce the impact of impulsive responding which is likely to distort true reasoning ability, subjects were told that they could take as long as they like to complete the questions.

Unlike study three, only two conditions were included in this experiment, one hypnotic and the other a relaxation control. The decision to include only two conditions was made entirely on practical grounds concerning the increased amount of testing time that the inclusion of a third condition would involve. This decision was considered justified given the inherent time constraints placed upon the current undertaking and the relatively high probability that an independent design would need to be used in this study (see section 9.2.1): it was anticipated that not enough subjects of appropriate suggestibility levels could be obtained to provide sufficiently large group sizes if a three-condition independent design was required. As a relaxation condition provides a more appropriate control than a baseline condition, the former was chosen for inclusion in preference to the latter. Due to the problems with the syllogistic reasoning task used in study two, the construction of a new task was required here and comparisons between that study and this would therefore be inappropriate. However, as scores obtained on the syllogistic reasoning measure in study two provide some information about subjects' baseline reasoning performance, they were used here as covariates in analysis.

If, as the model of hypnosis offered in chapter three predicts, hypnosis involves a temporary suspension in the ability to think critically, then one would expect syllogistic reasoning performance during hypnosis to be significantly worse than in a non-hypnotic control condition, assuming equivalent levels of relaxation for the two. Moreover, if highly suggestible individuals respond to more suggestions than low suggestibles in the hypnotic situation because only they experience a reduction in critical thought during hypnosis, then one would expect a significant interaction between suggestibility group and condition; accordingly, one would predict that high suggestibles will show worse syllogistic reasoning performance in an hypnotic compared to a non-hypnotic condition, while low suggestibles will show no reasoning performance differences between the conditions. Unlike in study three, if the levels of self-reported relaxation in the hypnotic and non-hypnotic conditions are not equivalent in the present investigation, the independent design used here renders relaxation suitable for use as a covariate in ANCOVA.

As was discussed in chapter six, reasoning performance has been shown to be affected by the degree of positive emotion felt by the individual; as hypnosis and relaxation conditions could conceivably differ in terms of self-reported happiness levels it is essential that variation between groups on this factor is assessed and used as a covariate in subsequent analyses if significantly different between groups. Accordingly, the self-report measure of happiness used in study two were also included in this study.

One further measure was also be included in this study. In study three, one of the reasons behind the selection of the tasks used was that they were relatively opaque in terms of what they were testing and how, and therefore what patterns of responding might be expected or desired by the experimenter. However, this is not the case for syllogistic reasoning tasks which are entirely transparent both in terms of what they are measuring and the way that they do it. Should the predictions made here be upheld and a significantly inferior reasoning performance be found for the highly suggestible subjects in the hypnosis condition, it might be argued that such a result is simply the product of subject expectations concerning the nature of hypnosis. In other words, subjects may believe that an inability to think critically is characteristic of hypnosis and perform accordingly, either through conscious compliance with the experimenters desires or via the automatic expectancy mechanisms described in chapter three. In order to assess whether any differences in reasoning performance between conditions are the product of such expectations or are an inherent element of hypnosis itself, some measure of subjects' expectations concerning the relationship between hypnosis and critical thought is therefore required. Accordingly, a revised version of the McConkey and Jupp (1985-86) Opinions About Hypnosis Survey including additional questions concerning this issue was used here. The questions concerning hypnosis and critical thought were embedded in the McConkey and Jupp survey rather than presented alone in order to deflect subjects' attention away from the purposes of including such items, which could conceivably have an impact on their subsequent reasoning performance during hypnosis or relaxation.

9.2 Method

9.2.1 Preliminary design considerations

Decisions about the design of the present study are considerably more complex than those concerning study three presented in chapter eight. As in that case, the present prediction stated that individuals would be worse in an hypnotic compared to a non-hypnotic condition, thus making possible the use of a within-subjects design. In the previous study, none of the tasks used had a history of showing practice effects in multiple testing, rendering them suitable for use with a within-subjects factor. In the case of syllogistic reasoning tasks, however, practice effects are common (see Johnson-Laird & Steedman, 1978) as the individual tends to work out over time the rules that are required for their successful completion. Clearly, such practice effects are likely to be even more pronounced when the same measure is given on more than one occasion, as the individual has the benefit of memory as well as reasoning rules to complete the task.

As the superior power and control of a within-subjects factor over the independent alternatives makes it the design of choice where possible, it was decided that every effort should be made here to secure its appropriate use. Accordingly, two further equivalent syllogistic reasoning tasks comparable to that used in study two were constructed. If in pilot work no significant practice effects are obtained on the two alternate forms of the syllogistic reasoning task given in counter-balanced order, and a sufficient level of alternate-forms reliability is attained, then their suitability for use with a within-subjects factor would be ensured. If, however, significant practice effects were obtained then the pilot data would nevertheless provide information concerning the internal reliabilities of the two forms, enabling the selection of the most reliable for use in an independent design.

Unlike in study two, on this occasion the construction of the syllogistic reasoning tasks closely followed the recommendations of Johnson-Laird and Steedman (1978) concerning the possible role of subject beliefs and expectations about the content of the syllogistic premises. Thus, the plausibility of the premises was maximised by using an occupation to denote one term and two different hobbies or interests to denote the other two terms. Fifteen occupations and thirty hobbies/interests were selected and one from the first category and two from the second category were randomly selected for each syllogism. This was done for each reasoning task, with the constraint that no combination of occupations and interests could be the same on both tasks. The form of the fifteen syllogisms selected was the same as those used in the syllogistic reasoning task from study 2 (see section 6.2.2); the order of the syllogisms was randomised for each form of the task. Thus, the two forms are identical in terms of their 'deep' structure i.e. the number and form of syllogisms involved. However, they differ markedly in their 'surface' structure i.e. the terms used in the premises and the order of the syllogisms.

In response to the criticism of the syllogistic reasoning task used in study two, for each form subjects were presented with the instructions provided in appendix XV, which were designed to make the requirements of the task clearer, and further isolate the syllogisms from subject attitudes and expectations (see Johnson-Laird & Steedman, 1978). The syllogistic reasoning task and its instructions were placed together in an A4 response booklet which contained spaces for subjects' answers (see appendices XIII, XIV and XV).

Table 9.1: Means and standard deviations for forms A and B of syllogistic reasoning task independent of test order.

N = 26	Form A	Form B
Mean reasoning score	9.69 (2.43)	10.23 (2.05)

Note: Standard deviations are shown in parentheses

Table 9.2: Means and standard deviations for first and second syllogistic reasoning testing occasions independent of form.

N = 26	First test	Second test
Mean reasoning score	9.54 (2.30)	10.38 (2.14)

Note: Standard deviations are shown in parentheses

The two forms of the syllogistic reasoning task were presented to twenty-six graduate and undergraduate students in a counter-balanced order, with half of the subjects receiving form A first and half form B first. The two forms were given in equivalent testing conditions but on separate days. Descriptive statistics for the two tasks are presented in table 9.1 and table 9.2; in line with the purposes of this study, results have been broken down both into individual forms (table 9.1) and testing occasions (table 9.2).

Examination of table 9.1 reveals that form A is slightly harder than form B. However, a one-way repeated measures analysis of covariance taking test order as a covariate revealed that this discrepancy is not significantly different to zero. Examination of table 9.2 reveals that syllogistic reasoning performance is greater on the second testing occasion than on the first, suggesting that a practice effect is in operation. A paired samples t-test indicated that the difference between the two testing occasions was significantly different from zero, $t_{(25)} = 2.12$, $p \leq 0.05$, confirming the presence of a practice effect in reasoning performance. As such, the use of a within-subjects factor in the current study was proscribed and an independent design was therefore be adopted. The internal consistency of the two forms was calculated; form A yielded a Cronbach's alpha of .6297, while form B yielded a Cronbach's alpha of .5279. As form A clearly possesses superior internal consistency to form B, it was selected for use in this study.

9.2.2 Design

A 2 × 2 independent quasi-experimental design with matching on hypnotic susceptibility between subjects in the two conditions was used here. The two independent variables were suggestibility group (high vs. low) and condition (relaxation vs. hypnosis). There were two dependent variables in this study, number correct on the syllogistic reasoning task and the time taken to complete it. It is hypothesised that highly suggestible subjects will show significantly greater syllogistic reasoning performance in the relaxation compared to the hypnosis condition, while low suggestibles will not show such a significant difference. Analysis was by 2 × 2 multivariate analysis of covariance taking syllogistic reasoning performance scores obtained in study 2 as a covariate. The use of MANOVA allows an analysis of the differences between the conditions in terms of overall syllogistic reasoning performance (i.e. a combination of both dependent variables) as well as differences between time and number correct independently. Should there be a significant difference between the relaxation and control conditions in self-reported relaxation, this will be taken as a further covariate.

9.2.3 Subjects

Subjects were 40 graduate and undergraduate students from University College London, of which 8 were male and 32 were female. All subjects were volunteers who were contacted following their participation in empirical study 2. Mean age was 24.45 years (s.d. 4.87 years; range 18-43 years). 20 of the subjects had scored between zero and five on the HGSHS:A (average HGSHS score of 2.85; s.d. 1.63) and had all failed the amnesia item; together they formed the superordinate low suggestibility group. These 20 subjects were then pseudo-randomly divided into two groups of 10 subjects such that the average suggestibility score in each group was roughly the same. One group, consisting of 3 males and 7 females with an average age of 25.3 years (s.d. 3.68 years) and HGSHS score of 2.9 (s.d. 1.45) was then randomly assigned to the hypnosis condition. The other group, consisting of 2 males and 8 females with an average age of 27.6 years (s.d. 6.74 years) and an average HGSHS score of 2.8 (s.d. 1.87) was assigned to the relaxation condition. 20 of the subjects had scored between eight and 12 on the HGSHS:A, with an average HGSHS score of 9.85 (s.d. = 1.18); together they formed the superordinate high suggestibility group. These 20 subjects were then pseudo-randomly divided into groups of 10 subjects on the basis of suggestibility score such that the average suggestibility score in each group was roughly the same. One group, consisting of 1 male and 9 females with an average age of 24.0 years (s.d. 3.8 years) and an average HGSHS score of 9.9 (s.d. 1.32) was then randomly assigned to the hypnosis condition. The other group, consisting of 2 males and 8 females with an average age of 20.9 years (s.d. 1.79 years) and HGSHS score of 9.8 (s.d. 1.14) was assigned to the relaxation condition. Each subject received £5 for taking part. Informed consent was obtained from all subjects.

9.2.4 Materials

McConkey and Jupp (1986) Opinions About Hypnosis Survey: A revised version of the McConkey and Jupp (1986) opinions about hypnosis survey was constructed. The McConkey and Jupp (1985-86) survey comprises twenty-five statements corresponding to commonly held beliefs about hypnosis which subjects must rate their agreement with on a four point Likert scale ranging from 1 (agree strongly) to 4 (disagree strongly). Four additional items concerning the relationship between hypnosis and critical thinking were constructed and added to the scale. The four additional items were: (1) 'during hypnosis responsive subjects are able to think more clearly than when not hypnotised'; (2) During hypnosis responsive subjects seem to understand things better; (3) During hypnosis responsive subjects tend to be more irrational than when not hypnotised; and (4) Hypnosis makes responsive subjects less able to think properly than when not hypnotised. Items one and two refer to a positive relationship between hypnosis and thinking (i.e. hypnosis makes thinking easier or better) while items three and four refer to a negative relationship between hypnosis and thinking (i.e. hypnosis makes thinking more difficult or worse). Both positive and negative items were included in order to minimise the possible influence of response bias, and will be treated as separate because agreement with the positive items does not necessarily imply disagreement with the negative items and vice versa.

The order of the twenty-five original and four additional items was randomised with the constraint that the additional items could be no less than two items apart. Questions were then put together in an A4 response booklet. In order to maximise the variance in subjects' responses to the questionnaire, the original four-point Likert scale was changed to a five point scale, with the additional point corresponding to a 'neither agree nor disagree' option that was placed in the middle of the scale. Inclusion of this point has the additional advantage of reducing the likelihood of subjects missing items out because they feel neither agreement nor disagreement with them, a problem apparently responsible for some of the missing data in study one.

(i) For details of the syllogistic reasoning task used here see section 9.2.1. A stopwatch was used to time subjects' completion of the task.

(ii) The hypnotic induction and relaxation control tape used in study 3 were also employed here. See section 8.2.3 and appendices IX and XI for details.

(iii) As in study 3, self-report measures of relaxation and happiness were used here as a manipulation check, and as a potential covariate should the conditions not be comparable in terms of self-reported relaxation and happiness. See section 6.2.2 and appendix VIII for details.

(iv) Syllogistic reasoning scores obtained in study 2 represent a rough baseline measure of reasoning ability for the subjects used in this study, and were used as a covariate here. See section 6.2.2 for details of this task.

9.2.5 Procedure

Subjects were contacted following their participation in study 2 and asked if they wished to participate in a further study investigating the relationship between hypnosis and thinking style. They were told that they would participate in a single session lasting approximately fifty minutes, consisting of either an hypnotic induction or a relaxation tape (which would be randomly determined on the day of testing) followed by one simple task. Subjects were not told which condition they would be participating in prior to the testing session despite the fact the information was actually known at this time; this was done in order to minimise the potential role of expectancies concerning the nature of the session. Upon arrival at the experimental situation, subjects were informed which condition they would be participating in and what it would entail, after which informed consent was obtained. Subjects then completed the attitudes to hypnosis questionnaire and then the relaxation measure; after this, the main part of the experiment began. At this point, subjects in the hypnosis condition listened to the hypnotic induction tape (see appendix IX) preceded by the instructions in appendix X, which were read verbatim by the experimenter. Subjects in the relaxation condition listened to the relaxation tape (appendix XI) preceded by the instructions in appendix XII. Following the tape subjects then completed the post-tape relaxation and happiness measures and were handed the syllogistic reasoning response booklet. They were asked to read through the instructions at the start of the booklet and begin the task when they were ready. Subjects were informed that they had as long as they liked to complete the task but that they would still be timed to get an idea of how long they took; they were told not to feel as though they were working against the clock. At this point the experimenter started the stopwatch. After completion of the task, the stopwatch was stopped and the completion time noted. At this point, subjects in the hypnosis condition were played the de-induction routine; at the end of the experiment subjects were thanked for their participation and paid £5.

9.3 Results

9.3.1 Data screening and preliminary analyses

Prior to analysis the data-set was screened for missing values. Three missing values were identified, one on the syllogistic reasoning (time) variable for a subject in the low susceptible relaxation group, and two on the pre-tape relaxation measure, one for a high susceptible hypnosis subject and one for a low susceptible hypnosis subject. The missing value for timing was due to a stopwatch failure, while experimenter error was responsible for the two relaxation missing values. In each case the missing values were replaced by the group mean.

The data-set was then screened for univariate and multivariate outliers and violations of the assumptions of analysis. All of the variables showed normal distributions and no outliers were identified.

Prior to the main body of the analysis, the pre- and post- tape relaxation scores in the hypnosis and relaxation conditions were compared to assess the impact of the interventions on self-reported levels of relaxation. Table 9.3 presents descriptive statistics for pre- and post-tape self-reported relaxation in the relaxation and hypnosis conditions; figures 9.1 and 9.2 provide a graphic representation of this data for the relaxation and hypnosis conditions respectively. Figure 9.3 presents a comparison of self-reported relaxation levels for the hypnosis and relaxation conditions and the high and low suggestible groups. Inspection of table 9.3 and figure 9.1 indicates that both high and low suggestible groups show comparably high levels of self-reported relaxation prior to the tape in the relaxation condition, and both groups show large increases in relaxation post-tape. However, it is apparent that the high suggestibility group show a larger increase in self-reported relaxation over time compared to the low suggestibility group.

A 2 × 2 mixed model analysis of variance with one between (suggestibility group: high and low) and one within subjects variable (time: pre-tape and post-tape) was performed on the self-reported relaxation scores for the relaxation condition. A significant main effect for time was found, $F_{(1,18)} = 58.04$, $p \leq 0.0005$ (one tailed), indicating that self-reported relaxation is significantly higher following the relaxation tape compared to

Table 9.3: Mean pre- and post-tape relaxation scores for high and low suggestible subjects in relaxation and hypnosis conditions.

CONDITION	TIME: Pre-tape	TIME: Post-tape
Relaxation		
Low suggestibles (n = 10)	96.10 (16.59)	116.00 (15.90)
High suggestibles (n = 10)	88.50 (23.12)	123.20 (11.98)
Hypnosis		
Low suggestibles (n = 10)	82.80 (19.56)	110.80 (19.56)
High suggestibles (n = 10)	94.60 (12.26)	118.50 (17.48)

Note: Standard deviations are shown in parentheses.

Figure 9.1: Mean pre- and post-tape relaxation scores for high and low suggestibles in relaxation condition

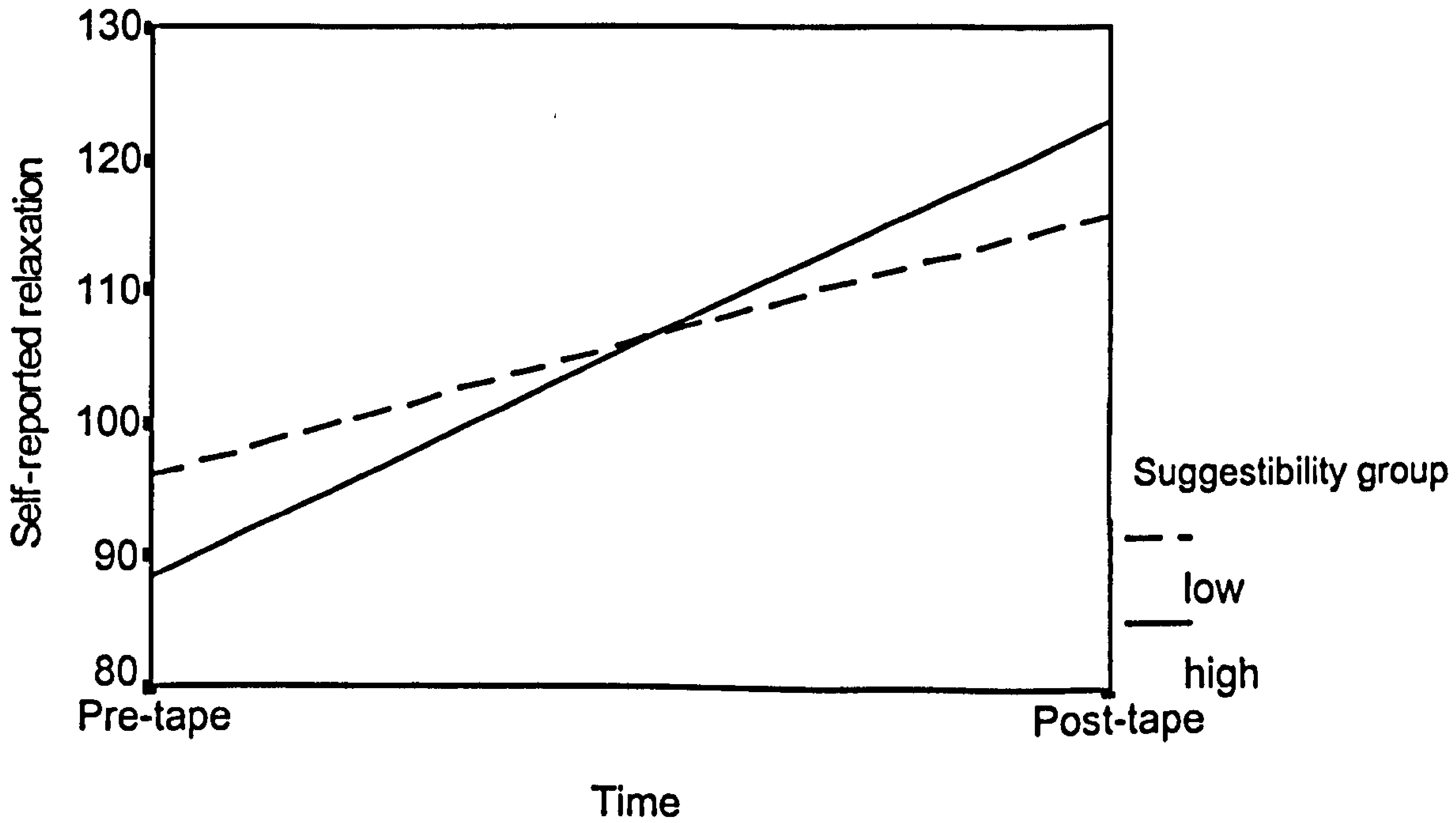
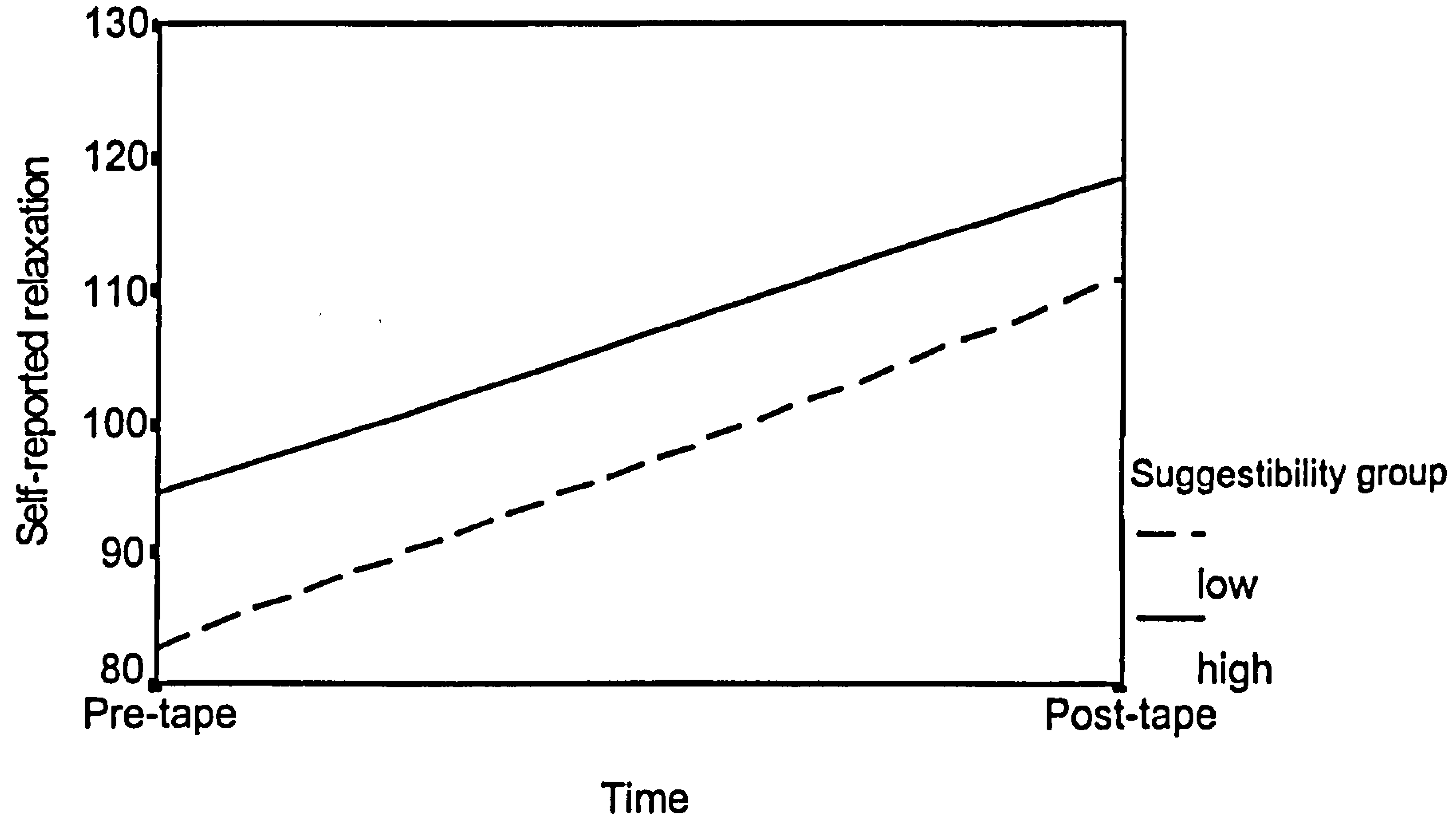


Figure 9.2: Mean pre- and post-tape relaxation scores for high and low suggestibles in hypnosis condition



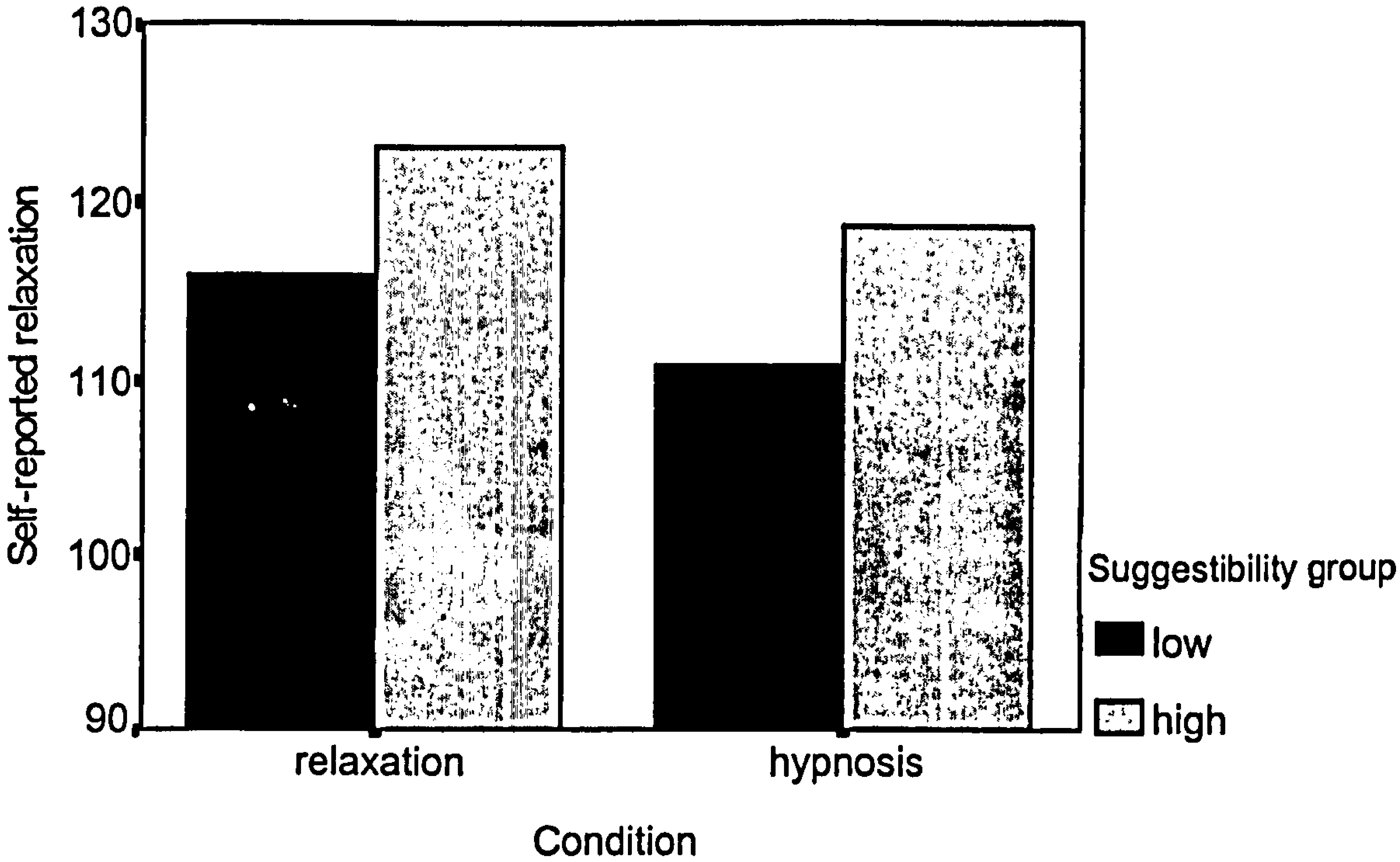
before the tape, as predicted; the main effect for suggestibility group was not significant (see appendix XVI, summary table 4A). The group × time interaction was also significant, $F_{(1,18)} = 4.26$, $p \leq 0.05$ (one tailed), confirming the observation that the high suggestible group show a significantly greater increase in relaxation following the relaxation tape than the low suggestibles. For all ANOVA summary tables, see appendix XVI.

Inspection of table 9.1 and figure 9.2 indicates that the highly suggestible group reported greater levels of relaxation than the low suggestible group in the hypnosis condition both pre- and post-tape; both groups showed large and comparable increases in self-reported relaxation post-tape.

A second 2 × 2 mixed model ANOVA with suggestibility group as a between subjects variable and time as a within subjects variable was performed on the relaxation scores for the hypnosis condition. A significant main effect for time was found, $F_{(1,18)} = 76.69$, $p \leq 0.0005$ (one tailed), indicating that self-reported relaxation is significantly higher following the hypnosis tape compared to before the tape, as predicted. Neither the main effect for suggestibility group nor the group-time interaction was significant (see appendix XVI, summary table 4B).

It can therefore be concluded that levels of self-reported relaxation for high and low suggestible subjects were significantly higher following both hypnosis and relaxation tapes as predicted.

Figure 9.3: Mean post-tape relaxation in hypnosis and relaxation conditions for high and low suggestibles



Having ascertained that both hypnosis and relaxation tapes bring about significant increases in self-reported relaxation for both groups of subjects, we must now address the question of whether or not the overall levels of relaxation in the hypnosis and relaxation conditions are comparable as intended. Figure 9.3 shows the comparison between the post-tape relaxation scores in the relaxation and hypnosis conditions for both high and low suggestible subjects. Inspection of table 9.3 and figure 9.3 indicates that levels of self-reported relaxation are roughly comparable between hypnosis and relaxation conditions and high and low suggestibles. A 2 × 2 factorial ANOVA (one-tailed[75]) with condition and group as between subjects variables was performed on the post-tape self-reported relaxation data. Neither of the main effects or the group × condition interaction was significant, confirming that the relaxation and hypnosis conditions are comparable in terms of self-reported relaxation (see appendix XVI, summary table 4C). The similarity between the two conditions in terms of self-reported relaxation supports the validity of the relaxation control condition, contrary to the findings of study 3. Accordingly, self-reported relaxation will not be used as a covariate in any analyses performed here.

[75] One-tailed analysis was used here following the finding in study 3 that hypnosis produced greater levels of relaxation than the relaxation control condition.

Table 9.4: Mean post-tape self-reported happiness for high and low suggestible subjects in relaxation and hypnosis conditions.

Suggestibility group	Condition: Relaxation	Condition: Hypnosis
Low	95.0 (20.07)	94.30 (26.34)
High	107.50 (17.93)	98.80 (24.28)

Note: Standard deviations are shown in parentheses

Having confirmed that the relaxation and hypnosis conditions are comparable in terms of self-reported relaxation, the question of whether this is also the case for self-reported happiness must also be addressed. Table 9.4 shows descriptive statistics for the post-tape happiness scores of the high and low suggestible groups in the hypnosis and relaxation conditions. Figure 9.4 shows the comparison between the post-tape happiness scores in the relaxation and hypnosis conditions for both high and low suggestible subjects. Inspection of table 9.4 and figure 9.4 indicates that high and low suggestible subjects are broadly comparable in terms of self-reported happiness for both relaxation and hypnosis conditions, although the high suggestible group reported generally larger levels of happiness than the lows, particularly in the relaxation condition. A 2 × 2 factorial ANOVA (two-tailed) with group and condition as between subjects variables revealed no significant main effects or interaction, suggesting that the groups and conditions are comparable in terms of self-reported happiness (see appendix XVI, summary table 4D); it will not, therefore, be used as a covariate here.

Figure 9.4: Mean post-tape happiness for high and low suggestibles in relaxation and hypnosis conditions

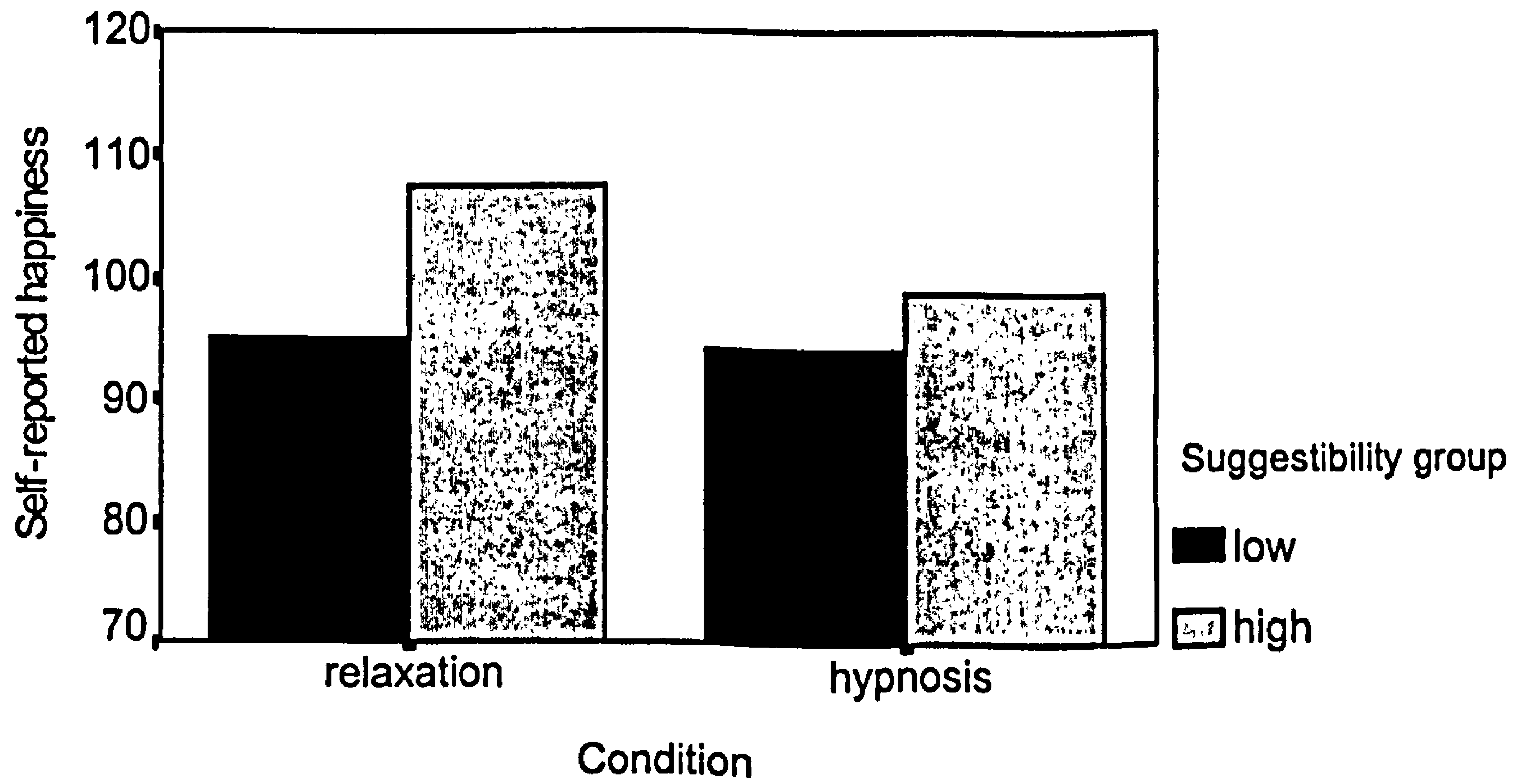


Table 9.5: Mean questionnaire response to positive items for high and low suggestibles in relaxation and hypnosis conditions.

	Condition	
Suggestibility group	Relaxation	Hypnosis
Low	3.05 (.50)	3.45 (.44)
High	3.10 (.52)	2.60 (.84)
Overall	3.08 (.49)	3.03 (.92)

Note : Standard deviations are shown in parentheses

Before addressing whether the hypnosis and relaxation condition differ in terms of syllogistic reasoning performance, an examination of the questionnaire items concerning the relationship between hypnosis and critical thinking must also be made. Table 9.5 presents descriptive statistics for the positive (i.e. hypnosis is associated with superior thought) questionnaire items for the high and low suggestible subjects in the relaxation and hypnosis conditions[76]. Table 9.6 presents descriptive statistics for the negative (i.e. hypnosis is associated with inferior thought) questionnaire items for the high and low suggestible subjects in the relaxation and hypnosis conditions. Inspection of table 9.5 indicates that both high and low suggestible subjects in the relaxation condition and the low suggestible subjects in the hypnosis condition neither agree nor disagree with the positive questionnaire items concerning the relationship between hypnosis and thinking. Highly suggestible subjects in the hypnosis condition do, however, show a tendency to agree with the positive questionnaire items, suggesting that these subjects believe that hypnosis makes thinking easier or better. However, a 2 × 2 factorial ANOVA (two-tailed) on the positive item responses with condition and group as between subjects variables showed no significant main effects or interaction (see appendix XVI, summary table 4E).

Inspection of table 9.6 indicates that subjects in all groups neither agree nor disagree with the negative questionnaire items concerning the relationship between hypnosis and thinking, suggesting that these subjects do not think that hypnosis makes thinking any worse or more difficult. A 2 × 2 factorial ANOVA (two-tailed) on the negative item responses with condition and group as between subjects variables showed no significant

[76] A high score represents strong average disagreement with the questionnaire items while a low score represents strong agreement. A score of 3 represents neither agreement nor disagreement.

Table 9.6: Mean questionnaire response to negative items for high and low suggestibles in relaxation and hypnosis conditions.

Suggestibility group	Condition	
	Relaxation	Hypnosis
Low	3.10 (.81)	3.45 (.44)
High	3.55 (.50)	3.40 (.70)
Overall	3.33 (.69)	3.43 (.57)

Note: Standard deviations are shown in parentheses

main effects or interaction, confirming this observation (see appendix XVI, summary table 4F). Thus, should a significant difference in syllogistic reasoning performance between the relaxation and conditions be found as predicted, these findings indicate that such a difference would not be attributable to subject expectations concerning what hypnosis is likely to do to their thinking ability.

9.3.2 Main analyses

With all preliminary analyses complete the main body of the analysis can now proceed. Table 9.7 presents descriptive statistics for the syllogistic reasoning variables for each of the groups and conditions; baseline syllogistic reasoning scores are included for illustrative purposes.

Examination of table 9.7 reveals that, for both high and low suggestibility groups, syllogistic reasoning performance (in terms of total score on the task) appears to be better in the hypnosis condition compared to the relaxation condition, contrary to expectation. However, the importance of including baseline syllogistic reasoning scores as a covariate here is highlighted by the pattern of syllogistic reasoning performance at baseline, as shown above: the two lowest and highest scoring groups at baseline are also the two lowest and highest scoring groups in the present study respectively. Thus, the apparent differences between the conditions and suggestibility groups appear to be accounted for by differences in baseline reasoning performance. Further examination of table 9.7 indicates that there is no systematic relationship between syllogistic reasoning score and the time taken to complete the task; however, ignoring total reasoning score, it appears that there is an interaction between condition and suggestibility group for the time variable: the high suggestible group in the hypnosis condition complete the reasoning task considerably quicker than those in the relaxation condition, with the converse being true for the low suggestibles. It is possible, however, that taking both

Table 9.7: Mean baseline reasoning scores and experimental syllogistic reasoning scores and times for high and low suggestibles in relaxation and hypnosis conditions.

	SUGGESTIBILITY/CONDITION			
	Low suggestibles		High suggestibles	
VARIABLE	Relaxation	Hypnosis	Relaxation	Hypnosis
Baseline syllogisms	9.80 (3.52)	11.60 (1.96)	10.80 (0.92)	11.80 (1.99)
Experimental Syllogisms (total score)	10.50 (1.90)	12.00 (1.89)	10.90 (1.20)	11.70 (1.83)
Experimental syllogisms (total time/sec)	674.40 (142.0)	598.60 (153.79)	536.90 (142.29)	623.70 (127.02)

Note: Standard deviations are shown in parentheses

reasoning time and total score in combination might yield differences between the conditions that are not apparent from inspection of table 9.7. The use of multivariate analysis of covariance allows this possibility, and the possibility that there are also univariate differences between the groups and conditions, to be assessed. Accordingly, a 2 × 2 MANCOVA was performed on the two syllogistic reasoning dependent variables total score and completion time, with condition and suggestibility group as between subjects variables. Baseline syllogistic reasoning performance was used as a covariate. Using Wilks' criterion, there were no significant main effects or interaction on the combined dependent variable. Moreover, there were no main effects or interactions on the individual independent variables, although the group × condition interaction for the time variable approached significance ($p = .088$) in line with the observation made above (see appendix XVI, summary tables 4G and 4H).

9.4 Discussion

No significant differences between the hypnosis and relaxation control conditions were found on either of the syllogistic reasoning variables or their composite for both low and high suggestible subjects, leading to the rejection of the experimental hypothesis; clearly, hypnotic subjects do not perform any worse on critical reasoning tasks during hypnosis compared to a non-hypnotic condition, nor do they take any longer to complete such tasks. The results obtained here therefore appear to contradict the model outlined in chapter three which postulates that the increased suggestibility typically observed in the hypnotic situation is, in part, a product of a reduction in critical thought following the hypnotic induction.

The results of this study also contradict the neuropsychophysiological and ego-psychological theories of hypnosis which suggest that hypnosis involves a reduction in reality testing and a shift from an analytical to a holistic style of thinking. It is apparent that if such a shift is occurring during hypnosis, any reduction in reality testing or analytical thinking brought about as a result is not sufficient to produce any significant decrement in performance on a task testing the ability to engage in logical reasoning. Moreover, these findings contradict dissociated control theory which suggests that hypnosis involves the inhibition of frontal attentional systems, which control not only novel behaviour but also critical thought. Furthermore, the findings obtained here also cast a degree of doubt on the validity of the trance logic concept: if hypnosis is associated with an unusual tolerance for logical incongruities then it is perhaps unlikely that a task which requires the correct application of logical principles would be performed no worse during hypnosis than outside it. However, one must consider the possibility that there is a dissociation between a tolerance for logical incongruities and an inability to think critically. Conceivably, it is possible to possess the former without in any way experiencing the latter and, as such, the findings obtained here need not necessarily provide a problem for the trance logic concept.

Although the findings obtained here appear to contradict, amongst others, the current model of hypnosis, there is an alternative explanation for why subjects do not appear any worse at critical reasoning during hypnosis, which nevertheless preserves the notion that hypnosis involves a reduction in critical thought. As this explanation is relevant both to the findings of the present study and those described in chapter eight, discussion of it will be postponed until the next chapter.

Two further findings from this study are worth mentioning. First, unlike in study three, the relaxation control condition produced comparable levels of relaxation to the hypnosis condition, confirming the validity of its use, at least in this study. Why studies three and four should differ in this regard is not immediately apparent, but may be an artefact of the use of a within subjects design in the previous study and an independent design here. In study three subjects were aware that they were taking part in two experimental conditions, one involving hypnosis and the other simple relaxation, with the difference between the two clearly apparent. If subjects believe that hypnosis produces greater levels of relaxation that a non-hypnotic relaxation condition this may be reflected in their subsequent self-reports in the two conditions, with a positive bias towards hypnosis. In this study where an independent design was used, subjects have no comparison condition and consequently their self-reports of relaxation are not influenced by this belief. Such a possibility highlights the limitations of self-report measures such as those used here, and underlines the importance of using more objective measures where possible.

Second, this study provides information concerning subjects' beliefs about the relationship between hypnosis and thinking. It is apparent that neither high nor low suggestibles believe that hypnosis is associated with an inability to think clearly or rationally, but at the same time do not believe that hypnosis makes thinking any clearer or easier. Such information could prove useful to other researchers wishing to address the relationship between hypnosis and thinking, with the obvious implication being that one need not worry about the possible effect of subjects' beliefs concerning hypnosis and thinking ability.

The study described in this chapter is the final empirical assessment described in this thesis of the model of suggestion and hypnosis outlined in chapter three. In the final chapter, the main findings from these studies will be restated and their implications for the models outlined in chapters two and three will be discussed.

CHAPTER 10: Summary and general discussion

10.1 Summary of chapters 1-9

In chapter one a review of the hypnosis literature revealed that, although existing theories could account for certain aspects of hypnosis research, no single theory could account for the entire range of findings concerning the phenomenon. Despite popular belief to the contrary, it was argued that the ego-psychological, dissociated control, sociocognitive and neuropsychophysiological theories of hypnosis are not actually mutually incompatible, but rather examine diverse aspects of the same phenomenon and describe them in the terms most closely allied to the domain under scrutiny. It was suggested that a single integrative theory, encompassing the central elements of each of the theories and describing the way in which the different levels of description correspond to one another, would provide a parsimonious and powerful account of hypnosis with which to organise existing findings and generate new hypotheses.

In chapter two it was argued that the most appropriate way of approaching the explanation of suggestion and hypnosis was to begin by providing a general account of the cognitive system which could then be applied to the particular phenomena of interest. It was further argued that such an approach would not only bring the explanation of hypnosis firmly within the remit of mainstream psychology, but also allow an exploration of what hypnosis research could contribute to the understanding of cognition and consciousness in general. In line with recent theorising within the field, it was suggested that the model of behavioural control provided by Norman and Shallice (1986) offers a useful starting point in the explanation of hypnotic behaviours and experiences. However, it was claimed that, in its original form, the model is inadequate for such an undertaking, and that a number of important revisions and extensions were necessary before this would be the case. Specifically, it was suggested that a more detailed account of how the model relates to perception and consciousness was required, and that the way in which the model conceives of automaticity and control would need to be reappraised. In addition, it was argued that a more refined understanding of individual and situational differences in behavioural control would need to be provided.

As such, a model of the cognitive system, based on that provided by Norman and Shallice (1986) but taking such suggestions into account, was proposed. According to this revised account, the cognitive system is comprised of a distributed set of processing sub-systems subject to control at two levels, higher and lower. Lower level control is based on the automatic activation of representations through the receipt of information from the internal and external environment, a default mode of cognition which is largely responsible for the control of behaviour in routine situations. In contrast, higher level control is based on the operation of sophisticated algorithms which serve to direct the operation of lower level systems through the allocation of attention. Such processes are typically, though not exclusively, employed in response to novel situational demands which lower level systems are not equipped to deal with. Thus, in its overall description of the cognitive system, this revised account preserves the general structure of the Norman and Shallice model. However, the model departs from that of Norman and Shallice in its adoption of the memory-based view of automaticity proposed by Logan (1988). Rather than viewing automatic processes traditionally as those which do not acquire attention, effort or intention for their operation, Logan's theory regards automatic processes as those which are based upon the single-step activation of memory representations. By this view, the encoding and retrieval of information in associative memory is the obligatory consequence of attending to the stimulus environment, a process which subserves the rapid and efficient control of well-learnt behaviours. In addition to addressing the problems associated with the traditional view of automaticity, Logan's theory also provides a basis for relating the Norman and Shallice model to perception and consciousness. According to the model presented in chapter two, the process of automatic memory retrieval brought about via attention to the stimulus environment may be regarded as an inferential process which serves to provide an interpretation, based on previous experience, of the situation and what it involves. This not only allows the appropriate management of action, but also provides the basis for consciousness. By this view, low level attentional systems, which exist at the interface between the external stimulus world and the internal representational world, select those representations which provide the best-fitting interpretation of the current state of affairs and use them to organise sensory information into a coherent perceptual whole. This information is passed onto higher level attentional systems where it becomes the individual's conscious percept. Information that is available to high level attentional systems is subject to the conscious manipulations and transformations performed by high level processing algorithms for the management of novel behaviour.

Although this model is in broad agreement with that provided by Norman and Shallice (1986) in its assertion that low level, automatic processes are largely responsible for the control of routine behaviour while high level processes are typically employed in novel situations, unlike Norman and Shallice it does not draw a strict control dichotomy between routine and non-routine circumstances. Rather, it proposes that high and low level control processes exist in a dynamic relationship with the majority of complex situations being managed by the joint operation of the two. By this view, situations are *relatively* routine or non-routine depending on the number of behavioural elements that are or can be controlled by low level processes alone. Moreover, the relative degree to which high and low level processes are used to control behaviour depends, to a considerable extent, on individual differences in preferred processing mode and their interaction with situational demands.

In chapter three this cognitive model was then applied to the understanding of suggestion, hypnosis and hypnotic susceptibility. On the basis of evidence suggesting that hypnotic and non-hypnotic suggestion operate according to the same psychological mechanisms, it was argued that the most appropriate way of approaching the explanation of hypnotic suggestion was to begin by providing an account of suggestion *per se*, and then address the differences, if any, between the two. Accordingly, an account of non-hypnotic suggestion was then proposed. By this view, suggestion is regarded as the automatic activation of low level memory representations by cues (typically, although not necessarily, linguistic) from the internal and external environment, following monitoring by low level attentional systems. As such, suggestion is viewed as a normal and ubiquitous phenomenon that is a fundamental aspect of everyday cognition and behaviour. According to this model, a successful behavioural suggestion involves its associated action representation reaching threshold activation, at which point it is triggered automatically. The sense of involuntariness that accompanies the suggested behaviour is not an inevitable concomitant of it, however, but is the result of a *post hoc* interpretation of its volitional status based on the pattern of activation across representational systems. In contrast, a successful suggestion for a perceptual or cognitive alteration involves the selection of a corresponding representation by low level attentional systems for the organisation of sensory information into a conscious percept. As such, the interpretive process is an inherent part of the successful execution of the suggestion, rather than a non-essential after-the-fact component of it. Such processing differences between behavioural and cognitive suggestions were cited as one of the central reasons underlying the differential response rates between the two (i.e. behavioural suggestions being successfully responded to significantly more often than cognitive suggestions).

A number of factors influencing the likely success of a given suggestion attempt were then proposed, including the nature of the representations stored within the cognitive system, attentional input from higher level systems, and individual and situational differences in the degree to which the automatic activation of representations is relied upon for the control of behaviour. On the basis of such factors, an account of the difference between hypnotic and non-hypnotic suggestion was then offered, with specific reference to why the hypnotic situation is consistently associated with elevated levels of suggestibility compared to non-hypnotic situations. Theoretical emphasis was placed on the nature of the hypnotic situation and the expectational and contextual factors associated with it, which together serve to create a pattern of activation across representational systems corresponding to an interpretive set labelled the "hypnotic role" following the work of Sarbin (1950, 1956). This interpretive set, which is an automatic consequence of entering the hypnotic situation, serves to provide a context for the appraisal of events during hypnosis, thereby shaping the occurrence and nature of behaviours and experiences encountered therein. The belief that hypnosis is associated with elevated levels of suggestibility was recognised as one particularly important factor in bringing about increases in suggestibility during hypnosis. In addition, the expectational and contextual demand to adopt a non-critical mode of responding during hypnosis was identified as being influential in bringing about certain state changes during hypnosis which have a significant moderating effect on suggestibility. Specifically, it was proposed that the induction of a state of absorption during hypnosis significantly augments the individual's responsivity to suggestions through increased attention and disattention being paid to relevant and irrelevant representations respectively. Moreover, the corresponding reduction in critical thought and bias towards lower level processing serves to minimise the activation of competing representations and maximise the degree to which behaviour and experience are controlled by lower level processes. By placing theoretical emphasis on both contextual/expectational factors and certain state changes during hypnosis, the account offered in chapter three provides a middle ground between sociocognitive theories and more state oriented models such as ego-psychological theory, dissociated control theory and the neuropsychophysiological model.

According to this view, responsivity to suggestions is the product of the interaction between situational variables and a number of individual factors including motivation, attitude, expectation, the ability to focus and sustain attention (i.e. become absorbed), and high vs. low level processing preference. Certain factors (e.g. attitude, expectation) were identified as being specific to the testing situation under scrutiny (e.g. hypnosis), while other factors (e.g. absorption, processing bias) were identified as relevant to suggestive responding in general.

In chapter four, some of the predictions made by the model of suggestion and hypnosis outlined in chapter three were identified and ways of assessing them discussed. Four predictions were identified as being central to the model: (i) suggestibility is positively related to a predisposition towards the low level control of behaviour; (ii) suggestibility is negatively related to a predisposition towards the high level control of behaviour; (iii) hypnosis involves a shift towards the low level control of behaviour; and (iv) hypnosis is associated with a relative inability to think in a critical fashion. Accordingly, four studies to assess these predictions were outlined, which form the basis of chapters five, six, eight and nine.

In chapter five, a study assessing the relationship between processing bias and hypnotic suggestibility (predictions i and ii) was described. Three questionnaires comprising nine scales apparently assessing high and low level processing preferences were obtained from the literatures concerning personality, learning style and creativity, and presented to 209 graduate and undergraduate students who had been tested on the Harvard Group Scale of Hypnotic Susceptibility (HGSHS). The nine questionnaire scales used were the Rational (RAT) and Experiential (EXP) scales of the Rational Versus Experiential Inventory, short form (RVEI-S), the Left hemisphere (L), Right hemisphere (R) and Integrated (I) scales of the Human Information Processing Survey (HIPS), and the deep semantic (DS), deep thinking (DT), elaborative episodic (EE) and elaborative self-actualising (ES) scales of the Inventory of Learning Processes (ILP). Of these, the RVEI-EXP, HIPS-R, ILP-ES and ILP-EE were selected as putative measures of low level processing preference, while the RVEI-RAT, HIPS-L, ILP-DS and ILP-DT were selected as putative measure of high level processing preference. The HIPS-I was included as a measure of the preference for the flexible integration of high and low level processing. In addition, a social desirability scale (SDS) was used to control for response variation due to individual differences in the need for positive self-presentation; a small, positive correlation between the HGSHS and SDS was predicted, in line with the sociocognitive prediction that presenting oneself in a positive light is a fundamental aspect of hypnotic responding.

Analyses concerning HGSHS scores revealed a slightly lower sample mean suggestibility score than that reported by Shor and Orne (1963) in the original norms for the scale. However, the sample mean was in line with those obtained for other European samples, as was the pattern of item response rates. The total scale showed good reliability as did most of the individual items, with the exception of the hand lowering item which did not show a significant corrected item-total correlation. Such a finding raised the possibility that an additional element of measurement error had further increased random variation in suggestibility scores. Factor analysis provided no evidence for the notion that the HGSHS comprises a three factor solution corresponding to the ideo-motor, challenge and cognitive items, but indicated that differences in item difficulty had resulted in the extraction of spurious factors; accordingly, the total HGSHS score was taken as the suggestibility correlate in this thesis.

Partial correlations controlling for the influence of social desirability were then calculated between the HGSHS and each of the low and high level processing preference scales. Contrary to the prediction that hypnotic suggestibility is negatively related to a high level processing preference, no significant correlations were found between any of the high level processing preference scales and the HGSHS. Nevertheless, in support of the prediction that hypnotic suggestibility is positively related to a low level processing preference, significant but very modest partial correlations were obtained between the HGSHS and the ILP-EE, HIPS-R and RVEI-EXP. However, contrary to prediction, no significant relationship was obtained between the HGSHS and ILP-ES. In addition, a small but significant positive correlation between the HGSHS and the social desirability was obtained as predicted. Standard multiple regression analysis revealed that the best unique predictor of hypnotic suggestibility was the social desirability scale followed by the RVEI-EXP, accounting for a unique 3.54% and 2.84% of the variance in suggestibility respectively; neither the ILP-EE or HIPS-R predicted significant unique proportions of the variance in suggestibility. Hierarchical regression analysis revealed that, after controlling for the effects of social desirability, the RVEI-EXP, ILP-EE and HIPS-R together accounted for 7.33% of the variation in suggestibility. However, the presence of a suppression effect indicated that a small and non-significant proportion of this 7.33% is attributable to social desirability rather than low level processing preference. A mixed standard-statistical regression revealed, on purely statistical grounds, that after controlling for the effects of social desirability only the RVEI-EXP and ILP-EE are successful predictors of suggestibility; the RVEI-EXP entered the equation first and accounted for 5.1% of the variation in suggestibility, with the ILP-EE entering second and accounting for a further 1.8% of the variation in suggestibility.

A factor analysis of the HGSHS, social desirability scale and high and low level processing preference measures (except the HIPS-I which was excluded on statistical grounds) yielded a three factor solution accounting for 60% of the total variance. Factors one (with strong factor loadings for the ILP-DS, ILP-DT, ILP-EE and RVEI-RAT) and two (loadings for HIPS-R, ILP-ES, RVEI-EXP and HIPS-L negatively) were interpreted as representing high and low level processing preference variables respectively. The HGSHS showed a modest loading on factor two, loading most strongly on the third factor with the social desirability scale. Although such a pattern of factor loadings provides support for the notion that the different low (and high) level processing preference questionnaires are measuring common constructs, the low communalities of the HGSHS, HIPS-L and ILP-ES indicated that caution should be exercised in the interpretation of this analysis for these variables. Nevertheless, these findings underline the importance of including a social desirability measure in research investigating the correlates of hypnotic suggestibility.

In chapter six a second study designed to assess the relationship between hypnotic suggestibility and processing predisposition was described. In this study, the relationship between the HGSHS and a number of behavioural, and therefore hopefully more objective, measures of processing predisposition was assessed. In total, eight behavioural measures were presented to 81 graduate and undergraduate students who had all been screened on the HGSHS: three triad classification tasks, two perceptual filtering tasks, the Matching Familiar Figures Test (MFFT), a syllogistic reasoning task, and Raven's advanced progressive matrices. In addition, social desirability was included as a partial correlate following the recommendations of study one.

The triad classification and perceptual filtering tasks were obtained from the literature concerning perceptual integrality, and were designed to assess integral vs. separable (i.e. low vs. high level) processing preferences and abilities respectively. The three triad classification tasks used three different dimensional combinations (size and brightness using square stimuli, colour and form using triangle stimuli, and size and angle using line stimuli) each varying in the degree to which integral or separable processing is favoured. The proportion of similarity-based (i.e. integral or low level) responses given on each set of stimuli provides three related indices of the individual's preferred processing mode. The two perceptual filtering tasks, each using a different primary dimension (size or angle), assess the subject's ability to ignore variation on a correlated but irrelevant stimulus. Such measures provide an index of individual differences in integral versus separable processing predisposition that are the product of the relative ability/inability to effectively carry out high level perceptual analysis.

The Matching Familiar Figures Test was obtained from the literature concerning the cognitive style dimension of reflection-impulsivity which corresponds to the distinction between higher and lower level cognition respectively. The syllogistic reasoning task and Raven's advanced matrices were included as measures of the ability to engage in higher level analytical processing. The use of these measures (and also the perceptual filtering tasks) therefore extends the research base concerning the relationship between hypnotic suggestibility and processing predisposition to encompass the possibility that an inability to engage in higher level processes (as opposed to a simple low level processing preference) is associated with suggestive responding.

The findings reported in chapter six provide partial support for the predictions that hypnotic suggestibility is positively related to a low level processing predisposition and negatively related to a high level processing predisposition. After controlling for the influence of social desirability, a small but significant positive correlation was obtained between the HGSHS and triad classification (squares) variables as predicted, indicating that highly suggestible individuals make significantly more similarity-based (i.e. low level) responses in triad classification using the square stimuli than low suggestibles. This finding was confirmed through ANCOVA comparing high and low suggestibility quartiles. Such a finding lends support to the notion that suggestibility is related to a low level processing preference. However, no significant partial correlations were found between the HGSHS and either of the other triad classification stimuli (triangles and angles), contrary to prediction; moreover, no differences were found between high and low suggestibility quartiles for these stimuli. Although only one of the three types of triad classification stimuli showed significant correlations with suggestibility, it is possible that such a pattern of findings is due to the fact that only the combination of size and brightness (i.e. square stimuli) is sufficiently biased towards dimensional (i.e. high level) responding to allow individual differences in similarity-based responding to reveal themselves in this context. The fact that the square stimuli yielded the lowest proportion of similarity based responses followed by the triangle and angle stimuli, a finding in line with the majority of previous research (e.g. J. D. Smith & Baron, 1981), offers some support for this notion.

Also in support of the prediction that suggestibility is related to a low level processing predisposition, a small but significant negative partial correlation was found between the HGSHS and the MFFT time variable, demonstrating that high suggestibles respond quicker on the task than lows, indicative of a relatively impulsive (i.e. low level) cognitive style. This finding was also confirmed using ANCOVA comparing high and low suggestibility quartiles. However, no significant partial correlations were found between the HGSHS and the MFFT error variables, raising the possibility the highs are simply quicker than lows but not necessarily more impulsive. Nevertheless, the semi-partial correlation between the HGSHS and MFFT time variables was reduced to nearly zero after controlling for the MFFT error variable in a hierarchical multiple regression analysis, providing support for the impulsivity interpretation of the relationship between suggestibility and MFFT time. However, this interpretation was tempered by chi-squared analysis which revealed that the frequency of high and low suggestibles in the impulsive and reflective categories of MFFT performance was not significantly different.

In support of the prediction that hypnotic suggestibility is negatively related to a high level processing predisposition (as indexed by high level ability), after controlling for the impact of happiness a negative relationship was obtained between the HGSHS and the syllogistic reasoning task. This finding appears to suggest that high suggestible are more irrational (i.e. incapable of higher level reasoning) than lows, although no significant differences between high and low suggestibility quartiles were found in ANCOVA. Moreover, further doubt was cast on this relationship by the finding of a significant positive relationship between the HGSHS and Raven's matrices, suggesting that high suggestibles are actually better at reasoning than lows. Again, no significant differences were obtained between high and low suggestibility quartiles, however. It is possible that these findings are a product of the syllogistic reasoning task being verbal and Raven's matrices being non-verbal, although it is not immediately apparent why such a pattern of relationships should be found on this basis. A more plausible alternative would appear to be possible differences between the two tasks in terms of the relative degree to which higher and lower level processes are involved in their completion, although further research would be required to assess this possibility. At the very least, caution should be exercised in the interpretation of these relationships.

Further doubt was cast on the notion that suggestibility is negatively related to high level processing ability by the lack of significant correlations between the HGSHS and interference on either of the perceptual filtering tasks. Clearly there is no evidence to suggest that high suggestibles are any worse than their low sugestible counterparts at high level analytical perception, at least as assessed by the filtering interference effect.

Standard multiple regression revealed that, after controlling for the effects of mood, social desirability and triad classification set, the MMFT time, syllogistic reasoning, Raven's matrices and triad classification (squares) variables accounted for a further 13.6% of the variation in suggestibility, significantly different from zero. On this basis, none of the variables accounted for a significant unique proportion of the variance in suggetibility. However, a mixed standard-statistical regression indicated that, on purely statistical grounds, the best predictor of suggestibility out of the processing predisposition variables was triad classification (squares), which accounted for 5.2% of the variation in suggestibility after controlling for covariates.

The model of suggestion and hypnosis outlined in chapter three is based on a novel model of the cognitive system described in chapter two. Although the model of the cognitive system is strongly supported by research findings concerning the theoretical work of Norman and Shallice (1986), Logan (1988) and Marcel (1983) on which it is based, the notion that there are higher and lower level 'modes' of processing each with distinct cognitive characteristics, aside from general control differences, is somewhat more speculative. It was for this reason that the studies reported in chapter five and six adopted an exploratory approach using a wide variety of putative low and high level processing measures, in the hope that such a broad approach would maximise the chances of obtaining significant evidence concerning the relationship between processing style and hypnotic suggestibility. The measures used in studies one and two were all selected on the basis of the *prima facie* similarities between the research and theory from which they were derived and the distinction between higher and lower level cognition outlined in chapter two. In chapter seven, the relationship between the different putative high and low level preference and ability measures was addressed in a bid to assess whether these apparent similarities translated into empirical reality, thereby providing evidence concerning the generality of the distinction between higher and lower level processing modes.

Scores on each of the self-report and behavioural measures of low and high level processing preference and ability for the 74 individuals who had participated in studies one and two were correlated, taking social desirability and the relevant mood variables as partial correlates where appropriate. Correlations between each of the behavioural high level processing measures provided partial support for the notion that each is assessing related aspects of a common construct. As predicted, significant relationships were found between the syllogistic reasoning task, Raven's matrices and certain measures obtained from the MFFT, suggesting that both the syllogistic reasoning and Raven's matrices variables are measuring a high level reasoning ability which is associated with good performance on the MFFT. The lack of a significant correlation between any of these variables and the two perceptual filtering tasks again suggests that the filtering tasks are not measuring a high level processing ability, at least not one that is related to reasoning or MFFT performance. The finding of a significant correlation between the syllogistic reasoning and Raven's matrices variables again questions the pattern of relationships between these variables and the HGSHS reported in chapter six. Indeed, following the removal of the seven subjects who had not completed the questionnaires in study one, the partial correlations between the HGSHS, the syllogistic reasoning task and Raven's matrices were reduced to non-significant levels. Clearly, the relationships between these variables and the HGSHS are not as robust as one would hope, and further research is required before any firm conclusions can be drawn concerning the relationship between hypnotic suggestibility and high level processing ability. This verdict is further supported by the discovery that the previously significant relationship between the HGSHS and the MFFT time variable is also reduced to non-significant levels following removal of the seven additional subjects.

A significant predicted correlation between Raven's matrices and the RVEI-RAT seems to suggest that individuals possess some insight into their thinking ability and are able to report it accurately; moreover, such a finding indicates that self-report can, to a small extent, provide a valid index of the degree to which individuals are capable of high level processing. However, none of the other self-report measures of high level preference correlated significantly with any of the high level behavioural measures. Nevertheless, with the exception of the left hemisphere scale of the HIPS, all of the high level processing questionnaires correlate significantly with one another, supporting the conclusion of study one that each is assessing a similar construct. Taken together this pattern of findings clearly indicates that, at least on a methodological level, the generality of the high level processing construct is restricted to particular measure types (i.e. self report or behavioural), despite the *prima facie* similarities between the research and theory from which the different measures have been obtained.

All of the self-report low level processing preference questionnaires showed significant partial correlations with one another as predicted, supporting the notion that each is assessing a related construct and validating the generality of the low level processing mode concept as assessed by self-report. As before, the RVEI-EXP, HIPS-R and ILP-EE all showed significant partial correlations with the HGSHS, underlining the strength of the relationships in each case. Moreover, with the restricted sample size used in this analysis the partial correlation between the HGSHS and ILP-ES is also significant, and to an even greater extent than with either the ILP-EE or HIPS-R. Why this correlation should prove non-significant with the larger sample is not immediately obvious; further research is clearly required before any firm conclusions can be drawn concerning the validity of the relationship between the ILP-ES and HGSHS.

Findings concerning the behavioural low level processing measures are less encouraging. Although, as predicted, all of the triad classification tasks correlated significantly with one another as did the two filtering interference tasks there were no significant correlations between the two measure types. Moreover none of the correlations between these variables and the MFFT proved significant. As such, there is no evidence to suggest that the different behavioural measure types are assessing related constructs, casting doubt over the generality of the low level processing construct. Nevertheless, the correlations between the ILP-ES and triad classification (triangles and squares) variables both approached, but did not quite reach, significance. As both the ILP-ES and triad classification measures were included in this thesis as putative measures of a low level processing preference (as opposed to processing ability) and there is evidence to suggest that both are related to suggestibility, such a pattern of findings is encouraging and suggests that the low level processing mode concept is a potentially fruitful avenue for the investigation of suggestion and hypnosis. Moreover, it helps to narrow down the range of variables of interest to future research concerning the relationship between low level processing and suggestibility. Furthermore, the finding that, unlike the MFFT, Raven's matrices and the syllogistic reasoning task, the correlation between the HGSHS and triad classification (squares) variables remains significant with the smaller sample size underlines the potential importance of such future research.

Having examined the relationship between suggestibility and processing preferences and abilities in the first two studies, the studies reported in chapters eight and nine turn to the question of hypnosis itself. In chapter eight, the prediction that hypnosis is associated with a low level processing bias was investigated in a repeated measures design study comparing 17 high and 17 low suggestible subjects in baseline, relaxation and hypnosis conditions on the triad classification and filtering tasks used in study two. Neither the high nor low suggestibles showed any predicted differences between the three conditions on either of the tasks. Only one differences was found between the groups and conditions, that between the baseline and relaxation and hypnosis conditions combined for both suggestibility groups on the triad classification (triangles) measure. However, this finding was in the opposite direction to that predicted, with the baseline condition showing a significantly greater proportion of similarity-based (i.e. low level) responses than the relaxation and hypnosis conditions combined; moreover, there was no significant difference between the relaxation and hypnosis conditions. This finding runs contrary to the prediction, derived from previous research, that a relaxed response criterion is associated with similarity-based responding, although the possibility that physical relaxation and a relaxed response criterion are different entities must be considered. At the very least, there is no evidence to suggest that hypnosis is associated with a bias towards low level processing as assessed by triad classification and perceptual filtering.

In chapter nine the prediction that hypnosis is associated with a relative inability to think in a critical fashion was assessed in an independent design study comparing high and low suggestibles in relaxation and hypnosis conditions on a syllogistic reasoning task comparable to that used in study 2. The possibility of using a within subjects design for this study was considered and rejected on the basis of evidence showing significant practice effects in syllogistic reasoning. The reasoning task used was constructed on the basis of the recommendations of Johnson-Laird and Steedman (1978) thereby avoiding the criticisms associated with the task in study 2; in addition, both score and time measurements were taken on the task to provide a better estimate of overall reasoning performance. Evidence from a revised version of the McConkey and Jupp (1986) Opinions About Hypnosis Survey including additional questions concerning the relationship between hypnosis and thinking indicated that subjects did not associate hypnosis with superior or inferior reasoning performance. As such, the possibility of an expectational explanation of any significant findings was ruled out. However, results indicated that there were no differences in reasoning performance in relaxation and hypnosis conditions for both high and low suggestible groups when rough baseline measures of reasoning ability obtained from the syllogistic reasoning task in study 2 were taken into account. Accordingly, the hypothesis the hypnosis is associated with an inability to think in a critical fashion was rejected.

10.2 General discussion

The aim of this thesis was to provide an integrative account of hypnosis and suggestion that incorporates the fundamental principles of the ego-psychological, dissociated control, sociocognitive and neuropsychophysiological models into a single explanatory framework. Having provided such an account on the basis of research and theory from cognitive psychology, four predictions made by the model have been assessed in four related studies, two concerning hypnotic suggestibility and two hypnosis itself. On the basis of these studies information has also been gathered concerning the validity of the cognitive model on which the proposed explanation of suggestion and hypnosis is based. The task now remains to explore the conceptual and methodological implications of this research for the theoretical position outlined here.

Before addressing this task, it should be noted that the author recognises that the significant findings on which this discussion will largely be based are, in many cases, less convincing in terms of effect size than one would hope. It should therefore be borne in mind that any theoretical exploration of the current research must be considered tentative until more conclusive evidence can be obtained. To this end, the penultimate section of this chapter will provide a discussion of the practical limitations of the research reported here and their implications for future research in this domain.

10.2.1 Hypnotic suggestibility and low level processing predisposition

Of the four empirical studies carried out to assess the predictions of the model of hypnosis and suggestion described in chapter three, two concerned the nature of hypnotic suggestibility and two hypnosis itself. As the significant findings obtained in this thesis all pertain to the former rather than the latter it seems appropriate to begin the discussion here; the implications of studies three and four for the current conceptualisation of hypnosis will be addressed in section 10.2.3.

To briefly summarise the relevant findings described more fully in chapters five and six, significant evidence in support of the prediction that hypnotic suggestibility is related to a low level processing preference was obtained using both self-report and behavioural measures. Specifically, significant positive partial correlations were found between the HGSHS and three of the four putative low level processing preference questionnaires completed by the entire sample of subjects in study 1 (ILP-EE, HIPS-R and RVEI-EXP)[77]. In addition, a significant correlation was found between the HGSHS and the fourth low level processing questionnaire (the ILP-ES) when analysis was restricted to those subjects who had also completed study 2. Furthermore, a significant positive correlation was found between the HGSHS and triad classification (squares).

All of these variables showing significant correlations with hypnotic suggestibility were, without exception, included in this thesis as putative measures of a low level processing preference, a pattern of findings which broadly supports the model of hypnosis and suggestion outlined in chapter three. The finding that these measures, taken together, account for nearly 20% of the variation in suggestibility strongly implicates low level processing in suggestive responding, particularly given the amount of uncontrolled

[77] For the sake of descriptive ease, from this point onwards all partial correlations will be referred to simply as correlations. Apart from the social desirability scale (which will be dealt with specifically), none of the remaining partial correlates are considered to be of any great theoretical significance and will therefore not be discussed in this context. Information concerning all partial correlates pertaining to each study can be obtained from the individual chapters.

variance likely to be associated with the measurement of hypnotic suggestibility (see chapter five), and the variance attributable to nuisance variables such as social desirability[78]. Moreover, obtaining significant correlations between suggestibility and both self-report and behavioural measures of low level processing preference provides converging evidence for the validity of the theoretical framework outlined in this thesis, particularly given that no significant correlations were found between the behavioural and self-report measures significantly correlated with suggestibility[79]. Such findings clearly suggest that the current model of suggestion merits further investigation, using both types of methodology. It is also noteworthy that none of the existing theories of hypnosis, with the possible exception of Fromm's ego-psychological theory, would have predicted[80] the present pattern of findings which underlines the conceptual advance that the current theory provides. Moreover, it is of some significance that none of the measures correlating significantly with suggestibility in this thesis have been used before in published research within the field, with such findings providing a basis for cross-fertilisation between research in this domain and that in a number of others (i.e. perception, personality, learning style).

Nevertheless, the low level processing mode concept is still very much in its infancy and it is essential that the concept be refined if it is to remain theoretically useful. The basic contention of the distinction between higher and lower level modes of processing made in this thesis is that there are differences in the relative degree to which individuals prefer to control behaviours by higher or lower level processes given the option to use either. This notion was based on research and theory concerning perceptual integrality/separability which shows a striking convergence with the model of the cognitive system outlined in chapter two, and the fact that one of the triad classification tasks correlates significantly with suggestibility provides good evidence for both this model and the model of suggestion developed in chapter three. Such a finding clearly suggests that high suggestibles have a preference for a passive, non-deliberate (as

[78] Some sociocognitive theorists might argue that social desirability is less of a nuisance variable to be controlled for than one of the primary mechanisms by which suggested responses are brought about. While this may be so in the case of hetero-suggestion (assuming, by the present model at least, that social desirability operates in an automatic or non-deliberate fashion), such an explanation seems untenable in the case of auto-suggestion.

[79] Although the correlation between the ILP-ES and triad classification (squares) approached significance; the theoretical relevance of such a relationship will be addressed presently.

[80] That is not to say that other theories could not accommodate these findings, however; it is the fact that the current model predicts them rather than just explains them that is of particular note. Moreover, given that the current model embraces the central principles of each major contemporary theory of hypnosis, one would want such theories to be able to accommodate this research in any case.

opposed to active and intentional) mode of processing, with the implication being that such processing has an important role to play in the explanation of suggestion. Complementary evidence is provided by Dixon and Laurence (1990, 1992) concerning the greater verbal automaticity of high suggestibles.

However, in chapter two it was argued that a basic difference in low vs. high level processing preference is likely to manifest itself in many different ways, not just on a purely cognitive level as with perceptual integrality, but also in an individual's personality and their behaviour and experiences in general. Indeed, the near significant correlations between the ILP-ES and triad classification (triangles and squares) provide tentative support for this assertion; however, none of the other low level processing questionnaires correlated significantly with any of the triad classification tasks, despite all correlating with both the ILP-ES and HGSHS. Moreover, the HGSHS correlates with both the ILP-ES and triad classification (squares), at least in the restricted sample. How is one to explain such a pattern of findings? [81]

To begin with, it is pertinent to note that in other research areas measures do not always correlate significantly with one another despite clear evidence to suggest that they are assessing related constructs. A relevant example is in the case of the converging operations used to establish the validity of the distinction between integral and separable forms of perceptual processing. Although both triad classification and perceptual filtering tasks have, for example, both been shown to converge on a common explanation of perceptual processing (e.g. Foärd & Kemler Nelson, 1984), it is not unprecedented to find a lack of any significant relationship between the two (see e.g. J. D. Smith & Baron, 1981), as was the case in the research reported here. One of the factors mediating the non-significant correlation obtained between the perceptual filtering and triad classification tasks is likely to be the fact that the former is measuring a processing ability while the latter is assessing a processing preference. Thus, the fact that the triad classification tasks do not correlate with most of the questionnaires used here still allows the possibility that they may be tapping different aspects of the same general low level processing mode construct. It is simply a question of addressing which aspect of the

[81] Why the correlation between the ILP-ES and HGSHS should prove non-significant with the larger sample size is not entirely clear. One possible explanation is that the smaller sample was subject to a systematic sampling bias that the larger sample had not been exposed to. It is conceivable, for example, that the smaller sample included a higher proportion of individuals with an interest in hypnosis and a motivation to take part in experiments involving its use. Such a bias could inflate the level of correlation between suggestibility and other variables, thereby accounting for the pattern of findings observed here. That notwithstanding, the current discussion of the relationship between the HGSHS:A, the ILP-ES and the triad classification task will be limited to those subjects who completed all three.

construct each measure is assessing and providing an explanation of why these aspects should or should not correlate significantly with one another.

Given that the ILP-ES correlates with both suggestibility and almost so with triad classification it seems appropriate to begin the discussion of this issue here. The five items on the ILP-ES are: (1) I believe in intuition; (2) I cram for exams; (3) Self-knowledge is the most important kind of knowledge; (4) My feelings are a very important part of my decision-making or judgement; and (5) Ideas in books often make my mind wander to other topics not necessarily related to what I am reading. Items 1 and 4 refer to the individuals' belief in or endorsement of intuition and emotion as important factors in decision making; in this regard, these items are similar to the majority of the items on the RVEI-EXP, which may account for the correlations between these two scales. However, the fact that the triad classification task correlated only with the ILP-ES and not the RVEI-EXP suggests that these items are not the determining factor in establishing this particular relationship. Of the remaining three items on the ILP-ES, only item 5 has any obvious relationship with the triad classification task. Item 5 apparently describes what might be considered a holistic behaviour, in that it refers to free-associative activities in learning in which ideas are related on the basis of similarity rather than logical rules. It is conceivable that such a pattern of behaviour might result from an integrative as opposed to a separable style of processing; the inclusion of this item may therefore have been instrumental in establishing the near significant relationships between the ILP-ES and triad classification. Items 2 and 3 on the ILP-ES do not have any *prima facie* relationship to triad classification, although it is possible that item 2 relates to triad classification because individuals who adopt a more strategic style of information processing in triad classification also adopt a more strategic approach to exam study, and hence do not tend to cram unlike their less strategic counterparts; this may be one further factor underlying the relationship between the ILP-ES and triad classification. Clearly, an analysis of the correlations between individual scale items and the triad classification tasks would provide invaluable information in this regard, although such an analysis is beyond the scope of the current thesis due to time limitations.

It is noteworthy that the ILP-ES items with potentially explicit links to triad classification are unlike any of the items on the remaining low level processing questionnaires, which may explain why none of them correlates significantly with triad classification while the ILP-ES does. Given that this is the case, the basis for the significant correlations between the ILP-ES, the ILP-EE and HIPS-R must be the relationship between items 1,3 and 4 on the ILP-ES and the other two questionnaires. As there are only 4 out of 40 items on the HIPS-R referring to emotion or intuition and none on the ILP-EE, it would appear therefore that there are other behavioural and experiential events that tend to co-vary with an inclination to rely on or endorse emotions and intuitions as a basis for decision making. Indeed, such an interpretation is highly likely given that the RVEI-EXP correlates significantly with all of the other low level processing questionnaires and hypnotic suggestibility despite being composed entirely of items referring specifically to intuition and emotion. Moreover, the ILP-ES, RVEI-EXP and HIPS-R all load on the same factor in factor analysis, clearly suggesting that they are tapping related constructs. The fact that these three different measures, each selected on the basis of the *prima facie* similarities between the research and theory from which they were derived, all correlate significantly with one another despite their obvious differences provides support for the generality of the low level processing mode construct proposed in this thesis; the task remains to delineate which behaviours are characteristic of a preference for low level processing and which are not.

The majority of the items on the ILP-EE appear to be addressing something akin to academic or intellectual curiosity which seems to be the source of its correlation with hypnotic suggestibility (cf. Tellegen & Atkinson, 1974). The finding that this scale correlates with all of the remaining low level processing questionnaires clearly suggests that there is some conceptual overlap between these measures. However, the fact that the ILP-EE does not load on the same factor as any of the other measures in factor analysis appears to indicate that while academic or intellectual curiosity often co-varies with other markers of a low level processing preference, it is not characteristic of such a preference. From the point of view of the model of the cognitive system outlined in chapter two this is perhaps not surprising, given that there are no real theoretical grounds to assume that this should be the case. Similarly, however, it is not immediately obvious why intellectual curiosity should co-vary with low level processing preference behaviours at all, regardless of whether it is characteristic of them. It is nevertheless possible that the source of the correlations between the ILP-EE and the other putative low level processing questionnaires is the inclusion of an item referring to fantasy ("Fantasy is very important to me"). The relationship between fantasy, intuition, emotion and creativity is well documented (see e.g. Lynn & Rhue, 1986, 1989) which may be the source of the significant correlations between the ILP-EE and the RVEI-EXP and ILP-ES. Given the long-standing relationship between fantasy and hypnosis (see e.g. Sheehan, 1979) the inclusion of this item may also have been instrumental in establishing the relationship between the ILP-EE and hypnotic suggestibility. Furthermore, the HIPS-R contains six items explicitly referring to fantasy or imagination, four to intuition and emotion and five to creativity, something which may explain why, of all the low level processing measures, the ILP-EE correlates most strongly with the HIPS-R. Such a pattern of items on the HIPS-R may also provide an explanation of the correlations between this scale and the RVEI-EXP and ILP-ES. As has been suggested on a number of occasions in this thesis, an examination of the inter-correlations between scale items and a factor analysis of them would prove invaluable in determining the validity of these speculations.

Having provided an account of the pattern of inter-correlations between the low level processing questionnaires, and the near significant correlations between the ILP-ES and triad classification, the question remains as to why none of the correlations between the other questionnaires and triad classification were anywhere near achieving significance. On the one hand it is possible that triad classification does not correlate significantly with the questionnaire measures because they are assessing entirely unrelated constructs. By this view, the near significant correlations between the ILP-ES and triad classification is an aberration that results from the inclusion of items that are related to an integral style of processing but which do not relate to the other self-report measures of processing preference. However, such an explanation is contradicted by the fact that these items were grouped with the remaining items on the ILP-ES into a single scale on the basis of their strong inter-correlations, common factor loadings and internal consistency in previous research. Moreover, both the triad classification tasks and low level processing questionnaires were selected for use in the present research on the basis of similarities between the conceptual and empirical work from which they were derived and the processing distinction made in this thesis. As such, the fact that each correlates significantly with suggestibility as predicted by the current framework strongly suggests that common constructs are being assessed in each case.

An alternative explanation might be that the near significant correlations between triad classification and the ILP-ES are entirely the product of chance. However, the fact that near significant correlations were obtained between the ILP-ES and two different types of triad classification stimuli appears to contradict this hypothesis. Nevertheless, as with all of the significant findings described in this thesis, it is essential that these results are replicated using more exacting standards before this possibility can be rejected outright.

A third possible explanation for this pattern of findings, and one that is endorsed here, might be that triad classification is a measure of *relative* processing preference (i.e.

higher versus lower level), whereas the questionnaires only provide information concerning subject attitudes towards low level behaviours and processes. The fact that an individual reports a favourable attitude towards low level processing, for example they endorse the RVEI-EXP item "I think there are times when one should rely on one's intuition", does not necessarily mean that they typically prefer intuition over more logical, higher level processes as a basis for decision making. All such a self-report can reveal is that the individual regards low level processing highly (assuming one can rely on self-report), and not whether they regard it more highly, or base decisions on it more often, than high level processing. Thus, in the case of the RVEI-EXP, the group of high scorers on this scale will be comprised of individuals who regard intuition as an important mental resource, some of whom will prefer to actually make the majority of their decisions on this basis and some of whom will not. As such, the RVEI-EXP does not provide a pure measure of processing preference and the correlation between this scale and triad classification will reflect this fact. A similar explanation could be offered for the non-significant correlations between triad classification, the ILP-EE and the HIPS-R, although in these cases items typically refer to behaviours rather than processes. Such an explanation can also accommodate the significant correlations between the different low level processing questionnaires and those between these and hypnotic suggestibility, as these are also unipolar scales of low level processing, rather than relative processing preference measures. However, by this view, one would need to assume that the near significant correlations between the ILP-ES and triad classification are due to the inclusion of items on the ILP-ES which do actually capture a relative high vs. low level processing preference, and not just endorsement of the latter. Existing information regarding the behaviours concerned is, however, insufficient to provide an answer to this question and further research is clearly required before any firm conclusions can be drawn in this regard. At the very least, however, this discussion raises the issue of what a good measure of processing preference actually is. One task for future research would be to address this issue by devising bipolar self-report scales that compare high vs. low level processing preference, rather than look at one or the other. If the generality of the distinction between high and low level processing holds firm, one can predict that triad classification would in this case show significant correlations with self-reported processing predisposition.

10.2.2 Hypnotic suggestibility, cognitive flexibility and processing preference

On the basis of the model presented in chapters two and three, it was predicted that hypnotic suggestibility would be (i) positively related to a low level processing preference; (ii) negatively related to a high level processing preference; and (iii) negatively related to certain high level abilities, namely the abilities to engage in problem solving and perceptual analysis. Although significant support for the first prediction has been reported here, no evidence was found in support of either of the predictions concerning higher level processing. The absence of significant correlations between the HGSHS:A and the RVEI-RAT, ILP-DS, ILP-DT and HIPS-R indicates that suggestibility and high level processing preference are unrelated. If engaging in higher level thought militates against suggested responding, as argued in chapter four, those individuals with a tendency to think critically clearly did not do so any more than anyone else during the presentation of the HGSHS:A. Alternatively, engaging in higher level thought may not militate against suggested responding at all, contrary to the current theory. Comparing the level of suggestibility displayed by individuals presented with instructions to relinquish critical thought prior to suggestibility testing with that of individuals not provided with such instructions may be one way of addressing this issue empirically. A study employing such a design is currently underway.

The absence of a significant correlation between the HGSHS:A and filtering interference indicates that highly suggestible individuals are no less able to engage in perceptual analysis than their low suggestible counterparts, contrary to prediction. Significant negative correlations between the HGSHS:A and the MFFT (time) and syllogistic reasoning variables were nevertheless obtained in study 2, indicating that high suggestibles are more impulsive and less able to engage in higher level reasoning than lows. However, when analysis was restricted to those subjects who had also completed the questionnaires in study 1, the significant correlations between the HGSHS:A, syllogistic reasoning and MFFT (time) variables were reduced to non-significant levels. The fact that these correlations were significant using the original sample is potentially relevant theoretically, although the fact that the removal of only seven subjects could render these correlations non-significant casts serious doubt on the validity of these findings. Also contrary to prediction, a significant *positive* relationship between the HGSHS:A and Raven's matrices was obtained in study 2, suggesting that highly suggestible individuals are actually *better* at analytical problem solving than their low suggestible counterparts. Although this relationship was rendered non-significant by the removal of the seven subjects who had not completed the questionnaires in study one, unlike those between the HGSHS, MFFT (time) and syllogistic reasoning, this correlation remained close to significance with this restricted sample. Thus, it may simply be a matter of inadequate statistical power that underlies the non-significance of this relationship, and not an artefact resulting from a small number of subjects exerting leverage on the magnitude of the correlation coefficient as appears to be the case with the syllogistic reasoning and MFFT (time) variables.

Leaving aside the question of whether or not performance on Raven's matrices reflects, in part, lower rather than higher level processing abilities, this finding raises certain issues concerning the nature of suggestibility. Broadly speaking, the capacity to engage in analytical problem solving rests on two essential components: the presence of appropriate processing algorithms and the ability to use those algorithms effectively. While the former is ultimately dependent on an organism's learning history, the latter is related to the inherent ability to flexibly manipulate and transform representations through the use of attention. As such, an individual who is able to engage in effective analytical problem solving is able to do so, in large part, because of their capacity for attentional control[82]. Thus, if high and low suggestible individuals are no different in their knowledge of problem solving algorithms (as the research here indicates), the positive correlation between the HGSHS:A and Raven's matrices may reflect suggestibility-related differences in the ability to control attention. Viewed from this perspective, such a finding is consistent with previous research concerning the relationship between hypnotic suggestibility and attentional ability (see e.g. Graham & Evans, 1977; Crawford *et al*, 1993). The significant correlations between the HGSHS:A, the ILP-ES and the ILP-EE may also relate to this notion. According to Schmeck, Giesler-Brenstein and Cercy (1991), the elaborative processing scale of the inventory of learning processes (comprising the ILP-ES and ILP-EE) reflects a preference for a holistic (i.e. low level) style of learning given the ability to use both analytic and holistic strategies in an adaptable and integrated fashion. Taken together, these findings appear to indicate that suggestibility may actually be related to a low level processing preference in combination with good *cognitive flexibility* (cf. Crawford, 1989). How might the model of suggestion and suggestibility outlined in chapter three accommodate such a pattern of findings?

[82] Conversely, however, an individual with good attentional control will be unable to solve problems effectively without the appropriate processing algorithms. Indeed, the validity of the prediction concerning suggestibility and high level processing ability rests on this fact.

In the first instance, it is important to consider where the concept of cognitive flexibility fits within the model of the cognitive system described in chapter two. Crawford (1989) has defined cognitive flexibility as "the degree to which an individual has and uses one of several available types of information processing strategies or styles during different tasks...as well as different states of awareness" (p. 155). Thus defined, a number of different sources of evidence may be viewed as indicative of a relationship between cognitive flexibility and hypnotic suggestibility (see e.g. Crawford, 1989; chapter one): (i) the tendency of highly suggestible individuals to engage in day-dreaming and intense everyday absorption (Crawford, 1982b), coupled with the positive relationship between suggestibility and sustained attentional ability (e.g. Crawford *et al*, 1993); (ii) the ability of highly suggestible individuals to fall asleep at will (Evans, 1977); (iii) the ability of highly suggestible individuals to produce and control vivid visual images (e.g. Crawford & Allen, 1983); (iv) the tendency of highly suggestible individuals to experience their emotions more intensely than lows (Crawford *et al*, 1989); (v) the ability of highly suggestible individuals to disembed both words (Wallace *et al*, 1994) and figures (Wallace, 1988) from complex stimulus arrays; and (vi) the positive relationship between suggestibility and creativity (see e.g. Lynn & Sivec, 1992). Evidence suggesting a positive relationship between hypnotic responsivity and *physiological* flexibility could also be regarded in this light (Crawford, 1989). In each of these domains, the common element appears to be the role that attentional control plays in the generation of the phenomenon in question. In some cases (e.g. increased imagery vividness; heightened affect intensity), the effect may result from the amplification of perceptual information by attentional systems, in others (e.g. absorption) sustained attentional processes appear to be the major underlying factor. Other phenomena are apparently related to the operation of control mechanisms governing attentional-switching (e.g. disembedding figures/words; sleep-control) and the manipulation and transformation of representations (e.g. day-dreaming). On the face of it, such processes reside within the realm of the supervisory attentional system (cf. Norman & Shallice, 1986), a notion that forms the basis for certain aspects of the neuropsychophysiological model of hypnosis. By that view, the superior supervisory attentional abilities of highly suggestible individuals enables them to attend to the hypnotic induction while ignoring extraneous stimuli, a process that acts as the precursor to a "letting go" of high level attentional control (see e.g. Gruzelier, 1998). Such an account is supported by the positive correlation between the HGSHS:A and Raven's matrices described here. We should not forget, however, that the ability of the SAS to control attention and manipulate information is, in part, related to the efficiency with which low level systems direct the activation and inhibition of low level representations (cf. Shallice & Burgess, 1996; Burgess & Shallice, 1996b). Given that this is the case, low level attentional competence may be regarded as an important element of cognitive flexibility also, as must the efficiency of the relationship between different levels of processing control. This is particularly pertinent given the observed relationships between the HGSHS:A, triad classification and the low level processing questionnaires.

The notion that suggestibility is intimately related to attentional control has important implications for any account of the mechanisms operating in the production of suggested effects, particularly concerning the role of the subject in this process. It may be that the success of a given suggestion attempt rests on the active (i.e. high level) efforts of the participating individual to create the suggested experience in question. According to the model outlined in chapter three, however, high level intervention is not an essential aspect of the suggestion process. By this view, suggested effects are the product of low level attentional systems selecting relevant behavioural and perceptual representations for the subsequent control of action and experience. It is nevertheless likely that higher level systems are capable of aiding this process in a number of ways. For example, consciously directing the focus of high level attention towards (or away from) particular perceptual channels could amplify the degree to which low level attentional systems activate or inhibit representations under their control. Alternatively, the generation of appropriate high level schemàta could trigger a search for suggestion-related representations by low level attentional systems (cf. Shallice & Burgess, 1996). The type of higher level process involved in the generation of a suggested effect is likely to vary according to the nature of the desired response. High level attention and disattention may, for instance, play an important role in the creation of suggested analgesia (see e.g. Crawford, Knebel, Kaplan, Vendemia, Xie, L'Hommedieu & Pribram, 1996), while the construction of high level schemata could contribute to the success of ideo-motor and challenge suggestions[83].

[83] By this view, the construction of a high level schema could activate suggestion-related perceptual representations which serve as feedback indicating that the suggested state of affairs is veridical; this would maximise the activation level of the behavioural representation involved in the generation of the suggested effect, increasing the likelihood of success. Such a position is broadly consistent with that of Kirsch and Lynn (1997) who propose that the successful execution of suggestions involves the prior creation of the subjective experience associated with the desired response (e.g. a feeling of lightness during an arm levitation suggestion). High level schemata could also contribute to ideo-motor and challenge suggestions by specifying the type of behavioural representations that would be appropriate for the suggested response.

The conceptual implications of such a view for the model outlined in chapter three are far-reaching indeed. In the first instance, it demonstrates that regarding suggestion as a purely low level process may, in many cases, be inappropriate; clearly, higher level processes may play an important role in this process also. Secondly, it signals the need for an appreciation of the more temporal aspects of suggestive responding. Rather than identifying suggestion as a single-step process involving the activation of low level representations, it may, in some cases, be more appropriately viewed as a multi-step process extended over time. According to this line of reasoning, the actual execution of the suggestion (i.e. low level attentional selection of a suggested representation) is only the end result of the suggestion process, and may be preceded by a number of different psychological events. Thirdly, such a view highlights the fact that different cognitive processes are probably involved in the execution of different suggestions. As such, any comprehensive theory of suggestion must be able to provide explanations tailored to individual phenomena and not just speak to suggested effects in general. Moreover, different processes may be responsible for the generation of the same suggested effect, both within and between individuals. For example, some individuals may be able to produce suggested phenomena on the basis of purely low level mechanisms (e.g. as in an action slip; Reason, 1979), while others may require the intervention of higher level systems to produce the same effect (see R. Brown, in press). Future theorising within this domain should not, therefore, limit itself to the explanation of suggested phenomena by reference to single processes that apply in all situations, as has been the case in the majority of previous models (including that offered here).

The idea that high level processes often play a central role in the generation of a suggested response also underlines the explanatory value of the self-suggestion concept. Self-suggestion may be regarded as the process by which a low level representation is automatically selected for the control of behaviour or experience as the result of triggering input from the internal rather than the external environment (see chapter three). The automatic activation of representations following the intervention of high level systems provides an archetypal example of this process. Such a phenomenon is most likely to occur during self-hypnosis, although it may also be a common component of hetero-hypnosis[84]. Suggested experiences may be produced, for example, as a

[84] It is probably true that self-suggestion is a ubiquitous phenomenon within everyday life also. The types of representations activated in these cases are nevertheless likely to differ from those activated during hypnosis, for obvious reasons.

consequence of deliberately repeating a suggestion to oneself, rather than through the direct action of the words of the hypnotist (cf. Woody & Bowers, 1994).

It is important to consider how such a revised account of suggestion might relate to existing theories within this domain. The notion that higher level processes often contribute to the process of suggestion is broadly consistent with the sociocognitive position concerning the role played by the subject in the generation of suggested effects (see e.g. Sarbin, 1950; Spanos, 1982). By this view, the participant is not simply a passive automaton at the mercy of environmental influences, but an active agent attempting to experience the suggested effect through the use of goal-directed strategies. As such, the present model embraces the sociocognitive assertion that suggested behaviours may occur as the result of intentional behaviours[85] performed by the participating individual. Although acknowledging the validity of such a view, the present account differs from that of certain sociocognitive theorists (e.g. Spanos, 1982) in its assertion that suggested phenomena, being the product of automatic cognitive processes, may also be generated unintentionally. It is in this sense that the current position differs from classical neodissociation theory (i.e. the theory of *dissociated experience*; Hilgard, 1977, cf. Woody & Bowers, 1994), which posits that suggested phenomena are the product of purely higher level processes (see chapter 1; Kirsch & Lynn, 1995).

The recent sociocognitive theory offered by Kirsch and Lynn (1997) also embraces the notion that suggested responses result from the automatic activation of low level representations. Unlike Kirsch and Lynn (1997), however, the present model does not require that establishing a higher level goal is a necessary part of this process. While it may be a common component, particularly in the hypnotic situation, the present model asserts that suggested behaviours can occur as the exclusive product of lower level

[85] What constitutes an adequate definition of intentional behaviour remains a contentious issue within this sphere. One possibility is that intentional behaviours are those that are executed in the pursuit of a pre-set goal established by higher level systems, a view largely in line with that offered by Kirsch and Lynn (1997). Such a definition is appealing because it embraces the notion that behaviours can be considered intentional even if they have been carried out by lower level systems (Kirsch & Lynn, 1997). Common sense accounts of intention also fit neatly with this view. It is unlikely, for example, that a driver who swerves to avoid a pedestrian would claim that they had done so unintentionally, even if they were to acknowledge that their behaviour had been controlled automatically at the time. In this case, the action of swerving is a product of a low level process that is consistent with the higher level goal of driving safely. This is some way from a comprehensive explanation of the relationship between intention and behaviour. In particular, such an account fails to explain why we are often unaware of setting such higher level goals in the context of everyday action. It may be that the act of setting a goal for a routine behaviour such as driving is so undemanding of higher level systems that its expression within conscious awareness is too brief to establish an adequate memory trace for subsequent recall. How one might assess the validity of such a view empirically is far from certain, however (see Velmans, 1991, and the accompanying commentaries). Regrettably, a comprehensive examination of these issues is beyond the scope of the current undertaking.

processing, as in the case of an action slip (see Reason, 1979).[86] The notion that suggested phenomena may, in certain circumstances, be the product of purely unintentional cognitive processes (i.e. the direct activation of low level representations) is consistent with the model of suggestion outlined by dissociative control theorists (e.g. Bowers, 1990, 1992; Woody & Bowers, 1994). In the present case, however, both high level inhibition and high level activation may facilitate the automatic activation of representations, implicating both unintentional *and* intentional cognitive processes in the generation of suggested effects. Viewed in this light, the present model offers even greater scope for conceptual reconciliation between the dissociative and sociocognitive models than previously thought.

The preceding discussion illustrates the type of role that high level processes might play in the generation of suggested effects. In each case, individual differences in both high and low level attentional abilities are likely to influence the probability of success in a given suggestion attempt. In line with the results described here, it may be that the most suggestible individuals will be those who have a preference for a low level style of cognition in combination with good cognitive flexibility. Such a disposition would allow for the use of high level strategies to augment an everyday tendency to control behaviour and experience on the basis of low level representations. That notwithstanding, the current model proposes that there are a number of different paths to good suggestive responsivity. For instance, individuals with a strong preference for low level cognition may not require good higher level abilities to respond successfully to suggestions, whereas those with very good higher level abilities may not require a low level processing bias to achieve the same results. Such a pattern of relationships could offer one further reason why the magnitude of the obtained correlations between the HGSHS and the low level processing predisposition questionnaires are not as large as one might hope.

10.2.3 Hypnosis, processing bias and critical thought

Having addressed the conceptual implications of studies 1, 2 and 2b for the theoretical framework outlined here, the discussion now turns to the findings of studies 3 and 4. In study 3, the prediction that hypnosis is associated with an increased preference for low level processing was assessed by comparing high and low suggestible subjects in

[86] In such cases, the suggested phenomenon in question may be considered genuinely unintentional; it appears purposeful, however, as it involves the execution of a well learnt behavioural routine established in line with previous system goals.

baseline, relaxation and hypnosis conditions on the triad classification and perceptual filtering tasks employed in study 2. No evidence was found to suggest that there were any differences between the conditions or groups on either of the tasks. In study 4, the prediction that hypnosis is associated with a reduced ability to think in a critical fashion was assessed by comparing high and low suggestibles in hypnosis and relaxation conditions on a syllogistic reasoning task similar to that used in study 2. No evidence was found to suggest that critical thinking ability is any different in the two conditions for either group of subjects. As such, neither of these studies provide support for the theoretical model of hypnosis outlined in chapter three.

The fact that the research described in this thesis supports only the current model's predictions concerning suggestibility and not hypnosis illustrates the preliminary nature of this explanatory framework. Clearly, there is some way to go before the model can provide a satisfactory description of such phenomena, and a considerable amount of empirical validation is required if this is to be achieved. Nevertheless, the findings obtained in this thesis will play an important role in shaping further theoretical development, with both significant and non-significant findings contributing substantially in this regard. The fact that significant evidence has been obtained with regards to suggestibility is particularly encouraging, indicating that the present account of suggestion (both hypnotic and non-hypnotic alike) and suggestibility is at least on the right track and therefore worthy of further investigation. The fact that no significant evidence concerning hypnosis itself has been obtained clearly demonstrates that the current model of hypnosis must be reconsidered and an alternative account provided. Importantly, the findings of studies 3 and 4 will be instructive in this regard.

In the first instance, the possibility that the non-significant findings obtained in these studies was a result of an inadequate level of hypnotic depth (i.e. absorption) being achieved in each case should be considered. However, although the data obtained in these studies is insufficient to categorically reject this interpretation, there is an alternative account which arguably provides a more probable explanation of these findings, whilst still retaining the notion that hypnosis involves a shift in processing preference brought about by a reduction in critical thought. According to the model of hypnosis presented here, the most important state change occurring during hypnosis is the induction of a state of extremely focused attention or absorption. It is the induction of this absorbed state that, according to the present view, is responsible for the reduction of critical thought and resulting shift towards low level cognitive processing presumed to be occurring during hypnosis. Moreover, by this view it is the dynamic relationship between attention, critical thought and low level cognitive processing that underpins suggestive responding, both during hypnosis and in the control of routine behaviour generally. However, the model does not suggest that the state of absorption obtained during hypnosis is immutable, only that a certain degree of attention[87] is required to successfully respond to a suggestion. Indeed, it is quite likely that the status of attention and cognition during hypnosis will be subject to considerable change, depending on the nature of the suggestions given and the activities engaged in. If this is the case, then giving an individual a syllogistic reasoning, triad classification or perceptual filtering task during hypnosis will simply create a demand, a suggestion even, to adopt a style of attention and cognition that is appropriate for the task in question. As a result, the individual will complete the task just as well during hypnosis as outside it, or possibly even slightly (although not significantly) better simply because they are more focused on it. Thus, one need not predict an increase in perceptual interference or similarity-based responding in triad classification and still retain the notion that a shift towards lower level processing is an inherent part of suggestive responding. Similarly, it can be argued that reduced critical thought is an important element in suggestive responding and a common element of the hypnotic experience without expecting an inferior reasoning performance following an hypnotic induction.

Such a view, should its validity be established, would have important conceptual and methodological implications. On the conceptual side, it would suggest that absorption is not a state in which the critical faculties and attentional abilities of the absorbed individual are irrevocably inhibited as suggested by dissociated control theory. Rather, by this view absorption should be reconceived as a state in which the absorbed subject achieves greater control over their attentional processes[88], endowing them with the ability to selectively attend (or disattend) to relevant information according to the nature of the suggestion or task given. Such an increase in cognitive flexibility (Crawford, 1989) during hypnosis would have the same augmenting effect on suggestibility that an inhibition of higher control would have, but at the same time allow for the existence of self-hypnosis. Such a view is consistent with that presented in the previous section

[87] And therefore reduction in critical thought/increase in low level processing bias.

[88] Something of a similar view has been proposed by Spiegel (e.g. 1998) and the neuropsychophysiological theory of Crawford and Gruzelier (1992; see also Gruzelier, 1998), except in these cases attentional control is ceded to the hypnotist rather than retained by the hypnotic subject themselves. However, as virtually identical hypnotic phenomena are possible during self-hypnosis as hetero-hypnosis, it seems more appropriate to place control in the hands of the subject and not the hypnotist. That is not to say, however, that during hetero-hypnosis the hypnotist is not the one controlling the subjects' focus of attention and inattention; it merely suggests that this need not necessarily be the case.

concerning the relationship between suggestibility and cognitive flexibility and the role of higher level processes in suggestive responding. Nevertheless, one of the mechanisms by which this absorbed state is achieved, and perhaps one of the products of such a state unless otherwise directed, may still be a (deliberate) reduction in critical thought and a shift towards low level processing. Indeed, it is possible that such a state of enhanced attentional control could be the result of processes associated with both low and high level attentional systems, a notion which would fit neatly with the mechanisms of suggestion outlined here.

According to this view, hypnosis researchers should stop speaking of hypnosis in static terms where one is in a particular state or not, but rather speak of it in fluid terms encompassing a variety of states and modes of processing that vary over time and instructions (cf. Kihlstrom, 1985). Indeed, with the advances made by recent neuropsychophysiological research and theory, the theoretical emphasis within the field has, to an extent, shifted towards a dynamic view of hypnosis with an appreciation of its more temporal aspects (see also section 10.2.2). One of the most important contributions of recent neuro-psychophysiological research is arguably the attention it has drawn to the fact that hypnosis involves considerable physiological change, which is largely dependent on how hypnosis is induced and what one does thereafter. If the field is to progress it is essential that our theories, and the methodologies we use to assess them, recognise this fact.

The methodological implications of such a view are clear. Assuming that attentional absorption is actually controllable/flexible then assessing state changes through ability and preference measures, such as those used in studies 3 and 4, is unlikely to show anything of real interest because the individual, without further instruction, will simply complete the tasks in the same way as normal. The only such measures likely to yield findings of any interest by this view would be those assessing cognitive flexibility itself, with the clear prediction being that, given comparable baseline abilities, absorbed individuals will complete them better than those who are not absorbed. If one is aiming to understand the state changes associated with absorption alone then more indirect measures, such as physiological assessment, which do not create suggestive demands are required. Other indirect measures, such as the Stroop task, may also be instructive in this regard, although given the theoretical dispute surrounding the concept of automaticity a set of converging operations (as opposed to a single task) would be required before any firm theoretical statements could be made concerning the processes involved in absorption.

Of course, although these conceptual and methodological speculations are potentially important, one must not lose sight of the fact that the negative results concerning hypnosis reported in this thesis also support the alternative, less state-oriented position, that absorption has no effect on suggestibility at all. By this view, the increases in suggestibility typically observed following an hypnotic induction are simply the product of the interaction between expectations and contextual cues. Thus, while absorption may or may not be a common component of the hypnotic experience, it has no functional significance with regards suggestion and suggestibility and merely serves to detract attention away from the processes of real interest. If one is to reject this position then a direct and measurable (preferably not by self-report) manipulation of absorption is required to assess whether or not it has any significant effect on suggestibility levels. Simply comparing those individuals who have been given an hypnotic induction with those who have not would be insufficient unless one can be certain that the only difference between these conditions is in level of absorption. However, as this is unlikely given the functional role that the hypnotic label appears to play in determining the degree and nature of suggestive responding, this hypothesis would probably be best examined in a context entirely divorced from hypnosis. This obviously raises the question of how absorption can be manipulated without using explicitly hypnotic techniques, although the fact that absorption does not appear to be unique to hypnosis (Kirsch, 1998) at least suggests that this is possible.

10.2.4 Methodological limitations and future research

Although evidence concerning the relationship between suggestibility and low level processing preference has been obtained here, this evidence is not as convincing as one would hope. In each case, the correlations between suggestibility and low level processing preference are, despite being statistically significant, rather disappointing in terms of effect size. Clearly, therefore, empirical replication using a more rigorous methodology is required before any firm conclusions concerning the relationship between suggestibility and processing preference can be drawn. Accordingly, this section will focus on the methodological limitations of the empirical research described here and their implications for future research in this domain.

10.2.4.1 Task-related problems and modifications

With the aid of hindsight, it is easy to identify certain limitations of specific measures used in this thesis. As with all self-report measures, the questionnaires used in study 1 (see chapter five) are inherently limited by their subjective nature. Such measures are subject to considerable variation from several sources unrelated to the construct of interest, namely processing preference. In particular, self-report responses are inextricably linked to the criteria used by subjects to judge whether and to what degree a particular statement is characteristic of them. Individual value judgements regarding the behaviours and processes described in these questionnaires may also be a significant source of response bias. For example, a subject with negative opinions concerning the value of intuition is unlikely to endorse items relating to it, despite the fact that on a cognitive level they may have a relative tendency towards such processing. The fact that the questionnaires used here are relatively transparent regarding the object of their study may well contribute to any such effect. A related problem is that subjects' responses are ultimately related to their perceptions of their own behaviour and cognition, which may or may not be an accurate reflection of reality. Given the methodological limitations of questionnaires such as the RVEI and ILP it may not be surprising that the observed correlations between these scales and the HGSHS:A are modest at best. A further problem with the questionnaires used here is the fact that they do not provide comprehensive coverage of the domain of lower level processes identified in chapter two. While the RVEI, ILP and HIPS encompass the concepts of holistic processing, intuition, emotion and creativity, for example, they say little or nothing about impulsivity and the tendency to move into "automatic-pilot" for the control of behaviour. Accordingly, the author is currently engaged in the psychometric validation of a new self-report instrument that, in addition to items from the appropriate sections of the RVEI, ILP and HIPS, includes others addressing these aspects of low level processing also. It is hoped that any pertinent findings concerning this measure, the so-called low level processing questionnaire (LLPQ), will be reported elsewhere.

In contrast to the questionnaires used in study 1, measures such as the triad classification task and the MFFT do a better job at concealing what they are attempting to measure and may offer a more objective assessment of processing preference as a result. That notwithstanding, there are certain problems with these measures as they have been used here. For example, the triad classification measure consisted entirely of critical items, potentially encouraging subjects to adopt a rigid response strategy to complete the task. As a result, item responses may reflect the application of a rule rather than a predilection for a particular type of perceptual processing. This may be overcome in future research by presenting the critical items alongside filler items drawn from the same set of stimuli but not forming the target configuration (see figures 6.1 and 6.2).

Limiting the task to the stimulus dimensions of size and brightness (i.e. the square stimuli used here) would also be an appropriate step given the findings reported here. Research using such a task is currently underway to reassess the relationship between suggestibility and perceptual integrality-separability.

In contrast to the triad classification task, the MFFT provides a performance measure specifically designed to tap individual differences in response strategy (Kagan, 1965; see also Kagan *et al*, 1964). Even given the relative objectivity that this may provide, however, the MFFT may not yield an accurate assessment of processing preference due to the way that it is scored. Although a short first-response latency may be indicative of an impulsive response set in many cases, such an interpretation may not apply when a quick initial response is followed by a more cautious approach on subsequent attempts. Deriving a performance measure from all response latencies rather than just the first would be one obvious solution to this problem. The uncertainty surrounding the relationship between suggestibility and reflection-impulsivity may be resolved by the use of such a modified version of the MFFT in future research.

One potential problem with Raven's matrices is the possibility that subjects may have arrived at correct solutions to certain items using holistic rather analytic cognitive processes (Hunt, 1974). Conducting a careful task analysis to identify those items that can only be solved through the use of analytical processing would be a necessary first step in the creation of a revised Raven's matrices measure for future research in this domain. It is hoped that the relationship between suggestibility and high level processing ability, only hinted at here, may be brought into sharper focus by the use of such a measure.

10.2.4.2 The measurement of suggestibility

Probably the most significant limitation of the empirical research described here relates to the assessment of suggestibility, provided in this context by the HGSHS:A. There are a number of methodological problems associated with the HGSHS:A which may have contributed to the equivocality of the current findings. In the first instance, the HGSHS:A may be subject to considerable measurement error associated with its group administration. Although group testing has the advantage of being practical, individuals may not behave in the same way in a group as they would on their own. The increased social demand of group testing may, for example, increase the likelihood of subject compliance, artificially inflating suggestibility scores as a result. Conversely, subjects may feel more inhibited in a group situation and feel less inclined (or be less able) to respond in line with the scale suggestions. Similarly, participants may be exposed to additional distractions in the group environment that prevent them from concentrating on the suggestions to the required degree. The fact that HGSHS:A administration employed varying group sizes, ranging from two to fifty individuals, may also have contributed to measurement error in this context. Ultimately, however, employing a group administered test of suggestibility seemed the only realistic option given the practical constraints placed on the current undertaking. In retrospect, it may have been more appropriate to concentrate on conducting fewer studies using more reliable, individually administered measures.

A second major problem with the HGSHS:A is the potential for it to overestimate suggestibility levels (Bowers, 1983). Compared to a measure such as the SHSS:C (Weitzenhoffer & Hilgard, 1962), the HGSHS:A incorporates only a small number of difficult cognitive items (e.g. negative hallucination) and concentrates largely upon easier suggestions for ideo-motor movements and inhibition (e.g. arm levitation and hand clasp). As such, only a proportion of the individuals who score highly on the HGSHS:A would do so on other measures of suggestibility. The overestimation of suggestibility by the HGSHS:A, coupled with the relatively lax criteria used for participant selection, almost certainly resulted in the inclusion of subjects in studies 3 and 4 who would not be regarded as genuinely high in hypnotic suggestibility. It is possible that the absence of any significant findings in these studies is a product of such subject selection procedures.

The HGSHS:A could also be criticised for failing to provide an assessment of the subjective experiences associated with behavioural responses on the test. As the experience of suggestion-related involuntariness and effortlessness is arguably the hallmark of a successfully suggested response (Weitzenhoffer, 1953), any test which fails to consider such experiences can only provide a limited assessment of suggestibility (Spanos, Salas, Menary & Brett, 1986). With this in mind, a measure such as the CURSS (Spanos, Radtke *et al*, 1983), which incorporates both objective and subjective scales, may have provided a more suitable instrument for the assessment of suggestibility in this thesis. It is possible that the correlations between suggestibility and low level processing preference obtained here would have been stronger if such a multidimensional scale had been used instead of the HGSHS:A.

Probably the most substantive criticism of the data collection performed here concerns the use of a single testing occasion for the measurement of suggestibility. The decision to take only a single assessment of suggestibility was based on two things. First and foremost, taking two suggestibility measures would have increased the amount of data collection to a level incompatible with the practical constraints placed on the present endeavour. Secondly, the test-retest reliability of the HGSHS:A (Hilgard, 1965) was considered high enough to render a further assessment of suggestibility unnecessary. There are a number of reasons, however, to assume that multiple testing provides a more reliable estimate of suggestibility than a single testing occasion (cf. Kurtz & Strube, 1996). It is possible, for example, that subjects feel more distracted and less relaxed during an initial encounter with hypnosis and find themselves less able to engage in the suggestions than one would like. Any increase in rapport across testing occasions may also contribute to subsequent suggestibility test performance. Perhaps more importantly, if one takes the view that responding to suggestions involves an element of acquired skill (see e.g. Gorassini & Spanos, 1986), first test measurements of suggestibility are unlikely to provide an entirely accurate reflection of an individual's ultimate responsivity to suggestion[89]. As such, it may have been more appropriate to address fewer empirical issues in this context and invest more time in establishing reliable suggestibility estimates through multiple testing. Such a practice is recommended for future research in this domain.

In addition to such methodological limitations, there are certain conceptual problems associated with the measurement of suggestibility in the research described here. Throughout this thesis, the term 'suggestibility' has been used almost exclusively to refer to the individual difference dimension assessed by the HGSHS:A. Such a practice is based on the assumption that tests of so-called hypnotic susceptibility, such as the Harvard Group Scale, provide an effective measure of the degree to which individuals respond to suggestions, regardless of whether or not they have received an hypnotic induction. However, the Harvard Group Scale does include an hypnotic induction and scores obtained on it will, at least to an extent, have been contaminated by this. Indeed, one of the central assumptions of the current model is that hypnosis has a significant effect on suggestibility levels through the induction of an absorbed state involving a reduction in critical thought and an increase in low level processing preference. As such, the significant correlations obtained here with the HGSHS may be a product of the inclusion of the hypnotic induction on the scale; thus, a low level processing preference may have nothing to do with suggestibility *per se*, but rather is associated with absorption itself with this being the source of the significant findings reported here.

[89] Indeed, this would be true of second experiences with hypnosis also. It is inevitable, however, that a second assessment of any skill would yield a better estimate of asymptotic performance than that provided by an initial test.

As such, a more careful usage of the terms suggestibility and susceptibility is recommended, as are methodological steps which take this caution into account. Accordingly, it is proposed that the term "suggestibility" be used to refer only to the degree to which individuals respond to suggestions, with a "hypnotic" qualifier being used when responsivity to suggestion is being assessed in an explicitly hypnotic context (i.e. one which has been labelled as such by all concerned). Following the current model, one would predict that suggestibility so defined will be related primarily to a low level processing predisposition, which is in turn influenced by attention, critical thought, expectations and contextual cues. In contrast the term "hypnotic susceptibility" should be reserved to refer specifically to an individual's receptivity to the state changes that the current model assumes are occurring during hypnosis, and the contextual and expectational cues that influence the induction of such changes. Thus, one would predict that hypnotic susceptibility as defined in this way will be related to the propensity to become absorbed, inhibit critical thought and experience a processing shift towards low level processing, as well as the belief that hypnosis involves these or similar state changes.

Clearly, there is overlap between these two concepts, although the distinction has obvious conceptual and methodological implications. By this view, so-called hypnotic susceptibility tests such as the HGSHS:A are ill defined because they contaminate suggestibility and susceptibility as they are described here. Rather, these tests should be redefined as measuring hypnotic suggestibility (cf. Kirsch, 1997), with information concerning hypnotic susceptibility being provided only by a comparison of suggestibility in hypnotic and non-hypnotic conditions (Kirsch, 1997). In this fashion, one could assess whether the low level processing measures significantly correlated with the HGSHS in this thesis are so related due to suggestibility or susceptibility factors; indeed, in all research investigating suggestion and hypnosis such a practice is recommended.

10.2.4.3 Future directions

If the present account of suggestion and hypnosis is to be established as a useful theoretical model within this domain, further conceptual and empirical development is essential. On the conceptual side, it is likely that the current model, which aims to account for all suggestions by reference to a common set of processes, fails to recognise important differences between suggested phenomena. As such, further work needs to be done to establish the functional differences between suggestion types. Such an analysis may provide important information concerning why some individuals respond well to some suggestions and not others (see e.g. Bowers, 1983). In a similar vein, the notion that different cognitive processes can be responsible for the same suggested response should also be investigated. In each of these cases, a likely avenue for conceptual development may involve explorative research looking at the differences between and within individuals who respond successfully to different types of suggestions. Other aspects of the model, such as the concepts of absorption and post-hoc interpretation, also remain relatively ill defined and require further conceptual elaboration if they are to prove useful. Conceptual development could also address the role of suggestion in contexts other than hypnosis. One potentially productive avenue for such development concerns the role of suggestion in the development of medically unexplained symptoms (Brown & Trimble, 1999, in preparation). Theoretical and empirical research based on this notion is currently underway.

Regarding the model of the cognitive architecture outlined in chapter two, resources should be put into identifying the physiological and anatomical substrates of the cognitive processes and systems described here. The concept of low level attention also needs to be described in far more detail, with particular emphasis on the processes by which low level representations are selected and integrated to form a unitary perceptual whole for further, higher level processing. The theoretical work of Marcel (1983) may be particularly instructive in this regard. The present model is also a long way from providing a satisfactory account of the relationship between cognition, phenomenology and intentionality; without such an understanding it is unlikely that a truly comprehensive account of suggestion and hypnosis will ever be possible[90].

On the empirical side, a number of possible avenues for future exploration come to mind. In the first instance, an attempt at replicating the observed relationship between suggestibility and low level processing preference is essential, as is a re-examination of the relationship between suggestibility, reflection-impulsivity and analytical processing ability. Recommendations concerning the most appropriate empirical approach to these issues are presented in sections 10.2.4.1 and 10.2.4.2. The notion that the increased suggestibility typical of the hypnotic situation is jointly determined by context-related expectations, the generation of intense absorption and a reduction in critical thought should also receive greater attention in future research. As discussed in section 10.2.3, however, the empirical approach adopted in this thesis may not be an appropriate

[90] It is inevitable the many other aspects of the models outlined in chapters two and three are in need of conceptual elaboration. Those described here simply represent the most pertinent in the opinion of the author at the current time.

strategy for the evaluation of these hypotheses: if, as suggested by this view, "hypnotic" absorption is associated with an increased ability to control attention, one would not anticipate altered performance on tasks assessing perceptual processing preference and the ability to think critically. Rather than assessing whether hypnosis is associated with a reduction in critical thought or a low level processing bias, an alternative approach might be to assess whether the hypnotic context, absorption and reduced critical thought increase the ability to respond to suggestions. An appropriately designed study looking at these variables in combination[91] with one another may allow one to assess both their individual and their interactive affect on suggestibility, thereby offering a way of identifying the components of importance within a hypnotic induction. The author is currently involved in a study that adopts such a design. Research of this sort is essential if we are to establish whether increased suggestibility is a unique aspect of the hypnotic situation or something that can be achieved by other manipulations of state and context. If the latter were to prove possible, as one might predict following the model of suggestion outlined in this thesis, such research could lead to the eventual demise of hypnosis as a conceptual and practical entity, to be superseded by alternatives more confidently grounded in contemporary psychological research and theory.

[91] For example, a 2 × 2 × 2 between subjects design taking context (non-hypnotic vs. hypnotic), absorption (instructions to become absorbed vs. no instructions) and critical thought (instructions to reduce critical thought vs. no instructions) as independent variables and change in suggestibility as a dependent variable.

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Appendices

APPENDIX I

APA Definition and description of hypnosis (taken from Kirsch, 1994)

Hypnosis is a procedure during which a health professional or researcher suggests that a client, patient, or subject experience changes in sensations, perceptions, thoughts, or behaviour. The hypnotic context is generally established by an induction procedure. Although there are many different hypnotic inductions, most include suggestions for relaxation, calmness and well-being. Instructions to imagine or think about pleasant experiences are also commonly included in hypnotic inductions.

People respond to hypnosis in different ways. Some describe their experience as an altered state of consciousness. Others describe hypnosis as a normal state of focused attention, in which they feel very calm and relaxed. Regardless of how and to what degree they respond, most people describe the experience as very pleasant.

Some people are very responsive to hypnotic suggestions and others are less responsive. A person's ability to experience hypnotic suggestions can be inhibited by fears and concerns arising from some common misconceptions. Contrary to some depictions of hypnosis in books, movies or on television, people who have been hypnotized do not lose control over their behaviour. They typically remain aware of who they are and where they are, and unless amnesia has been specifically suggested, they usually remembered what transpired during hypnosis. Hypnosis makes it easier for people to respond to suggestions, but it does not force them to have them experiences.

Hypnosis is not a type of therapy, like psychoanalysis or behaviour therapy. Instead, it is a procedure that can be used to facilitate therapy. Because it is not a treatment in and of itself, training in hypnosis is not sufficient for the conduct of therapy. Clinical hypnosis is should be used only by properly trained and credentialed health care professionals (e.g. licensed clinical psychologists), who have also been trained in the clinical use of hypnosis and are working within the areas of their professional expertise.

Hypnosis has been used in the treatment of pain, depression, anxiety, stress, habit disorders, and many other psychological and medical problems. However, it may not be useful for all psychological problems or for all patients or clients. The decision to use hypnosis as an adjunct to treatment can only be made in consultation with a qualified health care provider who has been trained in the use and limitations of clinical hypnosis.

In addition to its use in clinical settings, hypnosis is used in research, with the goal of learning more about the nature of hypnosis itself, as well as its impact on sensation, *perception, learning, memory, and physiology. Researchers also study the value of hypnosis in the treatment of physical and psychological problems.*

APPENDIX II

Instructions for perceptual filtering task used in studies two and three

The following instructions were read verbatim to subjects prior to completion of the task.

Upon presentation of first set of cards

Okay, I have here a set of cards. On each card there is a line, and there are two types of line: short lines (lines with a small angle[92]) *and long lines* (lines with a large angle). *All the long lines* (large angles) *are the same size and all the short lines* (small angles) *are the same size. Now, what I want you to do is sort the cards, as quickly as you can and with as few errors as possible, into two piles, one of short lines* (small angles) *and one of long lines* (large angles). *I am going to ask you to sort the cards ten times in all, with the first four sorts being practice trials as you don't know what constitutes a short* (small angle) *or long* (large angle) *line yet. I am going to be timing you while you do this and, after the first four sorts, I will also tell you whether you have made any mistakes or not. Remember to sort the cards as quickly as you can and with as few errors as possible. Do you have any questions?* (any questions are answered by paraphrasing the above instructions) *Here comes the first sort: are you ready? Okay, when I say "go" start sorting the cards.* (Timing begins with Experimenter saying "go").

After the first four card-sorts the following instructions are read verbatim to subjects

Okay, that was the final practice trial. The next six trials are for real. I will now tell you if you have made any mistakes after each sort. Are you ready? Okay, here comes the next sort.

After the six experimental card-sorts the following instructions are read verbatim to subjects

That was the final sort of that kind. I am now going to ask you to do ten more card-sorts which are slightly different this time. Before I asked you to sort the cards on the basis of line

[92] The instructions presented here arbitrarily take line length as the initial sorting dimension and line angle as the secondary sorting dimension. The phrasing for the alternative dimensions are presented in parentheses. In cases where angle was the sorting dimension, it was demonstrated to subjects that the angle in question was that measured from the horizontal as taken from the lowest point of the line.

length (line angle). *Now I am going to ask you to sort the cards on the basis of line angle* (line length). *As before, there are two types of line, lines with a small angle* (short lines) *and lines with a large angle* (long lines). *All the small angles* (short lines) *are the same size and all the large angles* (long lines) *are the same size. Now, what I want you to do is sort the cards, as quickly as you can and with as few errors as possible, into two piles, one of small angles* (short lines) *and one of large angles* (long lines). *I am going to be timing you while you do this and, after the first four sorts, I will also tell you whether you have made any mistakes or not. Remember to sort the cards as quickly as you can and with as few errors as possible. Do you have any questions?* (any questions are answered by paraphrasing the above instructions) *Here comes the first sort: are you ready? Okay, when I say "go" start sorting the cards.* (Timing begins with Experimenter saying "go").

APPENDIX III

Instructions for triad classification task used in studies two and three

The following instructions were read verbatim to subjects prior to completion of the task.

Okay, I have here a set of cards. On each card there are three items, either three lines, three triangles or three squares (subject is shown first card as an example). *Now, what I want you to do is simply say, for each card, which two of the three items go together the best. That's right, which two of the three go together the best. There are two points to note. First, there are no right or wrong answers. Second, you can take as long as you like for any one card. You can refer to the items as top, middle and bottom or you can simply point to the two you think go together the best. Do you have any questions?* (any questions are answered by paraphrasing the above instructions) *Are you ready? Okay, here is the first card.*

APPENDIX IV

Instructions for Raven's Advanced Progressive Matrices (set II) used in study two

The following instructions were read verbatim to subjects prior to completion of the task.

Okay, I am now going to present you with a series of pictures. Each picture consists of a three by three grid and the bottom right hand element of that grid is missing. Now, what I want you to do is simply say which of the eight alternatives at the bottom of each picture would fit in the missing portion of the grid. Only one of the eight alternatives will fit and you must tell me which it is. If you think you know the correct answer then tell me which of the eight alternatives you think fits. I am not timing you so you can take as long as you like. Do you have any questions? (any questions are answered by paraphrasing the above) *There are twelve pictures in all. Here comes the first one.*

APPENDIX V

Instructions for Matching Familiar Figures Test

The following (original task) instructions were read verbatim to subjects prior to completion of the task.

I am going to show you a picture of a familiar item and then some pictures that look like it. You will have to point to the picture on the bottom of this page (point) *that is just like the one on this top page* (point). *Let's do some for practice.* (Experimenter gives practice items. *Now we are going to do some that are a bit harder. You will see a picture on top and eight pictures on the bottom. Find the one that is just like the one on top and point to it.* (Experimenter gives main test items).

APPENDIX VI

Syllogistic Reasoning Task used in study two

The following fifteen questions were presented in an A4 response booklet with the instructions presented in appendix VII on the front page. Question answers are provided for instructive purposes.

Question 1

All authors are bakers.
All bakers are comedians.

What follows?

Answer: All authors are comedians.

Question 2

No accountants are butchers.
All cooks are butchers.

What follows?

Answer: No accountants are cooks or (vice versa).

Question 3

No painters are teachers.
All cyclists are painters.

What follows?

Answer: No cyclists are teachers (or vice versa).

Question 4

All bakers are authors.
All comedians are bakers.

What follows?

Answer: All comedians are authors.

Question 5

Some accountants are butchers.
No butchers are cooks.

What follows?

Answer: Some accountants are not cooks.

Question 6

Some teachers are painters.
All painters are cyclists.

What follows?

Answer: Some teachers are cyclists.

Question 7

All authors are bakers.
No comedians are bakers.

What follows?

Answer: No authors are comedians (or vice versa).

Question 8

All butchers are accountants.
Some butchers are cooks.

What follows?

Answer: Some accountants are cooks (or vice versa).

Question 9

All painters are teachers.
Some painters are not cyclists

What follows?

Answer: Some teachers are not cyclists (or some teachers are cyclists).

Question 10

All bakers are authors.
All bakers are comedians.

What follows?

Answer: Some authors are comedians (or vice versa).

Question 11

All butchers are accountants.
Some cooks are butchers.

What follows?

Answer: Some cooks are accountants (or vice versa).

Question 12

All teachers are painters.
No painters are cyclists.

What follows?

Answer: No teachers are cyclists.

Question 13

Some bakers are authors.
All bakers are comedians.

What follows?

Answer: Some authors are comedians (or vice versa).

Question 14

All accountants are butchers.
Some cooks are not butchers.

What follows?

Answer: Some cooks are not accountants (or vice versa).

Question 15

All painters are teachers.
No cyclists are painters.

What follows?

Answer: Some teachers are not cyclists.

End of task

APPENDIX VII

Instructions for Syllogistic Reasoning Task used in study two

The following instructions were presented on the front page of the response booklet containing the syllogistic reasoning task described in appendix VI.

In this task you will be asked to read two statements. Your task is to write down what logically follows from these statements. Please take as much time as you feel necessary. Do not worry if you find some of the questions difficult: some of them are meant to be hard. There are no trick questions. If you have any questions about the task please free to ask, preferably before you start writing. Obviously, we cannot help you in answering the questions themselves. Please answer all the questions.

Here are a couple of examples:

Example 1

All doctors are Egyptologists.
All Egyptologists are farmers.

What follows?

Answer: All doctors are farmers

Example 2

All Egyptologists are doctors.
Some farmers are Egyptologists.

What follows?

Answer: Some farmers are doctors

Please turn over and begin the task when you are ready.

APPENDIX VIII

Visual analogue scales for (a) happy; and (b) relaxed mood self-reports

(a)

At this moment in time, how **HAPPY** do you feel? Please indicate on the line below.

As unhappy as I can be	As happy as I can be

(b)

At this moment in time, how **RELAXED** do you feel? Please indicate on the line below.

As unrelaxed as I can be	As relaxed as I can be

APPENDIX IX

Script for hypnotic induction and deinduction used in studies 3 and 4

The following script was written by Dr. David Oakley in collaboration with the author. Three dots in the script indicate a brief pause in the reading of the text. The script was recorded verbatim on audio-cassette.

Hypnotic induction

OK, just sit back as comfortably as you can with your eyes closed... just breathing nice and easy and gently... and as you breathe in be aware of the coolness of the air... and as you breathe out... the air slightly warmer and moister... and imagine yourself... as you breathe easily and gently... as relaxed and comfortable as you can be at the moment. Imagining yourself breathing away the tension or stress in your body... It might help to imagine a colour... a particular colour which represents tension. Whatever colour come to mind to represent tension in your body... just imagining that colour now... and imagining yourself beginning to breathe out... breath which is coloured or tinged with that colour of tension... and so you can almost see yourself breathing away the tension and stress in your body... with every breath you take... just becoming more and more relaxed, more comfortable, easier and more relaxed... just breathing away the tension... with each breath tinged with the colour of tension... so that those tense feelings can simply drift away as you breathe out... and the tension can just drift away... into the air... to be dispersed where it can't affect you anymore... and as time goes by you may be aware of the breath becoming lighter and lighter in colour as all the tension is just breathed away... and as you breathe out in particular... feel yourself sinking down into the support of the chair beneath you... and feel yourself becoming more comfortable... more relaxed as time goes by... also be aware of the muscles in your body becoming easier and looser and more relaxed... begin, perhaps with the muscles in your legs and just imagine those muscles letting go of their tension... becoming relaxed and easy... perhaps like bands... rubber bands which have been stretched tight with all the tension and stress of the day... and now you can imagine those bands begin released safely and easily... becoming looser and slacker... as your muscles relax... easier and easier... you may become aware of the chair beneath your legs... supporting your legs... imagine that warmth spreading into the muscles... relaxing and easing them... and imagining those warm feelings spreading down your legs... from your upper legs to your *lower legs... to your feet... right down into your toes, just becoming more and more relaxed, more and more comfortable as time goes by... and as your body relaxes your mind can stay nice and alert and ready for different thoughts and images later as your body relaxes more and more... also be aware of the muscles in your shoulders and back... imagine those muscles also becoming more relaxed, more easy, more comfortable... and if you're aware of the contact of the chair behind you, behind your back, behind your shoulders, you may be aware of that warm feeling... the warm contact with the chair... and you can imagine that warm feeling spreading into the muscles of your back... the muscles of your shoulders... loosening those muscles and easing them... relaxing more and more... just feel the warm relaxing feelings spreading into those muscles... and your muscles respond by letting go... and becoming loose and easy, quiet and calm... just feel those warm feelings spreading through the muscles of your back... and shoulders... and feel them perhaps... spreading into your arms... into your hands... into your fingers... right down into the tips of your fingers... warm, relaxing and comfortable... easy feelings... and you may also be aware of the possibility of those warm relaxing feelings... spreading into the muscles of your neck... and face... and forehead and eyelids... all the muscles of your face and neck... just relaxing more and more... just letting go of their tension... muscles sinking down... settling down into good... easy... relaxed positions... face settling down into a relaxed, easy expression as the muscles... just lose their tension... becoming loose and easy... and the muscles of your forehead in particular just becoming relaxed... and calm... and quiet... any feelings of tension or stress... just easing away as you let go of the tense and tight feelings in the muscles.*

So, just relaxing more and more deeply now... and as your body relaxes more and more... your mind can be clear... and alert... and ready to imagine a pleasant place... where you might feel particularly calm... and quiet... just imagine some calm and pleasant scene... you might imagine a beach or a garden... a hilltop or some other place... it may be a real place or an imaginary place... indoors or out... it really doesn't matter so long as it is somewhere you can feel really good and relaxed... gather up any good feelings you have now... any warm, relaxed an comfortable feelings... and take them with you to that place... be aware of the colours and sights around you... the objects and things nearby... or in the distance... be aware of the temperature of that place... it may be a warm and tranquil place... it may be a cool and refreshing place... just so long as you feel good... and relaxed... and easy... and as you become aware of the sights around you... you may also be aware of sounds... maybe the *sound of the breeze blowing and disturbing leaves, or maybe some other sounds... there may be the sound of birds... maybe the sound of water... wherever you are just listen for the sounds around you now... and enjoy those sounds as you relax more and more... and if you are in a very quiet place just enjoy the peace and calm... becoming more and more relaxed... and calm as you're there in that very pleasant, relaxing place... you may be ware of the surface you are sitting on... or standing on... or lying on... you may feel the surface beneath you... comfortable and easy... you may be aware of smells or scents... sounds and sights... just there now in these very pleasant surroundings. And as you look around you... you may be aware of some part of the scene... that you could approach and walk down... or descend in some way... to find an even more calm and relaxed place... even more calm and relaxed feelings. If you could now just... take yourself to that part of the scene... and pause for a moment or two... and when you're ready... begin to walk down... or run down... or float down, perhaps... to find an even more pleasant and relaxing place... and as you descend... gently... at your own pace... relaxing more and more as you go... I'll count from one... to ten as you go down... into even more relaxed... and comfortable feelings. One... two... just relaxing deeper and deeper... three... four... more and more relaxed... more and more comfortable... five... six... seven... eight... nine... and ten just deeply and calmly relaxed. And just there now in that deeper... even more pleasant... more relaxed place. Again be aware of the sights around you... the colours... be aware of any sounds there may be in this special... relaxing place. Be aware of any scents or smells that you may find there... enjoying the feeling of relaxing more and more... deeper and deeper as you enjoy the scene around you... looking at things that are new... or that you may not have noticed before... pleasant reassuring things around you now... and just relaxing deeper and deeper... more and more comfortable... more and more relaxed... calm, quiet feelings... relaxed and easy feelings... just relaxing deeper and deeper and enjoying all the sights around you... the colours... the sounds... all those familiar things... that make this such a pleasant... and relaxing place to be in. Just remaining as relaxed and hypnotised as you are now... remember that it is possible for you... to open your eyes... and to talk... and to carry out tasks without affecting how relaxed and hypnotised you feel... without affecting any of those good feelings... and in a moment someone else will give you further instructions. Until then continue to enjoy the special relaxing place.* [the tape is then stopped, the subject is asked to open their eyes, and the task is presented; after completion of the task, the tape is restarted and the deinduction routine begins].

Deinduction

Good... Still feeling nicely relaxed and comfortable... with your eyes closed... just enjoy the feelings of calm and relaxation... and if you'd like to spend a few more moments... in the place you were relaxing in before... that special place... just return there now... and enjoy the sights and sounds again... of that particular place... and any smells and scents... and all the things around you... just relaxed and comfortable... quiet and easy. [pause 30 seconds]. And remember that you cannot be deeply relaxed... or hypnotised... accidentally... or against your will... but only if you decide to relax yourself... or agree to go through these... or similar hypnosis procedures again... just staying relaxed and calm now.

In a moment I'm going to count back from ten to one... and when I do... just return to nice... wide awake feelings... return to the room you were in when you started... leave the special place behind... leave the deeply relaxed or hypnotised feelings. Bring back with you though... any good... or calm... or quiet feelings you'd like to help you through the rest of the day... the week... the future. And when I get to one... just open your eyes... feeling really good, pleasantly relaxed and comfortable... but wide awake... back to normal wide awake feelings... just returning now then... to wide awake feelings... ten, nine, eight, seven, six, five, four, three, two... more and more awake... back to good wide awake feelings... and one... and just open your eyes when ready.

APPENDIX X

Experimental instructions for hypnosis condition in studies 3 and 4

The following instructions were read verbatim to all subjects participating in the hypnosis condition in study three.

Okay, before we begin the experiment I'm going to say a few words about the hypnosis procedures that you will be encountering today. The hypnotic induction that you will receive has been recorded on audio-tape and lasts about fifteen minutes. What I would like you to do is listen to the tape, think along with the instructions that you are given, and try to imagine what the tape asks you to imagine. Most importantly, allow yourself to become as relaxed and hypnotised as possible. At a certain point in the tape I will stop the tape-recorder, ask you to turn to me, and then I will give you the experimental tasks. After the tasks I will switch the tape-recorder on again and you will hear the remainder of the tape. When the tape finishes the session is over.

There are no documented dangers associated with hypnosis; however, if at any point you want to end the session then simply say so and I will stop the tape. If this occurs, you will simply come out of hypnosis and feel no ill effects afterwards. The same will happen if the fire alarm goes off. In either case, I will give you suggestions for having left hypnosis.

There are two final points I want to make about this session. First, you should remember that it is possible for you to talk and perform tasks during hypnosis without in any way affecting how relaxed and hypnotised you feel. Second, if at any point during the tape you want to change position, or cough, or scratch then you will be able to do this without affecting how relaxed and hypnotised you feel.

Before I start the tape, do you have any questions? (questions are answered by paraphrasing the above). *Okay, let's begin.*

APPENDIX XI

Script for relaxation induction used in studies 3 and 4

The following is an edited transcript taken from pages 68-80 of Lewis Caroll's *Alice in Wonderland*[93]. It was recorded verbatim on audio-cassette.

There was a table set out under a tree in front of the house, and the March Hare and the Hatter were having tea at it; a Dormouse was sitting between them, fast asleep, and the other two were using it as a cushion, resting their elbows on it, and talking over it's head.

The table was a large one, but the three were all crowded together at one corner of it. "No room! No room!" they cried out when they saw Alice coming. "There's plenty *of room!" said Alice indignantly, and she sat down in a large arm-chair at one end of the table.*

"Have some wine," said the March Hare in an encouraging tone.

Alice looked all round the table, but there was nothing on it but tea. "I don't see any wine," she remarked.

"There isn't any," said the March Hare.

"Then it wasn't very civil of you to offer it," said Alice angrily.

"It wasn't very civil of you to sit down without being invited," said the March Hare.

"I didn't know it was your *table," said Alice, "It's laid for a great many more than three."*

"Your hair wants cutting," said the Hatter. He had been looking at Alice for some time with great curiosity, and this was his first speech.

"You should learn not to make personal remarks," said Alice with some severity: "It's very rude."

The Hatter was the first to break the silence. "What day of the month is it?" he said, turning to Alice: he had taken his watch out of his pocket, and was looking at it uneasily, shaking it every now and then, and holding it to his ear.

Alice considered a little, and then said "The fourth."

"Two days wrong!" sighed the Hatter. "I told you butter wouldn't suit the works!" he added, looking angrily at the March Hare.

"It was the best *butter," the March Hare relied meekly.*

"Yes, but some crumbs must have got in as well," the Hatter grumbled, "you shouldn't have put it in with the bread-knife."

[93] In *Complete Works of Lewis Carroll,* 1966, London: The Nonesuch Press.

The March Hare took the watch and looked at it gloomily: then he dipped it into his cup of tea, and looked at it again: but he could think of nothing to say than his first remark, "It was the best *butter, you know."*

Alice has been looking over his shoulder with some curiosity. "What a funny watch!" she remarked. "It tells the day of the month, and doesn't tell what o'clock it is!"

"Why should it?" muttered the Hatter. "Does your *watch tell you what year it is?"*

"Of course not," replied Alice very readily, "but that's because it stays the same year for such a long time together."

"Which is just the case with mine, *" said the Hatter.*

Alice felt dreadfully puzzled. The Hatter's remark seemed to her to have no sort of meaning in it, yet it was certainly English. "I don't quite understand you," she said, as politely as she could.

"the dormouse is asleep again," said the Hatter, and he poured a little hot tea upon its nose.

The Dormouse shook it's head impatiently, and said, without opening its eyes, "Of course, of course: just what I was going to remark myself."

"Have you guessed the riddle yet?" the Hatter said, turning to the March Hare again.

"No, I give up," the March Hare replied. "What's the answer?"

"I haven't the slightest idea," said the Hatter.

"Nor I," said the Dormouse.

Alice sighed wearily. "I think you might do something better with the time," she said, "than wasting it in asking riddles that have no answers."

"If you knew Time as well as I do," said the Hatter, "you wouldn't talk about wasting it, *it's* him. *"*

"I don't know what you mean," said Alice.

"Of course you don't!" the Hatter said, tossing his head contemptuously. "I dare say you never even spoke to Time!"

"Perhaps not," Alice cautiously replied, "but I know I have to beat time when I learn music."

"Ah! That accounts for it," said the Hatter. "He won't stand beating. Now, if you only kept on good terms with him, he'd do almost anything you liked with the clock. For instance, suppose it were nine o'clock in the morning, just time to begin lessons: you'd only have to

whisper a hint to Time, and round goes the clock in a twinkling! Half-past one, time for dinner!"

"I only wish it was," the March Hare said to itself in a whisper.

"That would be grand certainly," said Alice thoughtfully, "but then – I shouldn't be hungry for it, you know."

"Not at first, perhaps," said the Hatter, "but you could keep it to half-past one as long as you liked."

"Is that the way you *manage?" Alice asked.*

The Hatter shook his head mournfully. "Not I!" he replied. "We quarreled last March – just before he *went mad you know – " (pointing with his teaspoon at the March Hare,) " – it was at the great concert given by the Queen of Hearts and I had to sing. Well, I had hardly finished the first verse," said the Hatter, "when the Queen bawled out 'He's murdering the time! Off with his head!'"*

"How dreadfully savage!" exclaimed Alice.

"And ever since that," the Hatter went on in a mournful tone, "He won't do a thing I ask! It's always six o'clock now."

A bright idea came into Alice's head. "Is that the reason so many tea-things are put out here?" she asked.

"Yes, that's it," said the Hatter with a sigh, "it's always tea-time, and we've no time to wash the things between whiles."

"Then you keep moving round, I suppose?" said Alice.

"Exactly so," said the Hatter, "as the things get used up."

"But what happens when you come to the beginning again?" Alice ventured to ask.

"Suppose we change the subject," the March Hare interrupted, yawning. "I'm getting tired of this. I vote the young lady tells us a story."

"I'm afraid I don't know one," said Alice, rather alarmed at the proposal.

"Then you shouldn't talk," said the Hatter.

This piece of rudeness was more than Alice could bear: she got up in great disgust, and walked off: the Dormouse remained asleep, and neither of the others took the least notice of her going, though she looked back once or twice, half hoping they would call after her: the last time she saw them, they were trying to put the Dormouse into the tea-pot.

"At any rate I'll never go there *again!" said Alice, as she picked her way through the wood. "It's the stupidest tea-party I ever was at in all my life!"*

Just as she said this, she noticed that one of the trees had a door leading right into it. "That's very curious!" she thought. "But everything's curious today. I think I may as well go in at once." And in she went.

Once more she found herself in the long hall, and close to the glass table. "Now, I'll manage better this time," she said to herself, and began by taking the little golden key, unlocking the door that led into the garden, and walking down the little passage; and then – *she found herself at last in the beautiful garden, among the bright flower-beds and cool fountains.*

A large rose tree stood near the entrance of the garden: the roses growing on it were white, but there were three gardeners at it, busily painting them red. Alice thought this a very curious thing, and she went nearer to watch them, and, just as she came up to them, she heard one of them say: "Look out now, Five! Don't go splashing paint over me like that!"

"I couldn't help it," said Five, in a sulky tone. "Seven jogged my elbow."

On which Seven looked up and said: "That's right, Five! Always lay the blame on others!"

"You'd *better not talk!" said Five. "I heard the Queen say only yesterday you deserved to be beheaded."*

"What for?" said the one who had spoken first.

"That's none of your *business!" said Five, "and I'll tell him – it was for bringing the cook tulip-roots instead of onions."*

Seven had just flung down his brush and had just begun: "Well, of all the unjust things..." when his eye chanced to fall upon Alice, as she stood watching them, and he checked himself suddenly: the others looked around also, and all of them bowed low.

"Would you tell me, please," said Alice, a little timidly, "why are you painting those roses?"

Five and Seven said nothing, but looked at Two. Two began in a low voice, "Why, the fact is, you see, Miss, this here ought to have been a red *rose-tree, and we put in a white one by mistake; and, if the Queen was to find out, we should all have our heads cut off, you know. So you see, Miss, we're doing our best, afore she comes, to..."*

At this moment, Five, who had been anxiously looking across the garden, called out "The Queen! The Queen!" and the three gardeners threw themselves flat upon their faces. There was a sound of many footsteps, and Alice looked around, eager to see the Queen.

First came ten soldiers carrying clubs: these were all shaped like the three gardeners, oblong and flat, with their hands and feet at the corners: next the ten courtiers: these were *all ornamented all over with diamonds, and walked two and two, as the soldiers did. After these came the Royal children: there were ten of them, and the little dears came jumping merrily along, hand in hand, in couples: they were all ornamented with hearts.*

Next came the guests, mostly Kings and Queens, and among them Alice recognised the White Rabbit: he was talking in a hurried, nervous manner, smiling at everything that was said, and went by without noticing her. Then followed the Knave of hearts, carrying the King's crown on a crimson, velvet cushion; and, last of all in this grand procession, came THE KING AND QUEEN OF HEARTS.

Alice was rather doubtful whether she ought to lie down on her face like the three gardeners, but she could not remember ever having heard of such a rule at processions; "and besides, what would be the use of a procession," thought she, "if people all had to lie down on their faces, so they couldn't see it?" So she stood where she was, and waited.

When the procession came opposite to Alice, they all stopped and looked at her, and the Queen said, severely, "Who is this?" She said it to the Knave of hearts, who only bowed and smiled in reply.

"Idiot!" said the Queen, tossing her head, impatiently; and, turning to Alice, she went on: "What's your name, child?"

"My name is Alice, so please your majesty," said Alice, very politely; but she added, to herself, "Why, they're only a pack of cards, after all. I needn't be afraid of them."

"And who are these*?" said the Queen, pointing to the three gardeners who were lying around the rose tree; for, you see, as they were lying on their faces, and the patterns on their backs was the same as the rest of the pack, she could not tell whether they were gardeners or soldiers, or courtiers, or three of her own children."*

"How should I *know?" said Alice, surprised at her own courage. "It's no business of* mine."

APPENDIX XII

Experimental instructions for relaxation condition in studies 3 and 4

The following instructions were read verbatim to all subjects participating in the relaxation condition in study three. Every effort was made to ensure the similarity between these instructions and those presented in the hypnosis condition in the same study.

Okay, before we begin the experiment I'm going to say a few words about the relaxation procedures that you will be encountering today. The relaxation procedure that you will receive has been recorded on audio-tape and is an extract from a popular novel - with which you are probably familiar - lasting about fifteen minutes. What I would like you to do is listen to the tape, think along with the story, and try to imagine the events occurring in the story. Most importantly, allow yourself to become as relaxed as possible. At a certain point in the tape I will stop the tape-recorder, ask you to turn to me, and then I will give you the experimental tasks. After the tasks the session is over.

If at any point you want to end the session then simply say so and I will stop the tape. If this occurs, you will simply come out of relaxation and feel no ill effects afterwards. The same will happen if the fire alarm goes off.

There are two final points I want to make about this session. First, you should remember that it is possible for you to talk and perform tasks after relaxation procedures without in any way affecting how relaxed you feel. Second, if at any point during the tape you want to change position, or cough, or scratch then you will be able to do this without affecting how relaxed you feel.

Before I start the tape, do you have any questions? (questions are answered by paraphrasing the above). *Okay, let's begin.*

APPENDIX XIII

Syllogistic reasoning task (form A) used in study 4

The following fifteen questions were presented in an A4 response booklet with the instructions presented in appendix XV on the front page. Question answers are provided for instructive purposes.

Question 1

Some of the cooks are cyclists.
All of the cyclists are inventors.

What follows?

Answer: Some of the cooks are inventors or vice versa.

Question 2

None of the dancers are cheese-lovers.
All of the film-fans are dancers.

What follows?

Answer: None of the film-fans are cheese-lovers or vice versa.

Question 3

All of the fishermen are shopkeepers.
All of the shopkeepers are wine-drinkers.

What follows?

Answer: All of the fishermen are wine-drinkers

Question 4

Some of the footballers are students.
All of the footballers are swimmers.

What follows?

Answer: Some of the swimmers are students or vice versa.

Question 5

None of the greengrocers are birdwatchers.
All of the bridge-players are birdwatchers.

What follows?

Answer: None of the greengrocers are bridge-players or vice versa.

Question 6

All of the accountants are hockey-players.
Some of the radio-listeners are not hockey-players.

Answer: Some of the radio-listeners are not accountants.

Question 7

Some of the builders are bowlers.
None of the bowlers are yachtsmen.

What follows?

Answer: Some of the builders are not yachtsmen.

Question 8

All of the musicians are pet-owners.
None of the gymnasts are pet-owners.

What follows?

Answer: None of the gymnasts are musicians or vice versa.

Question 9

All of the gardeners are golfers.
None of the surfers are gardeners.

What follows?

Answer: Some of the golfers are not surfers.

Question 10

All of the architects are coffee-drinkers.
Some of the architects are not painters.

What follows?

Answer: Some of the coffee-drinkers are not painters.

Question 11

All of the psychologists are science-fiction fans.
None of the science-fiction fans are walkers.

What follows?

Answer: None of the psychologists are walkers or vice versa.

Question 12

All of the archers are comedians.
All of the archers are climbers.

What follows?

Answer: Some of the comedians are climbers or vice versa.

Question 13

All of the sailors are poets.
Some of the antique-collectors are sailors.

What follows?

Answer: Some of the antique-collectors are poets or vice versa.

Question 14

All of the technicians are chess-players.
All of the model-makers are technicians.

What follows?

Answer: All of the model-makers are chess-players.

Question 15

All of the draughtsmen are gourmets.
Some of the draughtsmen are drivers.

What follows?

Answer: Some of the gourmets are drivers.

End of task

APPENDIX XIV

Syllogistic reasoning task (form B) used in study 4

The following fifteen questions were presented in an A4 response booklet with the instructions presented in appendix XV on the front page. Question answers are provided for instructive purposes.

Question 1

All of the shopkeepers are yachtsmen.
All of the radio-listeners are shopkeepers.

What follows?

Answer: All of the radio-listeners are yachtsmen.

Question 2

All of the technicians are bridge-players.
Some of the painters are not bridge-players.

What follows?

Answer: Some of the painters are not technicians.

Question 3

All of the footballers are drivers.
Some of the footballers are not inventors.

What follows?

Answer: Some of the drivers are not inventors.

Question 4

Some of the gardeners are cheese-lovers.
All of the cheese-lovers are bird-watchers.

What follows?

Answer: Some of the gardeners are bird-watchers or vice versa.

Question 5

All of the students are film-fans.
Some of the students are walkers.

What follows?

Answer: Some of the film-fans are walkers.

Question 6

All of the draughtsmen are wine-drinkers.
Some of the surfers are draughtsmen.

What follows?

Answer: Some of the surfers are wine-drinkers or vice versa.

Question 7

All of the dancers are archers.
None of the swimmers are archers.

What follows?

Answer: None of the swimmers are dancers or vice versa.

Question 8

Some of the gymnasts are greengrocers.
All of the gymnasts are chess-players.

What follows?

Answer: Some of the chess-players are greengrocers or vice versa.

Question 9

None of the musicians are model-makers.
All of the coffee-drinkers are musicians.

What follows?

Answer: None of the coffee-drinkers are model-makers or vice versa.

Question 10

All of the architects are climbers.
None of the climbers are fishermen.

What follows?

Answer: None of the architects are fishermen or vice versa.

Question 11

All of the golfers are accountants.
All of the accountants are poets.

What follows?

Answer: All of the golfers are poets.

Question 12

Some of the psychologists are hockey-players.
None of the hockey-players are antique-collectors.

What follows?

Answer: Some of the psychologists are not antique-collectors.

Question 13

None of the sailors are cyclists.
All of the bowlers are cyclists.

What follows?

Answer: None of the sailors are bowlers or vice versa.

Question 14

All of the builders are gourmets.
None of the walkers are builders.

Answer: Some of the gourmets are not walkers.

Question 15

All of the science-fiction fans are cooks.
All of the science-fiction fans are pet-owners.

What follows?

Answer: Some of the cooks are pet-owners or vice versa.

End of task

APPENDIX XV

Instructions for syllogistic reasoning tasks used in study 4

The following instructions were written on the front page of the response booklets containing the syllogistic reasoning tasks presented in appendices XIII and XIV.

In this task you will be presented with fifteen questions concerning the hobbies and professions of a number of individuals assembled in a room. Each of the questions consists of two statements about some of the individuals' hobbies and professions. Your task is to write down what follows from each pair of statements.

Please note the following points

1. All of your answers should be in one of the following forms:

(a) all of the ..... are .....
(b) none of the ..... are .....
(c) some of the ..... are .....
(d) some of the ..... are not .....

2. Your answers should be based solely on what can be deduced with absolute certainty from the initial statements

3. For each question there is always at least one valid conclusion that can be drawn

4. You can take as long as you like to complete the questions

Here are a couple of examples

Example 1

All of the salesmen are cricketers
All of the cricketers are beer drinkers

What follows?

Answer: All of the salesmen are beer-drinkers

Example 2

None of the Egyptologists are poker-players
Some of the Egyptologists are hill-climbers

What follows?

Answer: Some of the hill-climbers are not poker-players

Please turn over and begin when you are ready to do so.

APPENDIX XVI

ANOVA summary tables for study 2, study 3 and study 4 analyses

Study 2 analyses

(2A) *Summary table for univariate F tests comparing the three triad classification sets on the proportion of similarity based responses for square, triangle and angle (transformed) stimuli.*

Source	Sum of Squares	df	Mean Square	F	Sig.
T.C. Angle stimuli	0.02092	2	0.01046	.996	.374
Error (angles)	.798	76	0.01050		
T.C. Square stimuli	.131	2	0.06568	1.123	.331
Error (squares)	4.445	76	0.05848		
T.C. Triangle stimuli	.634	2	.317	4.371	.016
Error (triangles)	5.508	76	0.07248		

(2B). Summary table for one way ANCOVA comparing high and low suggestibility quartiles on triad classification (square stimuli).

Source	Sum of Squares	df	Mean Square	F	Sig.
Covariate (SDS)	.110	1	.110	2.405	.129
Covariate (TC set)	.278	1	.278	6.098	.018
Covariate (Relaxation)	.119	1	.119	2.622	.113
Suggestibility group	.235	1	.235	5.169	.029
Error	1.777	39	0.04555		

(2C). *Summary table for one way ANCOVA comparing high and low suggestibility quartiles on triad classification (triangle stimuli).*

Source	Sum of Squares	df	Mean Square	F	Sig.
Covariate (SDS)	0.04454	1	0.04454	.710	.405
Covariate (TC set)	.513	1	.513	8.177	.007
Covariate (Relaxation)	.366	1	.366	5.827	.021
Suggestibility group	0.02086	1	0.02086	.332	.568
Error	2.447	39	0.06275		

(2D). *Summary table for one way ANCOVA comparing high and low suggestibility quartiles on triad classification (angle stimuli, transformed data).*

Source	Sum of Squares	df	Mean Square	F	Sig.
Covariate (SDS)	0.01009	1	0.01009	.884	.353
Covariate (TC set)	0.009058	1	0.009058	.794	.378
Covariate (Relaxation)	0.003015	1	0.003015	.264	.610
Suggestibility group	0.001006	1	0.001006	.088	.768
Error	.445	39	0.01141		

(2E). *Summary table for one way ANCOVA comparing high and low suggestibility quartiles on filtering interference (size stimuli).*

Source	Sum of Squares	df	Mean Square	F	Sig.
Covariate (SDS)	.175	1	.175	.115	.737
Covariate (gender)	3.298	1	3.298	2.160	.149
Suggestibility group	1.287	1	1.287	.843	.364
Error	61.068	40	1.527		

(2F). *Summary table for one way ANCOVA comparing high and low suggestibility quartiles on filtering interference (angle stimuli).*

Source	Sum of Squares	df	Mean Square	F	Sig.
Covariate (SDS)	.140	1	.140	.126	.724
Suggestibility group	1.055	1	1.055	.949	.336
Error	45.572	41	1.112		

(2G). *Summary table for one way ANCOVA comparing high and low suggestibility quartiles on syllogistic reasoning (transformed data).*

Source	Sum of Squares	Df	Mean Square	F	Sig.
Covariate (SDS)	.172	1	.172	2.690	.109
Covariate (happiness)	0.01961	1	0.01961	.306	.583
Suggestibility group	0.02574	1	0.02574	.402	.530
Error	2.563	40	0.06406		

(2H). *Summary table for one way ANCOVA comparing high and low suggestibility quartiles on Raven's matrices (transformed data).*

Source	Sum of Squares	Df	Mean Square	F	Sig.
Covariate (SDS)	10.677	1	10.677	4.182	.047
Covariate (happiness)	3.976	1	3.976	1.557	.219
Suggestibility group	9.650	1	9.650	3.779	.059
Error	102.137	40	2.553		

(2I). *Summary table for one way ANCOVA comparing high and low suggestibility quartiles on MFFT (time).*

Source	Sum of Squares	df	Mean Square	F	Sig.
Covariate (SDS)	45.965	1	45.965	.175	.678
Suggestibility group	1369.228	1	1369.228	5.203	.028
Error	10790.579	41	263.185		

(2J). *Summary table for one way ANCOVA comparing high and low suggestibility quartiles on MFFT (errors).*

Source	Sum of Squares	df	Mean Square	F	Sig.
Covariate (SDS)	82.500	1	82..500	1.753	.193
Suggestibility group	73.343	1	73.343	1.559	.219
Error	1929.409	41	47.059		

Study 3 analyses

(3A) *Summary table for 2 × 2 mixed model ANOVA with one between subjects factor (suggestibility group: high and low) and one within subjects factor (time: pre-tape and post-tape) calculated from relaxation scores in the relaxation condition.*

Source	Sum of Squares	df	Mean Square	F	Sig.
Time	10656.27	1	10656.27	42.915	.000
Error (time)	7945.99	32	248.312		
Suggestibility group	216.199	1	216.199	.217	.644
Error (sugg. group)	31821.25	32	994.414		
Time × Group	824.273	1	824.273	3.320	.078

(3B) *Summary table for 2 × 2 mixed model ANOVA with one between subjects factor (suggestibility group: high and low) and one within subjects factor (time: pre-tape and post-tape) calculated from relaxation scores in the hypnosis condition.*

Source	Sum of Squares	df	Mean Square	F	Sig.
Time	16089.94	1	16089.94	45.352	.000
Error (time)	11352.82	32	354.776		
Suggestibility group	1120.235	1	1120.235	1.096	.303
Error (sugg. Group)	32701.53	32	1021.923		
Time × Group	13.235	1	13.235	.037	.848

(3C) *Summary table for 2 × 2 mixed model ANOVA with one between subjects factor (suggestibility group: high and low) and one within subjects factor (condition: hypnosis and relaxation) calculated from post-tape relaxation scores in the hypnosis and relaxation conditions.*

Source	Sum of Squares	df	Mean Square	F	Sig.
Condition	919.118	1	919.118	6.888	.013
Error (condition)	4269.765	32	133.430		
Suggestibility group	1341.235	1	1341.235	1.490	.231
Error (sugg. group)	28800.00	32	900.00		
Condition × Group	46.118	1	46.118	.346	.561

(3D) *Summary table for 2 × 3 mixed model ANOVA with one between subjects factor (suggestibility group: high and low) and one within subjects factor (condition: baseline, relaxation and hypnosis) calculated from the proportion of similarity based responses in triad classification (transformed angle stimuli).*

Source	Sum of Squares	Df	Mean Square	F	Sig.
Condition	0.04818	2	0.02409	2.541	.087
Error (condition)	0.607	64	0.009479		
Suggestibility group	0.0135	1	0.0135	.677	.417
Error (sugg. group)	0.638	32	0.01993		
Condition × Group	0.02051	2	0.01913	2.081	.141

(3E) *Summary table for 2 × 3 mixed model ANOVA with one between subjects factor (suggestibility group: high and low) and one within subjects factor (condition: baseline, relaxation and hypnosis) calculated from the proportion of similarity based responses in triad classification (square stimuli).*

Source	Sum of Squares	df	Mean Square	F	Sig.
Condition	0.0359	2	0.0179	0.937	.397
Error (condition)	1.225	64	0.0191		
Suggestibility group	.286	1	.286	1.655	.207
Error (sugg. group)	5.527	32	.173		
Condition × Group	0.00132	2	0.0618	0.323	.725

(3F) *Summary table for 2 × 3 mixed model ANOVA with one between subjects factor (suggestibility group: high and low) and one within subjects factor (condition: baseline, relaxation and hypnosis) calculated from the proportion of similarity based responses in triad classification (triangle stimuli).*

Source	Sum of Squares	df	Mean Square	F	Sig.
Condition	0.269	2	0.134	3.865	.026
Error (condition)	2.225	64	0.0347		
Suggestibility group	0.142	1	0.142	.777	.385
Error (sugg. group)	5.829	32	0.182		
Condition × Group	0.0190	2	0.0095	.273	.762

(3G) *Summary table for planned orthogonal contrast comparing proportion of similarity based responses in triad classification (triangle stimuli; collapsed across susceptibility groups) in the baseline condition with the combined relaxation and hypnosis conditions.*

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	.191	1	.191	6.405	.016
Error (contrast)	.982	33	0.02975		

(3H) *Summary table for planned orthogonal contrast comparing proportion of similarity based responses in triad classification (triangle stimuli; collapsed across susceptibility groups) in relaxation and hypnosis conditions*

Source	Sum of Squares	df	Mean Square	F	Sig.
Contrast	0.01471	1	0.01471	.519	.476
Error (contrast)	.935	33	0.02834		

(3I) *Summary table for 2 × 3 mixed model ANOVA with one between subjects factor (suggestibility group: high and low) and one within subjects factor (condition: baseline, relaxation and hypnosis) calculated from filtering interference scores (angle dimension).*

Source	Sum of Squares	df	Mean Square	F	Sig.
Condition	0.008158	2	0.004079	.116	.891
Error (condition)	2.255	64	0.03523		
Suggestibility group	0.02072	1	0.02072	.388	.538
Error (sugg. group)	1.710	32	0.05342		
Condition × Group	0.02502	2	0.01251	.355	.703

(3J) *Summary table for 2 × 3 mixed model ANOVA with one between subjects factor (suggestibility group: high and low) and one within subjects factor (condition: baseline, relaxation and hypnosis) calculated from filtering interference scores (size dimension).*

Source	Sum of Squares	df	Mean Square	F	Sig.
Condition	.000	2	.000	.000	1.000
Error (condition)	107.662	64	1.682		
Suggestibility group	.471	1	.471	.472	.497
Error (sugg. group)	31.921	32	.998		
Condition × Group	2.509	2	1.254	.746	.478

Study 4 analyses

(4A) *Summary table for 2 × 2 mixed model ANOVA with one between subjects factor (suggestibility group: high and low) and one within subjects factor (time: pre-tape and post-tape) calculated from relaxation scores in the relaxation condition.*

Source	Sum of Squares	df	Mean Square	F	Sig.
Time	7452.900	1	7452.900	58.037	.000
Error (time)	2311.500	18	128.417		
Suggestibility group	.400	1	.400	.001	.977
Error (sugg. group)	8541.500	18	474.528		
Time × Group	547.600	1	547.600	4.264	.054

(4B) *Summary table for 2 × 2 mixed model ANOVA with one between subjects factor (suggestibility group: high and low) and one within subjects factor (time: pre-tape and post-tape) calculated from relaxation scores in the relaxation condition.*

Source	Sum of Squares	df	Mean Square	F	Sig.
Time	6734.025	1	6734.025	76.695	.000
Error (time)	1580.450	18	87.803		
Suggestibility group	950.625	1	950.625	2.092	.165
Error (sugg. group)	8179.650	18	454.425		
Time × Group	42.025	1	547.600	.479	.498

(4C) *Summary table for 2 × 2 factorial ANOVA with one between subjects factor (suggestibility group: high and low) and one within subjects factor (condition: hypnosis and relaxation) calculated from post-tape relaxation scores in the hypnosis and relaxation conditions.*

Source	Sum of Squares	Df	Mean Square	F	Sig.
Condition	245.025	1	245.025	1.034	.316
Suggestibility group	555.025	1	555.025	2.342	.135
Condition × Group	.625	1	.625	.003	.959
Error	8531.700	36	236.992		

(4D) *Summary table for 2 × 2 factorial ANOVA with one between subjects factor (suggestibility group: high and low) and one within subjects factor (condition: hypnosis and relaxation) calculated from post-tape happiness scores in the hypnosis and relaxation conditions.*

Source	Sum of Squares	df	Mean Square	F	Significant.
Condition	220.900	1	220.900	.440	.511
Suggestibility group	722.500	1	722.500	1.439	.238
Condition × Group	160.000	1	160.000	.319	.576
Error	18072.200	36	502.006		

(4E) *Summary table for 2 × 2 factorial ANOVA with one between subjects factor (suggestibility group: high and low) and one within subjects factor (condition: hypnosis and relaxation) calculated from positive questionnaire item responses.*

Source	Sum of Squares	df	Mean Square	F	Significant.
Condition	.100	1	.100	.052	.821
Suggestibility group	6.400	1	6.400	3.339	.076
Condition × Group	8.100	1	8.100	4.226	.047*
Error	69.000	36	1.917		

* p = .094, two-tailed test

(4F) *Summary table for 2 × 2 factorial ANOVA with one between subjects factor (suggestibility group: high and low) and one within subjects factor (condition: hypnosis and relaxation) calculated from negative questionnaire item responses.*

Source	Sum of Squares	df	Mean Square	F	Significant.
Condition	.400	1	.400	.253	.618
Suggestibility group	1.600	1	1.600	1.011	.321
Condition × Group	2.500	1	2.500	1.579	.217
Error	57.000	36	1.583		

(4G) *Summary table for 2× 2 factorial ANCOVAs with one between subjects factor (suggestibility group: high and low) and one within subjects factor (condition: hypnosis and relaxation) calculated from syllogistic reasoning scores.*

Source	Sum of Squares	df	Mean Square	F	Significant.
Baseline reasoning	35.590	1	35.59-	15.846	.000
Condition	3.543	1	3.543	1.578	.217
Suggestibility group	.757	1	.757	.337	.565
Condition × Group	.114	1	.114	.051	.823
Error	78.610	35	2.246		

(4H) *Summary table for 2× 2 factorial ANCOVAs with one between subjects factor (suggestibility group: high and low) and one within subjects factor (condition: hypnosis and relaxation) calculated from syllogistic reasoning times.*

Source	Sum of Squares	df	Mean Square	F	Significant.
Baseline reasoning	1414.397	1	1414.397	.069	.795
Condition	763.906	1	763.906	.037	.848
Suggestibility group	29014.678	1	29014.678	1.410	.243
Condition × Group	63477.596	1	63477.596	3.084	.088
Error	720361.40	35	20581.754		

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HYPNOTIC SUSCEPTIBILITY AND HOLISTIC/EMOTIONAL STYLES OF THINKING

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Abstract

It has been suggested that an everyday preference for holistic and emotional thought is related to the ability to enter hypnosis, although research addressing the idea has often yielded inconsistent results. This study correlated hypnotic susceptibility, as measured by the Harvard Group Scale (Shor and Orne, 1962), with three measures of a holistic/emotional thinking style: the experiential sub-scale of the Rational Versus Experiential Inventory (RVEI) (Epstein et al., 1995), the right hemisphere sub-scale of the Human Information Processing Survey (HIPS) (Taggart and Torrance, 1984) and the elaborative processing sub-scale of the Inventory of Learning Processes (ILP) (Schmeck et al., 1977). A social desirability measure was also included. Only the experiential scale of the RVEI and the social desirability scale showed significant positive correlations with susceptibility; a multiple regression analysis showed the RVEI scale to be the best predictor of susceptibility. The implications of these results for the analytic-holistic hypothesis in hypnosis are discussed.

Key words: hypnosis, hypnotizability, cognitive style, analytic thinking, holistic thinking, social desirability

Introduction

The notion that hypnosis involves some sort of temporary inhibition of reality-based, logical thought allowing more emotional, intuitive and holistic cognitive processes to predominate – the so-called *analytic-holistic hypothesis* (Brown and Oakley, 1997) – has an extensive history within hypnosis research, and represents a point of significant correspondence between accounts of hypnosis from across the theoretical spectrum (Brown and Oakley, 1997, in prep). Evidence indicating that hypnosis is characterized by an increase in imaginative processing (e.g. Crawford and Allen, 1983) and heightened affect (e.g. Crawford et al., 1989) has often been cited in support of this idea, and the widely popular and well researched notion of hypnosis as a state of absorption (Tellegen and Atkinson, 1974) also rests on similar premises. Moreover, there is some evidence to indicate that the ability to enter hypnosis is related to heightened affect intensity (Crawford and Brown, 1987) and an everyday preference for holistic processing (e.g. Wallace, 1990) that, in some cases, involves considerable engagement in fantasy-related behaviour (Lynn and Rhue, 1986).

However, despite the popularity of the analytic-holistic hypothesis, an examination of the evidence cited in support of the idea indicates that its validity is far from having been unequivocally established (see Brown, 1996). For example, although imaginative processes clearly bear some relation to hypnosis and hypnotic susceptibility, a series of inconsistent findings have led to considerable uncertainty regarding the nature of that relationship (Sheehan, 1979; deGroh, 1989). Similarly, while there is some evidence to suggest that high susceptibles possess a superior holistic processing ability to lows (e.g. Crawford, 1981; Wallace, 1990), this finding has not proven particularly robust and there is some evidence to indicate that high susceptibles may in fact have a superior *analytic* processing ability compared with lows (e.g. Wallace et al., 1994). Clearly there is a need for much more research before we can say with any certainty whether hypnosis represents a state of increased holistic processing, or whether hypnotic susceptibility is related to an everyday preference for processing in this way.

In this paper evidence will be presented that bears on the latter of these two possibilities. The distinction between analytic and holistic cognitive processes has existed for many years within the wider sphere of psychology as a whole, and the notion of individual differences in analytic and holistic processing preference has been a popular one within the learning style and personality literatures. The research presented here attempts to assess the relationship between hypnotic susceptibility and three self-report measures obtained from these literatures. By assessing the relationship between sub-scales obtained from these measures and standard measures of hypnotic susceptibility, we aim to shed some light on the validity of the analytic-holistic hypothesis in hypnosis. The measures that we selected were the Rational Versus Experiential Inventory (RVEI) (Epstein et al., 1995), the Human Information Processing Survey (HIPS) (Taggart and Torrance, 1984) and the Inventory of Learning Processes (ILP) (Schmeck et al., 1977).

The RVEI is based on Cognitive-Experiential Self-Theory (CEST) (Epstein, 1983, 1994), a global theory of personality that postulates the existence of two separate processing systems, the rational and the experiential. The rational system operates via the conscious manipulation of symbols in a logical and analytical fashion, while experiential processing is holistic, emotional and imaginative. All behaviour is determined by the dynamic balance that exists between the two systems, and the RVEI attempts to assess the relative degree to which individuals prefer to process rationally or experientially.

The HIPS is derived from the creativity and learning-style literatures and is based on a biological metaphor that distinguishes between left cerebral hemisphere activities involving language, logic and analysis, and more image-based, emotional and holistic activities that are the putative remit of the right hemisphere. While the validity of the biological metaphor has been questioned since the development of the HIPS (Beyler and Schmeck, 1992), a number of studies have supported the validity of the behavioural distinction underlying the scale (Taggart and Torrance, 1984).

Like the HIPS, the ILP was also developed within the learning-styles literature and is designed to assess the processes that students go through in the course of learning. It comprises four sub-scales representing particular styles of learning of which one, the elaborative processing sub-scale, is of interest here. A number of studies have suggested that the elaborative processing scale measures the degree to which students are flexible processors, capable of using both analytic and holistic learning strategies (e.g. Schmeck and Geisler-Brenstein, 1989). However, although the elaborative processing sub-scale is designed to measure flexible functioning of this sort, individuals who score high on this particular measure reportedly demonstrate a preference for a more intuitive, holistic style of thinking despite the capacity for processing analytically. If a significant positive correlation were found between susceptibility and scores on this scale, it would suggest that the ability to enter hypnosis is related to both a holistic style of thinking, and the ability to flexibly shift between different cognitive styles and structures according to task demands. As Crawford (1989) has pointed out, there is good evidence to suggest that this 'cognitive flexibility' is indeed related to hypnotic susceptibility.

Each of the measures that we have selected uses the analytic-holistic processing distinction as a useful descriptive and predictive construct. If the ability to enter hypnosis is related to an everyday preference for thinking in a holistic fashion, we should expect to find a positive relationship between standard measures of hypnotic susceptibility, such as the Harvard Group Scale of Hypnotic Susceptibility (HGSHS) (Shor and Orne, 1962), the experiential sub-scale of the RVEI, the right hemisphere sub-scale of the HIPS, and the elaborative processing sub-scale of the ILP.

Method

Subjects

Subjects were 93 graduate and undergraduate students from University College London, of which 33 were male (mean age was 21.83 years, sd 4.66, range 18–48 years). All were homogeneous in terms of educational level and socio-economic status. Informed consent was obtained from all subjects. Each participant was paid £7 for taking part. Subjects were recruited on a volunteer basis for participation in a hypnotizability study.

Measures

Harvard Group Scale of Hypnotic Susceptibility

The Harvard group scale comprises an initial hypnotic induction followed by 12 test suggestions of roughly increasing difficulty. The more suggestions passed, the higher the susceptibility score. Although the Harvard is perhaps not as sensitive to differences in susceptibility as the Stanford scales, it demonstrates good test-retest reliability (Fellows, 1988) and its format allows the testing of groups of up to 30 subjects, making the test a good practical alternative to the individually administered Stanford scales.

Rational Versus Experiential Inventory, short form

The short form of the RVEI consists of four main sub-scales sub-divided into a further eight lower-order sub-scales; of these, only the experiential scale is of relevance here. The experiential sub-scale was derived from the sensing-intuiting sub-scale of the Myers Briggs Type Inventory (MBTI) (Briggs and Myers, 1976) and is designed to assess the degree to which individuals prefer to rely on their emotions (e.g. 'I tend to use my heart as a guide for actions') and intuitions (e.g. 'A solution to a problem will often come to mind without having to consciously reason it out') when making decisions. Although the experiential scale is divided into separate preference and ability dimensions, for the sake of conceptual clarity and statistical power we have collapsed the two sub-scales into one. The combined scale is composed of 10 statements, to which subjects must rate the truthfulness as it relates to them on a five-point Likert scale ranging from 'completely false' to 'completely true'.

Human Information Processing Survey

The HIPS is composed of 40 multiple choice questions, each of which has three possible answers corresponding to right hemisphere, left hemisphere and integrated sub-scales. Right hemisphere responses consist largely of behaviours associated with intuition, emotion and imagination, while left hemisphere responses correspond to more linguistic and logical behaviours; no preference between left and right hemisphere options represents an integrated processing response. In the present context, we are only interested in scores on the right hemisphere sub-scale.

Inventory of Learning Processes
The ILP is composed of four main sub-scales, each corresponding to an aspect of learning behaviour. Of the four, only one is of relevance here: the elaborative processing sub-scale. According to Beyler and Schmeck (1992) this sub-scale measures the degree to which students are capable of flexibly shifting between analytic and holistic styles of thinking. However, those scoring highly on the elaborative scale also generally prefer to process holistically, relying on their intuitions and 'gut-feelings' in decision-making situations regardless of processing flexibility. Although the recently revised version of the ILP (ILP-R) (Schmeck et al., 1991) further sub-divides the elaborative processing sub-scale into two additional thinking styles, we will retain the original super-ordinate division for the sake of clarity and statistical power. The scale comprises 10 statements* concerning holistic (five items, e.g. 'Ideas in books often make my mind wander to other topics not necessarily related to what I am reading'), intuitive (two items, e.g. 'I believe in intuition') and emotional (three items, e.g. 'My feelings are a very important part of my decision-making or judgement') styles of thinking, which subjects must rate on a six-point Likert scale indicating the extent of their agreement with it.

Social Desirability Scale
Many of the statements forming the questionnaires used here have potentially socially desirable responses; as such, we will use the Crowne and Marlowe (1960) Social Desirability Scale to be included as a predictor in subsequent regression analyses. The scale is the most commonly used instrument for assessing the influence of individual differences in the need for good social presentation (A. Furnham, 1996, personal communication). It comprises 34 true-false statements of which each has a desirable and a socially undesirable response; the total score is given by the number of desirable responses made.

Design and procedure
The nature of the study is correlational by definition. In addition to assessing simple correlations, an explorative regression analysis will also be performed in order to account for the potential influence of social desirability.

Questionnaires were presented together in a random order and completed under supervised, quiet and well-lit conditions. Testing occurred in small groups but all subjects were kept separate. Completion of the questionnaire package took approximately 25 minutes.

Susceptibility testing took place in a separate session after completion of the questionnaires. Again, testing occurred in small groups but all subjects were kept separate. Completion of the Harvard took approximately one hour for each group. Anonymity of responses was maintained throughout the experiment in an attempt to minimize the possible influence of social desirability.

Results

Scores on each of the measures fell within the standard range for a student population, and each sample of scores conformed to a normal distribution. Table 1 shows the inter-correlations between each of the measures. All correlations shown correspond to the Pearson product-moment correlation coefficient (r). To take into

*These items have been identified by the present authors as either holistic, intuitive or emotional on the basis of face validity; no such distinction is made by Schmeck, Ribich and Ramaniah (1977) due to common factor loadings for these items.

Table 1. Correlation matrix

	HARV	HIPS-R	ILP-E	RVEI-E
HIPS-R	0.1154			
ILP-E	0.1660	0.3539**		
RVEI-E	0.2629*	0.3451**	0.3992**	
SDS	0.2573*	–0.1252	–0.0014	0.1129

*Significant at $p<0.01$
**Significant at $p<0.0001$

account the high number of correlations being carried out, a relatively conservative alpha value of 0.01 will be used in this study.

As can be seen from Table 1, the experiential scale of the RVEI, the elaborative processing sub-scale of the ILP and the right hemisphere sub-scale of the HIPS all show moderate inter-correlations with one another. This is to be expected given that each of the scales purports to be measuring a similar construct. However, contrary to expectation, neither the right hemisphere sub-scale of the HIPS nor the elaborative processing sub-scales of the ILP show significant correlations with the Harvard scale of susceptibility. Indeed, of the holistic processing questionnaires, only the experiential sub-scale of the RVEI showed a significant, but modest, positive correlation ($r = 0.2629$; $p < 0.01$) with susceptibility. However, a significant positive correlation ($r = 0.2573$; $p < 0.01$) between social desirability and hypnotic susceptibility was also found.

An explorative step-wise multiple regression was performed on the susceptibility scores with each of the measures as predictors. The best predictor of susceptibility was the experiential scale of the RVEI (adj $R^2 = 0.06$; $F_{1,88} = 6.78$, $p < 0.01$). Of the other measures, only the social desirability scale contributed to any further variance in susceptibility (adj. $R^2 = 0.10$; $F_{2,87} = 6.13$, $p < 0.005$).

Discussion

The findings obtained here provide only partial support for the analytic-holistic hypothesis in hypnosis. Consistent with our hypotheses we found a significant, though modest, positive relationship between hypnotic susceptibility and scores on the experiential sub-scale of the RVEI. Despite a significant association between susceptibility and social desirability, a multiple regression indicated that the experiential scale of the RVEI was the best predictor of susceptibility. However, contrary to our predictions no significant relationship was found between susceptibility and scores on the right hemisphere sub-scale of the HIPS, or the elaborative processing sub-scale of the ILP. Nevertheless, consistent with our expectations all of the holistic processing scales correlated significantly with one another, suggesting that each measure is tapping, to an extent at least, a similar construct.

Given the significant intercorrelations between each of the holistic processing measures, the fact that only the experiential scale of the RVEI correlated significantly with susceptibility is somewhat surprising. In order to account for these findings, an examination of the items in each of the questionnaires is required. All of the items comprising the experiential scale of the RVEI refer to the use of gut-feelings, instincts, emotions and intuitions when making decisions. However, although both the right hemisphere sub-scale of the HIPS and the elaborative processing sub-scale of the ILP contain items of this nature, there is a significant departure from this theme in many of the other questions. Given the unidimensional nature of the experiential scale of the RVEI, we would argue that, in this sample at least, the significant (but moderate) inter-correlations between each of these measures reflects more the consistency in their inclusion of emotionally based items than any sort of assessment of a general holistic thinking style. Indeed, we believe that the pattern of findings here highlights the problem in using 'holistic processing' as a generic term that includes aspects of imagery, a preference for wholes over parts and the importance of intuition and emotion. A more precise operationalization of the term appears to be needed, something on which we are currently working (Brown and Oakley, in prep).

The significant positive correlation between susceptibility and the experiential scale of the RVEI would seem to suggest, then, that the ability to enter hypnosis is in some way related to the degree to which individuals rely on their gut-feelings and intuitions when making decisions. This finding lends support to the analytic-holistic hypothesis in its present form (see Brown and Oakley, 1997). Such a findings is also consistent with evidence indicating that high susceptibles experience their emotions more strongly than lows do (Crawford and Brown, 1987): clearly, the more intensely that a particular emotion is felt, the more likely that subsequent decisions will be made on the basis of it. Moreover, this finding is consistent with evidence suggesting that hypnosis is characterized by an increase in emotionality (Crawford et al., 1989). It seems reasonable to suggest that individuals who regard their emotions as fundamental to their everyday decision-making processes are more likely to allow themselves to enter a state in which emotions are heightened. This may be of particular relevance clinically, particularly if the client regards hypnosis as a way of achieving insight into the nature of their emotional problems.

It could also be argued that these findings support the notion that hypnosis is a state of higher level functional inhibition, the basis of the dissociated control theory of hypnosis (e.g. Woody and Bowers, 1994). It is possible that individuals who rely more on their emotions and intuitions than logic and reason when making decisions do so because of a relative inability to think about situations in a logical way. Given that the conscious and analytical processes involved in logical thought are governed by higher level control functions (Brown and Oakley, 1997), and that the covert interpretations that underlie emotions and intuitions are controlled at a lower level, it seems reasonable to assume that an everyday bias towards lower level processing facilitates the entry into a state of higher level processing inhibition. However, there are a number of alternatives to this explanation that are equally, if not more, feasible. For example, if an individual associates hypnosis with unconscious, emotional processes and a lack of control and logical thought, then completing a set of questionnaires quite transparently designed to assess ones preference for emotional and intuitive decision-making might in some way affect their subsequent performance on a susceptibility test. Thus, a high scorer may believe that they are likely to be highly susceptible and consequently allow themselves to become more engaged in the hypnotic experience. Conversely, individuals who believe (or desire) themselves to be highly susceptible may be inclined to complete the questionnaires according to the belief that high susceptibles are more emotional or intuitive. These potential effects are liable to be exacerbated by presenting the questionnaires within a hypnotic context as they were in this case, a factor that should be taken into account when planning further research of this sort (cf Laurence, 1997).

One other finding of importance is the significant positive correlation between susceptibility and social desirability, a finding that supports the socio-cognitive prediction that high susceptibles possess a need for positive self-presentation. Given this evidence, we would argue that the inclusion of a social desirability measure is an essential requisite of research concerning hypnotic susceptibility, particularly when susceptibility is being measured by self-report (as in the case of the HGSHS) and where other questionnaire measures are being used.

The findings presented here provide partial support for the analytic-holistic hypothesis in hypnosis, in that susceptibility appears to be modestly related to an everyday preference for making decisions on the basis of intuitive and emotional feelings. Contrary to the hypothesis, other apparently holistic behaviours as measured by the right hemisphere sub-scale of the HIPS and the elaborative processing sub-scale of the ILP do not appear to be related to susceptibility. Furthermore, the present research is unable to assess whether a self-reported emotional bias is related to susceptibility as a function of belief and expectation about hypnosis, or as a cognitive predisposition towards experiencing certain information processing alterations during hypnosis. Although the use of questionnaires can be constructive in identifying areas of potential interest, when it comes to accurately assessing questions of this sort more research using more precise and objective measures is clearly needed. Moreover, in order for this to be done in a constructive way, a sound and well-defined theoretical foundation is required. We (Brown and Oakley, in preparation) are currently working towards this end.

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MAIN PAPER

HYPNOSIS AND COGNITIVE-EXPERIENTIAL SELF-THEORY: A NEW CONCEPTUALIZATION FOR HYPNOSIS?

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ABSTRACT

Evidence for a shift from analytical to holistic processing during hypnosis is presented as a basis for a new conceptualization of hypnosis in terms of Epstein's integrative theory of personality, Cognitive-Experiential Self-Theory (CEST; e.g., Epstein, 1973, 1990, 1994). Support for this view comes from parallels between the hypnotic state and the experiential system as embodied in CEST and from converging lines of enquiry from cognitive psychology. It is concluded that there is significant heuristic value in such a conceptualization, which can form a framework within which to organize data and generate research, and can serve as an interface between cognitive psychology, the psychology of individual differences and hypnosis theory.

Despite pervasive theoretical differences within the field, the notion that hypnosis involves some sort of temporary suspension of critical thought to allow a more holistic, intuitive, emotional and imaginal way of thinking to predominate has proved extremely popular (e.g., Spanos & Barber, 1974; Crawford, 1982). Such an idea is appealing for a number of reasons. For example, a number of studies have indicated that hypnosis is characterized by an increase in imaginative processing (e.g., Crawford & Allen, 1983; for a review see Sheehan, 1979), heightened creativity (e.g., Raikov, 1983) and affect intensity (e.g., Crawford, Clarke, Kitner-Triolo & Olesko, 1989). Moreover, there is evidence to suggest that the ability to enter hypnosis might be facilitated by an everyday preference for a holistic style of thinking (e.g., Tellegen & Atkinson, 1974; Wallace, 1990) that, in extreme cases, involves considerable engagement in fantasy-related behaviour during normal waking — the so-called fantasy-prone personality (Lynn & Rhue, 1986)

The idea that hypnosis involves a shift from an analytic to a more holistic style of processing — a notion we shall refer to as the *analytic-holistic hypothesis* — is well represented, albeit often implicitly, in many contemporary cognitive accounts of hypnosis. For example, both neodissociation theory (e.g., Hilgard, 1977), and its more recent interpretation dissociated control theory (e.g., Bowers 1992), regard the disruption and inhibition of higher executive functions (the seat of conscious, analytical processing) as central to the induction and maintenance of hypnosis. The neuropsychophysiological model of Crawford and Gruzelier (1992) embodies a more explicit version. Citing evidence indicating a cerebral activity shift from left frontal to right posterior sites during a hypnotic induction (e.g., for a review see Crawford, 1994), Crawford and Gruzelier argue that hypnosis is characterized by a switch from a focused to a diffuse style of attentional processing corresponding to a shift from an analytical to a more holistic mode of cognition.

However, although the analytic-holistic hypothesis has played a major role in shaping cognitive theorising about hypnosis, it suffers from one fundamental shortcoming. Generally speaking, within the literature 'holistic processing' has been used as an umbrella term to describe such concepts as intuition, imagination and emotion with no clear indication as to the relationships, should they actually exist, between these constructs. Clearly, as a definition of holistic processing 'that-which-is-not-analytic' is unsatisfactory. In short, what is missing is an adequate theoretical framework to organize data concerning hypnosis and the analytic-holistic hypothesis and to generate research in order to assess the validity of the notion. We attempt to address this shortcoming in the remainder of this paper by presenting a conceptualization of hypnosis in terms of an established theory of personality, Cognitive-Experiential Self-Theory (e.g., Epstein, 1973, 1990, 1994).

HYPNOSIS AND COGNITIVE-EXPERIENTIAL SELF-THEORY

Epstein's (e.g., 1973, 1990, 1994) Cognitive-Experiential Self-Theory (CEST) is a cognitively oriented, global theory of personality which postulates the existence of a superordinate division of mental functions into two systems: the rational and the experiential systems. According to Epstein, conscious, deliberative thinking is not the natural mode of processing for humans as it is a highly inefficient way of dealing with the vast amount of information presented to the individual. The majority of information, he argues, is processed automatically and effortlessly outside conscious awareness, providing an efficient and adaptive method of responding to incoming data. CEST postulates that these forms of information processing are carried out separately by the rational and experiential systems respectively — the dynamic balance between both mediating all behaviour. Table 1 presents a comparison of the attributes of these systems.

According to CEST, the rational system operates within established rules of inference: it is conscious, logical, analytical and is affect-free. Epstein suggests that this system is, evolutionarily speaking, relatively 'new', coming about through the gradual acquisition of language by our forebears. In contrast, the experiential system is a relatively crude system, evolved over millions of years and present in both animals and humans, that automatically processes information and directs behaviour according to the emotional valence of prior experience. It is thus fundamentally pre-conscious and operates according to a holistic process based, in part, on maintaining a favourable pleasure-pain balance. Such a view has much in common with that of Oakley (1985). All behaviour is a result of the dynamic interplay between the operations of these two systems; the relative degree to which either is used in preference to the other is determined jointly by individual differences and the processing demands of the situation.

The essence of our conceptualization is that hypnosis represents one situation where the balance of processing is altered in favour of the experiential system. Such a notion is consistent with the reduction in planning functions, critical judgement and reality testing which many have suggested are inherent to the hypnotic experience (e.g., Shor, 1959; Woody & Bowers, 1994). Moreover, the form in which Epstein proposes the experiential system encodes information, namely imagery, metaphors and narratives, are assumed by many to be integral to the induction and maintenance of hypnosis (e.g., Waxman, 1989).

Table 1. Comparison of the experiential and rational systems

Experiential system	Rational system
1. Holistic operation	1. Analytic operation
2. Affective: Pleasure-pain oriented	2. Logical: Reason oriented
3. Associationistic structure	3. Logical structure
4. Behaviour mediated by 'vibes' from past experiences	4. Behaviour mediated by conscious appraisal of events
5. Encodes reality in concrete images, metaphors and narratives	5. Encodes reality in abstract symbols (words and numbers)
6. Rapid processing: Oriented towards immediate action	6. Slower processing: Oriented towards delayed action
7. Slower to change: Changes with repetitive or intense experience	7. Changes more rapidly: Changes with speed of thought
8. More crudely differentiated: Broad generalisation gradient; stereotyping	8. More highly differentiated
9. More crudely integrated: Dissociative; context-specific processing	9. More highly integrated: Cross-context processing
10. Experienced passively and preconsciously	10. Experienced actively and consciously
11. Self-evidently valid: 'Experiencing is believing'	11. Requires justification via logic and evidence

From 'Cognitive-Experiential Self-Theory: An integrative theory of personality' by S. Epstein, in R.C. Curtis, *The Relational Self: Theoretical Convergences in Psychoanalysis and Social Psychology*, New York: Guilford Press. Copyright 1991 by Guilford Press. Adapted by permission.

Should hypnosis represent a significant shift towards holistic, experiential processing one would also expect to find an increase in the emotionality of hypnotized subjects, a hypothesis borne out by a small number of studies (e.g., Crawford *et al.*, 1989). Moreover, the fantasy-prone subjects of Lynn and Rhue (1986) proved more likely to report physical reactions to violence in films and on television than their less fantasy-prone counterparts. Clearly, responding to emotionally arousing material in this way would suggest that fantasy-prone (and therefore hypnotically susceptible) subjects are more sensitive to the unconscious emotional evaluation of stimuli than those less prone to fantasy. Given that hypnosis involves a bias towards experiential processing, one might predict that the more prone to processing experientially during everyday life one is, the more susceptible one will be to hypnosis. Furthermore, the observed relationships between fantasy-proneness, hypnotic susceptibility and creativity (e.g., Lynn & Rhue, 1986) are also consistent with the conceptualization advanced here, as CEST regards the experiential system, due to its holistic and associationistic nature, to be the seat of intuitive wisdom and creativity.

CEST proposes a division of mental function that is prima facie very similar to that proposed in traditional psychoanalytical theory, with the primary and secondary processes corresponding to the experiential and rational systems respectively. However, there is one fundamental difference. Unlike psychoanalytic theory, CEST has a strong evolutionary component, suggesting that the experiential system is phylogenetically ancient and present in both human and non-human species alike. Conversely, the rational system is evolutionarily recent — being based on language — and is unique to humans. Such a notion is strongly supported by Reber's (1992) evolutionary argument for a dissociation between explicit and implicit memory processes. Citing the 'developmental lock' model (Wimsatt, 1986; Schank & Wimsatt, 1987) Reber argues that, given the relative evolutionary infancy of consciousness, explicit memory systems must have developed on the basis of a pre-existing system of implicit processes. This system is highly resistant to change and, because of its phylogenetic antiquity, should be present in many species other than our own. Furthermore, if one assumes that analytical processes require consciousness for their operation, then it follows that the implicit system must operate according to non-analytical rules. This not only furnishes CEST with a strong evolutionary backbone, it could provide a significant source of cross-fertilization between hypnosis research and cognitive psychology should our conceptualization prove valid.

We would make a strong claim, therefore, that CEST is a useful heuristic within which to organize data concerning hypnosis and the analytic-holistic hypothesis. As a cognitive account of hypnosis, however, it is not sophisticated enough to allow detailed explanations and predictions to be made on the basis of it. In short, it is the barest of bones of an information processing theory — what is needed is some empirical flesh. To this end, an examination of research concerning the analytic-holistic dichotomy within cognitive psychology as a whole has yielded a number of potentially fruitful avenues for investigation (see Brown, 1996). Work from the fields of attention, perception, memory, problem solving and cognitive style demonstrate a remarkable convergence in favour of the conceptualization of mental processes that is fundamental to CEST. For the sake of brevity, we provide only a brief illustration here.

The question of whether multidimensional stimuli are perceived analytically or holistically has enjoyed a significant resurgence in recent years (Smith, 1989). Much of this revival stems from earlier research concerning dimensional integrality and separability (Shepard, 1964; Lockhead, 1972; Garner, 1974) and is firmly rooted in the best standards of cognitive psychology. This research has shown that certain dimensional combinations lend themselves more to a holistic form of processing; these have been described as 'integral stimuli' (Lockhead, 1972; Garner, 1974). Conversely, other combinations of dimensions have been described as 'analysable' (Shepard, 1964; Lockhead, 1972) or 'separable' (Garner, 1974) because they are more likely to be processed analytically.

However, more recently research has indicated that both integral and separable stimuli may, under certain conditions, be processed separably and integrally respectively. For example, a set of stimuli composed of dimensions of size and brightness, the prototypical example of separable stimuli, are often processed holistically under incidental conditions or concurrent task demands (e.g., Foard & Kemler-Nelson, 1983). Thus, it is not simply the stimulus that determines the nature of the processing operation performed, but task requirements also. One clear prediction from our conceptualization might be that hypnosis represents one such task manipulation that motivates the holistic processing of stimuli usually processed analytically.

Furthermore, a number of findings indicating that subject factors influence the nature of the processing operation performed might also be of relevance here (see Foard & Kemler-Nelson, 1983). For example, several studies have shown that cognitive development appears to proceed in parallel with a shift from a holistic to a more analytical form of perceptual processing (e.g., L.B. Smith and Kemler, 1977). Thus, young children tend to process stimuli commonly perceived as separable by adults in a holistic fashion, with this tendency diminishing as the child matures. Such a developmental trend from integral to separable processing might go some way towards explaining the observed pattern of superior hypnotic susceptibility in children (e.g., Hilgard, 1965). An investigation of the relationship between hypnotic susceptibility and integral versus separable processing preference may shed some light on this matter.

On the basis of this perceptual research, Foard and Kemler Nelson (1983) concluded that holistic processing is a primitive fall-back mode of cognition that operates in the absence of the ability or inclination to process analytically. Clearly, such a conclusion is consistent with the organization of mental processes that we have presented here. Furthermore, this research offers tried and tested methodologies with which to test the validity of our ideas. Work is currently under way in our laboratory in an attempt to do just this.

CONCLUSIONS

Our conceptualization of hypnosis in terms of CEST provides a useful heuristic within which to organize data concerning the analytic-holistic hypothesis. Furthermore, extension of this conceptualization to incorporate research from psychology as a whole provides not only theoretical substance but a number of potentially useful methodological paradigms with which to assess the validity of our claims. In addition, through such a process of cross-fertilization it is hoped that our conceptualization offers considerable potential for hypnosis research and theory to enrich our understanding of the nature of intuition, and the relationship between cognition and emotion.

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