GENDER DIFFERENCES IN DEPRESSION AND ANXIETY ACROSS THE ADULT LIFESPAN

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STATEMENT OF THE CANDIDATE'S CONTRIBUTION TO THE RESEARCH

Research for this thesis was undertaken using data from the first and second waves of the Personality and Total Health (PATH) Through Life Project. This large, community project was designed and implemented by the Centre for Mental Health Research (CMHR).

The candidate independently analysed all data and drafted all chapters for this thesis. Chapters were then circulated for review amongst the candidate's supervisors. Professor Helen Christensen provided feedback on all chapters. In addition, Professor Andrew Mackinnon provided comments for Chapters 1, 2, 3, 5, 6, 7 and 8, as well as guidance on the statistical plan for the thesis. Dr Peter Butterworth provided feedback on Chapters 1, 2, 3 and 7. Dr Tim Windsor also gave feedback on an early version of Chapter 7 – when it was in the form of a manuscript to be submitted for publication.

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LIST OF ABBREVIATIONS

GENERAL

ABS	Australian Bureau of Statistics
APA	American Psychological Association
AUDIT	Alcohol Use Disorders Identifications Test
BAS	Behavioural Activation Scale
BIS	Behavioural Inhibition Scale
CSA	Childhood Sexual Abuse
CES-D	Centre for Epidemiological Studies Depression Scale
CIDI	Composite International Diagnostic Interview
CMHR	Centre for Mental Health Research
BDI	Beck Depression Inventory
DSM	Diagnostic and Statistical Manual of Psychiatric Disorders
EPQ	Eysenck Personality Questionnaire
GAD	Generalised Anxiety Disorder
HADS	Hospital Anxiety and Depression Scales
HPA	Hypothalamic-pituitary-adrenal (axis)
HPT	Hypothalamic-pituitary-thyroid (axis)
HRT	Hormone replacement therapy
NHMRC	National Medical Health and Research Council
NIMH	The National Institute of Mental Health
OCD	Obsessive Compulsive Disorder
OD	Overanxious Disorder
PMDD	Premenstrual Dysphoric Disorder
PPD	Post-Partum Depression
PTSD	Post-traumatic Stress Disorder
SF-12	Short Form Health Survey (12-item)
STPI	State-Trait Personality Inventory
STW	Spot-the-Word Test

DATASETS/SURVEYS

ECA	Epidemiological Catchment Area Study (US)
NSMHWB	National Survey of Mental Health and Well-Being (Australia)
NCS	The National Comorbidity Survey (US)
PATH	Personality and Total Health Survey/Project (Canberra, Australia)

STATISTICAL

CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
DF	Degrees of Freedom
DIF	Differential Item Functioning

EM	Expectation-maximisation
IRT	Item Response Theory
MAR	Missing at random
Mediator^{p}	Potential Mediator
Moderator^{p}	Potential Moderator
MGA	Multiple Group Analyses
MVA	Multivariate Analyses
N	Number of participants
OLS	Ordinary Least Squares
RMSEA	Root Mean Square Error of Approximation
SD	Standard Deviation
SPSS	Statistical Package for the Social Sciences
TLI	Tucker Lewis Index

THESIS ABSTRACT

Women are on average twice as likely as men to experience depression and anxiety disorders. Several explanations have been proposed to explain these gender disparities. However, few studies have examined the possibility that the gender difference in depression and anxiety prevalence, and the explanatory factors involved, vary across the life course. This thesis describes the pattern of distribution for gender differences in depression and anxiety levels across the adult lifespan, and evaluates the role of potential psychosocial risk factors at particular life stages. Analyses were undertaken using the first and second waves of the Personality and Total Health (PATH) Through Life study. This study collects data on three narrow-aged cohorts living in the Canberra and Queanbeyan region (Australia) every four years. At Wave 1, participants were aged 20-24, 40-44 and 60-64. The outcome measures used in this thesis were the Goldberg Depression and Anxiety Scales.

Across the three PATH cohorts, women experienced higher levels of depression and anxiety than did men. However differences were most prominent in the youngest age group. Latent variable modelling showed that for each age group, the gender difference in levels of depression and anxiety could not be attributed to gender-biased items. Two pathways to the gender disparity in depression and anxiety levels were explored. First, multivariate mediation analyses identified gender differences in exposure to potential psychosocial risk factors. Second, Ordinary Least Squares (OLS) regression identified gender differences in vulnerability or susceptibility to potential psychosocial risk factors. Women of all age groups were more exposed than men to childhood adversity, low mastery, high behavioural inhibition, rumination, neuroticism, poor health and interpersonal problems, factors that were associated with greater depression and anxiety.

They were also more vulnerable than men to depression and anxiety if they had experienced negative events involving social networks or were recently married, or if they had poor cognitive function or low mastery. Age comparisons suggested that stress in domestic relationships and responsibilities were particular vulnerabilities for young women, and that middle aged women were specifically susceptible to poor social support and behavioural inhibition. No specific vulnerabilities emerged for older women.

While the focus of this thesis was identifying potential risk factors that might explain the preponderance of symptoms for women, the analysis techniques adopted also provided information on potential risk factors relevant to men. The findings showed that men were more exposed to employment problems than women, and were more vulnerable to alcohol abstinence, aggression and problems at work. For young men, unemployment was a particular vulnerability, as were domestic responsibilities for middle aged men, and poor health and low family support for older men. Overall, the potential psychosocial risk factors identified for depression were similar to those identified for anxiety.

This thesis confirms that a lifespan perspective is important when describing gender differences in depression and anxiety, and identifying associated risk factors. It also demonstrates that the roles played by potential risk factors, can be investigated effectively using the frameworks of exposure and vulnerability. Information regarding levels of depression and anxiety amongst subgroups such as gender and age group, as well as the risk factors most relevant to these subgroups, is important for understanding the development of anxiety and depression, and in framing potential prevention interventions.

1. GENDER DIFFERENCES IN DEPRESSION AND ANXIETY ACROSS THE ADULT LIFESPAN: AN OVERVIEW OF THIS THESIS

1.1. The focus of this thesis

It is well established that women are twice as likely to experience both depression (Kuehner, 2003; Nolen-Hoeksema, 1987) and anxiety (Blazer, Hughes, George, Swartz, & Boyer, 1991; Mackinaw-Koons & Vasey, 2000) as men. This finding has been reported in the context of both continuous measures of symptom counts and formal diagnoses. A number of explanations have been proffered for why these gender differences occur, including artefactual, biological, psychological and social hypotheses (Mackinaw-Koons & Vasey, 2000; Piccinelli & Wilkinson, 2000). However, several aspects of the research in this area remain under-developed and fractured. Reports of the gender ratios for the prevalence of depression and anxiety disorders have often failed to consider the possibility of variation across the lifespan. Studies identifying gender variability with respect to potential risk factors for depression and anxiety have also largely ignored the possibility of age variation. Another short coming of these studies has been the choice to study risk factors individually rather than studying multiple influences concurrently.

This thesis explores the notion that age variation is an important element in describing and explaining the gender difference in depression and anxiety prevalence. In doing so it clarifies the possible patterns of age distribution for the gender difference in both depression and anxiety, and concurrently explores the roles of a wide range of potential psychosocial risk factors at particular life stages. While there are alternate biological and artefactual risk factors that are also potentially important (as reviewed in Chapter 2), the focus of this thesis is predominantly on psychosocial determinants.

Depression and anxiety can be conceptualised both as a set of symptoms which lie on a continuum and a formal diagnosis, however, the assessments used in this thesis define both outcomes as a continuous measure of symptom counts.

1.2. Thesis perspectives

This thesis adds to the available literature surrounding gender differences in depression and anxiety through the adoption of three main perspectives or frames of reference. Although each of these areas has conceptually been recognised as an important aspect of describing and explaining gender differences in depression and anxiety in reviews of the literature, they have rarely been adopted as part of the research methodology in published research studies.

The first perspective adopted is that a lifespan or developmental approach is an important aspect of describing and explaining the gender difference in depression and anxiety. Previous reports have typically used a generic ratio of 2:1 to describe the preponderance of both outcomes in women, while largely ignoring other research indicating that these ratios are likely to vary across the adult lifespan (Jorm, 1987; Mackinaw-Koons & Vasey, 2000). In addition, the roles played by potential psychosocial risk factors have rarely been investigated in the context of particular life stages.

The second perspective is that there are multiple relevant psychosocial risk factors or explanations for the gender difference in depression and anxiety that would benefit from being studied concurrently. Previous studies of psychosocial risk factors in either outcome have often focused on a single risk factor without considering the complex interactions that take place in the development of psychopathology.

The third perspective is that the vast literature surrounding the gender difference in depression serves as a useful springboard for expanding the more limited research surrounding the gender difference in anxiety. While there is a large body of research examining the gender difference in depression, there is a paucity of research investigating the gender difference in anxiety. Given the high comorbidity between anxiety and depressive disorders, and the strong correlation between related constructs, the description and explanations for the gender difference in both outcomes are likely to overlap (Moffitt et al., 2007).

1.3. The importance of this thesis

The huge burden depressive and anxiety disorders place on individuals, their families and the public health system makes the identification of at risk subgroups an important area of research. In Australia, depression is the leading cause of years of life lost due to disability (Mathers, Vos, & Stevenson, 1999) and anxiety disorders are the most common type of mental disorder experienced (Andrews, Henderson, & Hall, 2001). Differences in prevalence across subgroups such as gender and age, suggest that the burden of these illnesses does not fall equally across the population. Research undertaken to clarify who is most at risk of experiencing depression and/or anxiety, as well as the risk factors associated with these specific population groups, is a fundamental part of developing effective prevention and treatment strategies.

1.4. General aims

The current thesis has two major aims. The first is to describe variation in the gender difference for levels of depression and anxiety across the adult lifespan using a

large representative community sample. The second is to establish and examine simultaneously the role of a wide range of potential psychosocial factors associated with depression and anxiety at various life stages. A subsidiary aim of this thesis is to expand the literature surrounding the gender difference in levels of anxiety. By examining gender differences in levels of both depression and anxiety concurrently, the current investigations provide insight into the similar and varying etiological processes for both outcomes.

1.5. Chapter description and research questions

This thesis utilises two waves of data from a large community survey, The PATH (Personality and Total Health) Through Life Project, to address the stated aims. This dataset was uniquely suited to the current investigation as it collects information on a wide range of pathological symptoms and associated risk factors from three narrow aged cohort groups (Wave 1: 20-24, 40-44, and 60-64). Levels of depression and anxiety were assessed by the Goldberg Anxiety and Depression Scales. A brief description of the each of the chapters in this thesis and the primary research questions addressed in Chapters 5, 6, 7 and 8, which report on the specific research studies of this thesis, is provided below.

- Chapter 2 reviews the literature surrounding the gender difference in depression and anxiety. The instability of the gender ratios in each outcome across the life course is outlined, and the major explanations for the preponderance of symptoms among women are reviewed. The findings from this chapter inform the list of variables investigated in Chapters 7 and 8 as potential psychosocial risk factors for the gender difference in both outcomes.

- Chapter 3 outlines the methodological framework and mechanisms adopted in this thesis and is separated into two major sections. The first section describes models of mediation and moderation and identifies them as suitable for examining how potential risk factors or correlates might influence the gender difference in depression and anxiety. The second section outlines the method used in this thesis to assess variation in findings across age. In both sections the challenges and limitations involved in using cross-section or restricted longitudinal data (two time points) to investigate developmental questions are discussed.
- Chapter 4 describes the characteristics of the survey sample, procedures and measures used throughout the analyses in this thesis. The key psychosocial factors described in this chapter are those identified in the literature review in Chapter 2.
- Chapter 5 reports the findings from Study 1. This study was conducted to confirm the presence of gender differences in levels of depression and anxiety in the PATH sample, and examine variation in these differences across three age cohorts (20-24, 40-44 and 60-64). Both cross-sectional and longitudinal (two time points) analyses were conducted. The primary research question addressed in this study was: *How do gender differences in levels of depression and anxiety differ across the adult lifespan?* Based on the evidence of previous research it was hypothesised that: *Gender differences in levels of depression and anxiety would vary across the three age groups examined.*
- Chapter 6 reports the findings from Study 2. The analyses undertaken examined whether gender differences in the Goldberg Anxiety and Depression Scales were due to gender-biased assessment items. This study was conducted to verify the validity of the scales as a measure of gender differences in both outcomes. The analyses conducted

addressed the research question: *Can gender differences in levels of depression and anxiety be attributed to gender-biased items within the Goldberg Scales?* This research question was investigated for each of the three PATH age cohorts. Based on the evidence of previous research it was hypothesised that: *Gender differences in depression and anxiety would in part be due to gender-biased scale items.* The findings from this study formed the basis of a publication in the *Journal of Mental and Nervous Disease* (Appendix 1).

- Chapters 7 and 8 report the findings from Studies 3 and 4. Both of these studies aimed to address the same research questions: *What are the potential risk factors for the preponderance of depression and anxiety for women?; and To what extent do they vary across the lifespan?* Each chapter dealt with these research questions using a different methodological framework, although the same broad set of psychosocial factors (as identified in Chapter 2) was investigated in both studies. Chapter 7 adopted a mediation framework, where gender differences in exposure to (or the frequency of) psychosocial factors were investigated as contributors towards the preponderance of depression and anxiety for women. Chapter 8 adopted a moderation framework, where gender differences in vulnerability to (or the impact of) psychosocial factors were assessed as influences on the gender difference in depression and anxiety. In both studies, variation in findings across the three PATH age cohorts was investigated. Based on the evidence of previous research it was hypothesised that: *The majority of psychosocial factors assessed would be identified as potential risk factors, and age variation in the potential risk factors identified would be evident.* The findings from

Study 3 formed the basis of a publication in the journal *Social Psychology and Psychiatric Epidemiology* (Appendix 2).

- Finally Chapter 9 draws together the findings from previous chapters and outlines the strengths and limitations of the studies conducted. This chapter also highlights the importance of the research findings generated in this thesis and identifies areas where future research is required.

1.6. Summary

Although a gender disparity in the prevalence of depression and anxiety is well established, several aspects of research in this area remain under investigated. This thesis aims to add to the literature by examining age variation in both the magnitude of the gender difference in depression and anxiety, and the roles played by a wide range of psychosocial risk factors. Identifying at risk subgroups and their corresponding risk factors is a central part of developing effective prevention and treatment strategies for common mental disorders, such as depression and anxiety.

2. GENDER DIFFERENCES IN DEPRESSION AND ANXIETY: EPIDEMIOLOGICAL RESEARCH AND ETIOLOGICAL EXPLANATIONS

2.1. Summary

This chapter demonstrates that the gender disparity in depression and anxiety prevalence differs as a function of age. It also describes and evaluates the four dominant categories of explanations for the gender difference in both outcomes: artefactual, biological, psychological and social. Artefactual explanations propose that observed gender differences are not a product of gender *per se*, but are the product of biases, such as measurement or clinical bias. Biological explanations focus on gender differences in human biology, such as neuroendocrine and neurotransmitter systems, hormones and genetics. Psychological explanations are based on gender differences in thought processes and behaviour, such as coping styles and personality characteristics. Gender differences in social conditions, such as socio-demographic circumstances, role strain and social support, form the basis of social explanations. A brief examination of the highly comorbid relationship between depression and anxiety is also provided. The literature reviewed in this chapter provides a list of candidate psychosocial risk factors for the gender difference in depression and anxiety prevalence. The specific roles played by these factors are investigated later in Chapters 7 and 8.

2.2. The gender difference in depression

2.2.1. Prevalence of the gender ratio

Depression is a term used to refer to a set of symptoms and a formal diagnosis. As such, gender ratios for depression have been reported using both measures of symptom counts or scale scores and formal diagnoses. The frequency of diagnosed 'Major Depression' can be described in terms of prevalence (the total number of cases during a period of time) or incidence (the number of new disease cases specified in a population during a period of time). In Australia, the 12 month prevalence of Major Depression is approximately 6% (Andrews et al., 2001). While the incidence of Major Depression is not available from a nationally representative Australian sample, the National Population Health Survey of Canada estimated an annual incidence proportion of 3.35% (Patten, 2000). Most data on the prevalence of depression is derived from large population surveys. Incidence statistics are more commonly used by smaller clinical investigations, where data is based on patients' first contact or admissions to health services, although incidence data can also derived from longitudinal population studies (Bebbington, 1996). While it is important to understand the differences between studies of prevalence and incidence, the overwhelming evidence is that regardless of the assessment tool or measurement description used, women experience more depression than do men (Kuehner, 2003).

The gender ratio for Major Depression has typically been reported as somewhere between 1.5:1 and 3:1. This finding has been widely documented in multiple studies, which have used a range of diagnostic assessments and have been undertaken in many different geographical locations. Reviews by Nolen Hoeksema (1987), Weissman and Klerman (1977), and more recently Kuehner (2003), include extensive summaries of the

reported findings of the gender ratio for depression. Chronic Minor Depression and Dysthymia are also approximately twice as common in women as men (Angst & Merikangas, 1997; Kessler, Zhao, Blazer, & Swartz, 1997). The Australian National Survey of Mental Health and Well-Being (NSMHWB) reported that the 12 month prevalence of having an affective disorder (either Major Depression or Dysthymia) was 1.8 times higher for women than men (Andrews et al., 2001).

In addition to studies using diagnostic categories as the outcome measure, many community-based surveys have assessed the gender difference in depression levels using continuous scales. These studies have similarly shown that being female is a risk factor for depressed mood (Jorm, 1987; Kessler, 2006; Nolen-Hoeksema, 1987). A study that utilised the Centre for Epidemiological Studies Depression (CESD) Scale found that the ratio of women to men categorised as depressed as the result of scoring above a predetermined threshold on the scale was 1.8:1 (Clark, Aneshensel, Frerichs, & Morgan, 1981). The mean total score for women (10.4) was significantly higher than that for men (7.6). The Short Form for the Beck Depression Inventory (BDI) has also been shown to have a significantly higher mean score for women (M=2.82) than men (M=2.16) (Knight, 1984).

2.2.2. Stability of the gender ratio across the lifespan

While there is robust evidence that depression is more common for women than men, there is less certainty surrounding the distribution stability or change of this difference with age. There is no obvious female preponderance of depression in children (Angold & Rutter, 1992; Clayton, 1983). If anything, boys are more likely to be diagnosed as clinically depressed than girls (Andersen, Williams, McGee, & Silva, 1987; Hankin et al., 1998). The gender difference in prevalence emerges during early adolescence. A

gender ratio comparable to the adult value is reached between the ages of 15 and 18 (Hankin et al., 1998). Although it is known that the difference emerges during adolescence, an exact age of onset has not been determined. This is likely to be because pubertal stage, rather than chronological age, triggers the onset of the gender gap (Angold, Costello, & Worthman, 1998; Patton et al., 1996). As puberty is a prolonged process with both biological and social transitions, it is difficult to pin-point the specific risk factors involved. One possibility is that a rise in negative affect coincides with rising levels of sex hormones for girls during puberty. Social factors are also likely to interact with hormonal changes to further heighten depression for girls (Angold et al., 1998).

Although the gender difference for depression emerges in puberty, available evidence suggests it does not peak at this age. The question "at which age or life stage is the gender ratio in depression greatest?" has not yet been adequately answered. The only meta-analysis available examining gender differences in depression prevalence and mean scores across the lifespan, conducted by Jorm (1987), found that the ratio was greatest during mid-life somewhere between 30 and 50 years old. However, a number of alternative studies have suggested that the ratio might peak earlier than this, possibly during young adulthood (18-25) (ABS, 1997; Der & Bebbington, 1987; Leon, Klerman, & Wickramaratne, 1993). From the evidence available, the age or life stage at which the gender ratio is greatest cannot be reliably determined, although there are several studies that indicate the period of young adulthood should be investigated further.

Post mid-life the gender difference in depression continues until around 50-60, after which several epidemiological studies indicate a reduction in the gap (Bebbington et al., 2003; Bland, Newman, & Orn, 1988; Robins & Rigeir, 1991). The precise age at which

the ratio begins to reduce has not been determined. It does appear that the gap narrows because women's level of depression decreases, rather than an increase for men (Copeland et al., 1987; Jorm, 1987). This has led the timing of the reduction to be linked to menopause. A study using data from the UK National Survey of Psychiatric Morbidity conducted by Bebbington et al. (2003) supported this theory. The researchers found a clear reversal of the gender ratio in prevalence of depressive episodes for those aged 55-64 in comparison to younger age groups, which was not explained by social factors such as marriage, childcare or employment status. However, contradictory evidence has also been published. Jorm's meta-analysis of studies concluded that the gender ratio did not reduce until well after menopause (1987). Furthermore, a large representative population study conducted by Cairney and Wade (2002) reported an equivalent gender gap for women aged pre and post 55, with both groups of women twice as likely than men to experience a Major Depressive Episode. On balance, the majority of research supports a narrowing of the gender gap somewhere after age 50. Although the evidence suggests the gender ratio in depressive disorders is smaller in older adults than younger age groups, many studies have shown that being female is still a significant risk factor for depression in the elderly (Djernes, 2006).

From the research evidence available, it can be concluded that the gender difference in depression varies as a function of age, emerging during adolescence and reducing in old age. There is less agreement on the precise age or life-stage at which the gender ratio is greatest. A more thorough overview of the pattern of the gender ratio across age, including findings from the National Survey of Comorbidity (NCS), the Epidemiologic Catchment Area (ECA) Studies and the Australian National Survey of

Mental Health and Well-being (NSMHWB), is provided in Chapter 6 of this thesis. The emergence and reduction of the gender ratio in depression has been linked to particular biological and social transitions. However, the available evidence for such causal associations remains inconclusive. Further research is needed to accurately map the distribution of the gender ratio across the lifespan. This information can then be used to identify concurrent or precipitating biological, psychological and environmental changes.

2.2.3. Gender differences in age of onset, illness course and illness quality

The earlier the age of onset for a depressive illness, the more severe the illness is likely to be (Endicott, 1998). This finding has led researchers to infer that depression is more prevalent in women, because they experience their first depressive episode at a younger age. Although more young women than young men experience depression, there does not appear to be a gender difference in the average age of onset for a Major Depressive Episode. Weissman (1993) reported results from the cross-national collaborative study showing no overall differences in the age of onset for males and females in four sites (ECA study, USA: male 27.2 and female 28.2; Edmonton, Canada: male 28.5 and female 25.5; Munich, Germany: male 26.2 and female 31.3; Christchurch, New Zealand: male 30.7 and female 28.3). Data from the NCS supported these observations with the mean age of onset for men reported as 24.4 and for women 23.5 (Kessler, McGonagle, Swartz, Blazer, & Nelson, 1993). Given that men and women have similar ages of onset, this does not seem to be a contributing factor to women's preponderance of depressive illness.

Gender differences in the course of depression may also be an important consideration. If women experience more chronic or frequent episodes than men, this will

be reflected in higher prevalence rates. 'Course' in this case refers to the chronicity or length of depressive episodes, how frequently they reoccur and the quality of depressive symptoms experienced. Results from the NCS indicate that the ratio of 12-month to lifetime prevalence is almost identical for men and women, implying no gender differences in the chronicity or recurrence of depression (Kessler et al., 1993). The NCS examined both chronic depression and 12-month acute recurrent depression and found no significant differences by gender. Similar results were found in the ECA studies and the National Institute of Mental Health (NIMH) Collaborative Program on the Psychobiology of Depression. The later study observed that men and women did not differ significantly in their time to recovery, or the severity and number of reoccurrences over a fifteen-year period (Simpson, Nee, & Endicott, 1997). Some research has found that women do have more chronic and recurrent depressive episodes than men, denoting a more complex picture (Ernst & Angst, 1992; Merikangas, Wicki, & Angst, 1994; Winokur, Coryell, Keller, Endicott, & Akiskal, 1993). However, it has been suggested that these alternate findings are due to recall bias and loss of participants. Studies with minimal attrition, which track participants for an extended time period typically, report no gender differences (Endicott, 1998; Kessler, 2003; Kessler, McGonagle, Nelson et al., 1994). The evidence indicates that the elevated rate of depression in women is due to a greater risk of first onset or first occurrence of illness, rather than greater frequency or length of depressive episodes.

There are some qualitative differences in the experience of depression for men and women. Women have been shown to experience more somatic symptoms relative to men as well as appetite increase, weight gain, fatigue, sleep disturbance, loss of interest in sex,

and crying (Angst & Dobler-Mikola, 1984; Carter, Joyce, Mulder, Luty, & McKenzie, 2000; Frank, Carpenter, & Kupfer, 1988; Perugi et al., 1990; Salokangas, Vaahtera, Pacriev, Sohlman, & Lehtinen, 2002; Wenzel, Steer, & Beck, 2005). There is also evidence to suggest that in general women experience more depressive symptoms than men. Kessler (1993) reports that if only the DSM-III-R (Diagnostic and Statistical Manual of Psychiatric Disorders) core symptoms were used (at least one period lasting 2 weeks or more of persistent depressed mood or markedly diminished interest in normal activities) the female: male risk ratio for lifetime depression prevalence would be 1.26. The risk ratio grows as the number of DSM criteria increase, and would be 2.50 if all eight criteria were required for a diagnosis. Therefore, it is not only a preponderance of core symptoms that contributes to higher depression prevalence for women; the more frequent endorsement of other depressive symptoms also appears to have an effect.

Epidemiological information about the age of onset, course and quality of depression for women and men is another important tool for evaluating the possible risk factors or proposed theories for the gender difference in depression. For example, Kessler (1994; 2003) concludes that if there is no gender difference in the frequency or length of recurrent depressive episodes, the elevated rate of depression in women must be due to a greater risk of first onset. It follows on that theories aiming to explain the gender difference in depression should focus on predicting initial occurrences of depression, and that those which focus on a mechanism that induces or creates a more chronic or recurrent course for women should be re-evaluated.

2.2.4. Gender differences in cohort trends

The prevalence of Major Depression has increased considerably during recent decades (Cross-National-Collaborative-Group, 1992; Wolk & Weissman, 1995). Specifically, younger cohorts (those born after World War II) appear to have a higher lifetime risk of Major Depression, than those born earlier (Kessler, McGonagle, Nelson et al., 1994; Lewinsohn, Rohde, Seeley, & Fischer, 1993; Weissman et al., 1993). Although there is evidence that the rate of depression has increased, there is less certainty surrounding whether the increase has occurred equally for men and women. One possibility is that the rate of depression has risen for men and stabilised for women for cohorts born after 1945, resulting in a narrowing of the gender gap in more recent times. Most of the evidence for this theory comes from cross-sectional research recording retrospective data such the Cross-National Collaborative Studies conducted in the United States, Canada and New Zealand (Weissman et al., 1993). Further support for this theory has also been shown in earlier studies carried out in Sweden and Canada (Hagnell, Lanke, Rorsman, & Ojesjo, 1982; Murphy, 1986). Conversely, the NCS explored cohort trends over the full life course and found that there was no major difference in the sex ratio of successively younger cohorts (Kessler, McGonagle, Nelson et al., 1994). However, the age range of the sample only extended to 55 making it impossible to study trends in the elderly.

Information on gender differences in cohort trends can be used to infer which biological, psychological and social risk factors might play a role in explaining the gender difference in depression. For example, it has been established that the prevalence for Major Depression has increased for both genders during recent decades. Kessler (2003) points out that change in biological risk factors could not have emerged this quickly, favouring

environmental mechanisms to explain the depression increase. One problem is that much of the current data available demonstrating growth in depression is from cross-sectional studies, which ascertain age of onset information retrospectively. This type of data cannot distinguish genuine cohort effects from artefactual inferences. For example, if recall failure increases with age, this could easily be interpreted as an increase in depression prevalence (Simon et al., 1995). This is also the case for observed gender differences in cohort effects: if older men are less likely to recall experiences of depression, depression will appear to increase in younger male cohorts. Longitudinal research across the lifespan is necessary to confirm that depression prevalence is in fact increasing, in order to establish whether the gender gap is narrowing in successive cohorts (see Rutter & Smith, 1995). This information can then be used to more accurately identify those risk factors responsible for change in the gender difference in depression.

2.3. The gender difference in general anxiety

2.3.1. Prevalence of the gender ratio

Nationally representative epidemiological studies report that anxiety disorders are the most common type of mental illness in both Australia (Andrews et al., 2001) and the United States (Kessler, McGonagle, Nelson et al., 1994). These studies also find that anxiety disorders are more common in women than men. The term 'anxiety disorders' covers a set of diagnoses including; panic disorder, social phobia, agoraphobia, generalised anxiety disorder (GAD), obsessive compulsive disorder (OCD) and post-traumatic stress disorder (PTSD). The focus of this thesis is generalised anxiety, of which the closest diagnosis match is GAD. GAD is predominantly characterised by excessive and uncontrollable worrying (Rodebaugh, Holaway, & Heimberg, 2008). The NCS found that

the 12 month and lifetime prevalence of GAD were approximately twice as high for women (4.3%; 10.3%) than they were for men (2.0%; 3.6%). Results from the ECA studies similarly show that the 12 month prevalence for women (5.0%) is twice that of men (2.4%) (Blazer et al., 1991). In Australia, the NSMHWB found that the 12 month prevalence of GAD was approximately 1.5 times greater for women (3.7%) than it was for men (2.4%) (ABS, 1997). Likewise, continuous measures of anxiety indicate that women experience higher mean levels of anxiety symptoms. Women have been found to score significantly higher than men on both the GAD-7 (a recently developed brief self-report scale for GAD) (Spitzer, Kroenke, Williams, & Lowe, 2006), and the Penn State Worry Questionnaire (Meyer, Miller, Metzger, & Borkovec, 1990).

2.3.2. Prevalence stability across the lifespan

In childhood, continuous measures of general anxiety and fear suggest that girls consistently report more anxiety symptoms than boys (Mackinaw-Koons & Vasey, 2000). Studies examining rates of diagnosed general anxiety in childhood have generally centred on 'overanxious disorder' (OD) rather than GAD, as most were conducted prior to the introduction of GAD in 1994 (APA, 1994; Mackinaw-Koons & Vasey, 2000). Overall, these studies suggest there is no apparent gender difference in rates of OD diagnoses in children. While studies conducted by Simonoff et al. (1997) and Costello et al. (1988) found higher prevalence rates of OD in girls than boys, other studies have found either no significant gender difference (Velez, Johnson, & Cohen, 1989) or that rates are higher in boys (Andersen et al., 1987). The research evidence does show that by adolescence there is a clear preponderance of GAD in girls, with reported gender ratios of about 3:1 (Cohen et al., 1993; Simonoff et al., 1997; Whitaker et al., 1990).

Post adolescence, the gender difference in both mean anxiety symptom scores and GAD diagnosis is maintained throughout adulthood, with an average ratio of about 1.5:1 (Mackinaw-Koons & Vasey, 2000). The age at which the gender ratio in general anxiety peaks is unclear. There are some indications that the ratio is greatest during late adolescence or early adulthood, such as the larger average gender ratio in adolescence (about 3:1) compared to adulthood (1.5:1) (Mackinaw-Koons & Vasey, 2000). However, national studies such as the NSMHWB, the NCS, and the ECA differ with respect to the age bracket at which the gender gap in GAD prevalence is greatest (ABS, 1997; Blazer et al., 1991; Wittchen, Zhao, Kessler, & Eaton, 1994). Research indicates that the gender gap in general anxiety reduces in older age, although again findings reporting a specific age range are inconsistent. The NSMHWB indicates that the gender gap in GAD begins to close as early as 40 (ABS, 1997), whereas the ECA studies indicate that the gap shows signs of reducing only after age 65 (Blazer et al., 1991). The Berlin Aging Study reports the prevalence of all anxiety disorders in the elderly, and shows that even in the 70s and 80s women are still significantly more likely to experience an anxiety disorder than are men (Schaub & Linden, 2000).

Overall, the research available is not sufficient to clearly describe how the gender ratio in general anxiety changes across the lifespan. The known facts are similar to those available for depression: that the difference emerges during adolescence, is greatest somewhere in post-adolescence, and reduces in older age. While the available research is inconsistent, the balance of evidence for both depression and anxiety suggests young adulthood may be the life stage at which the gender ratios are greatest.

2.3.3. Gender differences in age of onset, illness course and illness quality

The age of onset (usually between late teenage years and late twenties (Kessler, Keller, & Wittchen, 2001)) and illness course for GAD do not appear to vary by gender. The ECA studies reported no significant gender differences in either the age of onset or the duration of symptoms for GAD (Blazer et al., 1991). A study of GAD in older adults similarly found that mean age of onset did not differ significantly between men and women (Le Roux, Gatz, & Wetherell, 2005). A review conducted by Howell et al., (2001) similarly concluded that the course of illness and prognosis for GAD were not qualitatively different for men and women. Based on this research, it can be surmised that the gender difference in generalised anxiety is not due to differences in the age of onset or chronicity of clinical symptoms. There is little research on gender differences in illness or symptom quality for GAD. However, measures of general anxiety suggest that women experience more somatic symptoms, such as headaches, back pain, dizziness and joint or limb pain, than do men (Barsky, Peekna, & Borus, 2001; Kroenke & Spitzer, 1998).

2.3.4. Gender differences in cohort trends

As for depression, anxiety seems to have increased in recent decades and younger cohorts (Twenge, 2000; Rutter & Smith, 1995). This has led researchers to investigate increases in social problems and decreases in social connectedness as possible correlates. There appear to be no comprehensive epidemiological studies with published findings addressing the stability of gender differences in anxiety prevalence across cohorts, either prospectively or retrospectively. If such information were available, it would provide insight into the biological and environmental mechanisms that might drive the gender difference in anxiety.

2.3.5. Conclusions for prevalence review (sections 2.2 and 2.3)

So far, it has been demonstrated that the gender ratios for depression and anxiety are unlikely to be stable across the adult lifespan. It has been argued that epidemiological information regarding the distribution of the gender ratio across age, age of onset, course of illness and cohort effects provides clues as to the biological and environmental factors that might explain the presence of gender differences in depression and anxiety.

2.4. Explanations for the gender difference in depression

A number of explanations have been proposed for the gender difference in depression prevalence. The research in this area is both voluminous and complex. It incorporates both a broad range of theories and empirically driven identification of measureable correlates and risk factors. In order to obtain a comprehensive list of the explanatory factors and theories that have been proposed, and to gain a better understanding of the evidence supporting each one, a systematic search for widely cited reviews examining gender differences in depression was conducted. The aim of the search was to identify key reviews in the area that both listed and provided critical evaluation of the explanations proffered for the gender difference in depression.

Reviews examining the gender difference in depression were identified through a search of the databases PubMed and PsychInfo conducted during April 2008. The keywords ‘depression’, ‘gender/sex’, and ‘differences’ were searched for in either the title or abstract, with the search limited to review articles. A total of 153 reviews were identified. The abstracts of these articles were studied, and the full-text of 43 articles was obtained for further investigation. Articles that reviewed a broad range of explanations for the gender difference in adulthood were included. Articles that reviewed only one domain

(e.g., biological) or were essentially discussions or commentaries, with little critical evaluation, were excluded. Articles focusing on the gender difference in childhood and adolescence were also excluded, as, although this is an important age-period, it was beyond the scope of this thesis to examine this life stage thoroughly. After considering the full text of the articles and reviewing the reference lists for any additional papers, a total of 12 key reviews were identified. A list of these reviews and the potential risk factors (or explanations) identified in each review can be seen in Table 2-1. Four main frameworks or groups of hypotheses for explaining the gender difference in depression emerged from the reviews. These were labelled: a) artefactual, b) biological, c) psychological and d) social. Tables 2-2, 2-3, 2-4 and 2-5 show a summarised list of each of the explanatory variables or theories contained in each hypothesis group. The following section describes each category of hypotheses, the explanatory factors or theories listed under these hypotheses, and the evidence found to support these explanations.

Table 2-1. Details of each review examined and the possible explanations identified.

Author, Date and Title	***Frameworks/risk factors for gender differences in depression examined***
1. Weissman and Klerman (1977) Sex differences and the epidemiology of depression	*Artefactual* - Alcohol masks depression in men; Help-seeking; Self-report bias *Biological* - Genetic factors; Neuro-endocrine and neurotransmitter systems; Reproductive hormones (reproductive events) *Psychological* - Learned helplessness (socialisation); Personality differences (e.g. women passive, dependent, neurotic) *Social* - No. stressful life events; Social roles and role strain (e.g. marital and economic status); Social status hypothesis
2. Nolen-Hoeksmema (1987) Sex differences in Unipolar Depression - evidence and theory	*Artefactual* - Alcohol masks depression in men; Help-seeking; Recall effects; Symptomology (measurement artefact) *Biological* - Genetic factors; Reproductive hormones (reproductive events) *Psychological* - Coping styles (e.g. ruminative style); Learned helplessness (socialisation); Psychoanalytic explanations *Social* - Social roles and role strain (e.g. marital and economic status)
3. Wolk and Weissman (1995) Women and depression: An update	*Artefactual* - Alcohol masks depression in men; Clinical judgment bias; Help-seeking; Self-report bias; Recall effects *Biological* - Genetic factors; Learned helplessness (socialisation); Reproductive hormones and events *Psychological* - Coping styles (e.g. ruminative style) *Social* - No. stressful life events; Social roles and role strain (e.g. marital and economic status); Social support; Vulnerability to negative life events (interpersonal)
4. Bebbington (1996) The origins of sex differences in depressive disorder: bridging the gap	*Artefactual* - Alcohol masks depression in men; Clinical judgment bias; Help-seeking; Recall bias; Self-report bias *Biological* - Genetic factors; Reproductive hormones (reproductive events) *Psychological* - Attributional style; Coping styles (e.g. ruminative style) *Social* - CSA; Negative interpersonal life events; Social roles and role strain (e.g. marital and economic status); Social support

5. Sprock and Yoder (1997) Women and depression: An update on the report of the APA task force	*Artefactual* - Clinical judgment bias; Help-seeking; Self-report bias *Biological*- Genetic factors; Neuro-endocrine and neurotransmitter systems; Reproductive hormones (reproductive events) *Psychological* - Attribution style; Coping styles (e.g. ruminative style); Personality differences (e.g. women passive, dependent) *Social* - Negative life events (interpersonal); Social roles and role strain (e.g. marital and economic status)
6. Piccinelli and Wilkinson (2000) Gender differences in depression	*Artefactual* - Differences in recurrence and chronicity; Help-seeking; Recall effects; Symptomology (measurement artefact) *Biological*- Genetic factors; Neuro-endocrine and neurotransmitter systems; Reproductive hormones (reproductive events) *Psychological*- Coping styles (e.g. ruminative style); Personality differences (e.g. women passive and dependent); Prior anxiety *Social* - CSA; Negative life events (interpersonal); Social roles and role strain (e.g. marital and economic status); Social support
7. Frackiewicz, Sramek and Cutler (2000) Gender differences in depression and antidepressant pharmacokinetics and adverse events	*Artefactual* - Clinical judgment bias; Help-seeking; Self-report bias *Biological* - Brain structure and brain function; Genetics; Neuro-endocrine and neurotransmitter systems; Reproductive hormones (reproductive events); Role of sex hormones during puberty *Psychological* - Coping styles (e.g. ruminative style); Personality traits through gender specific socialization *Social* - CSA; Gender specific socialization; Social roles and role strain (e.g. marital and economic status)
8. Blehar (2003) Public health context of women's mental health research	*Artefactual* - Symptom differences (measurement artefact) *Biological* - Brain based emotional processing differences; Genetics; Hormonal/reproductive changes as triggers; Role of sex hormones during puberty *Psychological* - Coping styles (e.g. ruminative style) *Social* - Negative life events (interpersonal)
9. Kessler (2003) Epidemiology of women and depression	*Artefactual* - Differences in recurrence and chronicity; Self-report bias; Symptomology (measurement artefact) *Biological* - Biological predisposition; Reproductive hormones (reproductive events) *Psychological* - Prior anxiety *Social* - Marriage; Negative life events as triggers

10. Kuehner (2003) Gender differences in Unipolar Depression: an update of epidemiological findings and possible explanations	*Artefactual* - Help-seeking; Recall effects; Symptomology (measurement artefact) *Biological* - Brain structure and brain function; Genetic factors; Neuro-endocrine and neurotransmitter systems; Reproductive hormones (reproductive events) *Psychological* - Coping styles (e.g. ruminative style); Personality differences (e.g. women passive and dependent); Prior anxiety *Social* - CSA; Negative life events (interpersonal); Social roles and role strain (e.g. marital and economic status)
11. Bromberger (2004) A psychosocial understanding of depression in women: for the primary care physician	*Artefactual* - None *Biological* - Genetic factors; Reproductive hormones (reproductive events) *Psychological* - Coping styles (e.g. ruminative style); Personality differences (e.g. women passive and dependent) *Social* - CSA; Negative life events; Social roles; Social support
12. Broughton and Street (2007) Integrated review of the social and psychological gender differences in depression	*Artefactual* - Alcohol masks depression in men; Clinical judgment bias; Differences in recurrence and chronicity; Help-seeking; Self-report bias; Symptomology (measurement artefact) *Biological* - None *Psychological*- Attribution style; Coping styles (e.g. ruminative style); Learned helplessness (socialisation); Personality differences (e.g. women passive and dependent) *Social* - CSA; Negative life events; Social roles and role strain (e.g. marital and economic status); Social support

Note: CSA – Childhood sexual abuse.

2.4.1. Artefactual Hypotheses

Artefactual hypotheses propose that the gender difference in depression is not product of gender *per se*, but is the result of one or more artefacts. These hypotheses include gender differences in help-seeking behaviour, symptom reporting and clinical biases. A complete list of the artefactual explanations identified can be seen in Table 2-2. Overall, the research evidence indicates that although artefactual determinants may marginally inflate the gender ratio for depression, they do not account for a substantial portion of the gap. The evidence for each proposed artefactual mechanism is outlined below.

Table 2-2. Summary of artefactual hypotheses for the gender difference in depression.

Artefactual hypotheses
Help-seeking behaviour
Self-report bias
Recall effects
Alcoholism as a mask for depression in men
Clinical judgement bias
Greater chronicity and recurrence in women
Symptom differences (measurement artefact)

2.4.1.1. Help-seeking

The help-seeking hypothesis postulates that the gender difference in depression prevalence occurs because women seek help for health problems more frequently than men. It has been demonstrated repeatedly that women seek out medical and psychiatric services more often than men (Galdas, Cheater, & Marshall, 2005; Kessler, Brown, & Broman, 1981). However, large multi-site studies such as the ECA and the World Health

Organisation Study of Psychological Problems in General Health Care, have shown that the gender ratio for depression is similar in both primary care settings (where help-seeking might play a role) and community samples (where help-seeking is not a factor) (Maier et al., 1999; Weissman et al., 1996). This finding has led reviews by Kuehner (2003), Wolk & Weissman (1995), Bebbington (1996), and Piccinelli and Wilkinson (2000) to conclude that differences in help-seeking behaviour do not account for a substantial portion of the observed gender difference in depression.

2.4.1.2. Self-report bias

Another artefactual theory is that gender differences in depression occur because more women than men are willing to disclose their depression to an interviewer (Chevron, Quinlan, & Blatt, 1978; Phillips & Segal, 1969). In his review, Kessler (2003) refutes this theory with three main points: 1) the gender difference in depression rates remains in both self-report studies and those that use informant reports (Kendler, Davis, & Kessler, 1997; King & Buchwald, 1982); 2) several methodological studies have found no gender difference in the self-reporting of psychological problems due to social desirability (Clancy & Gove, 1972; Gove & Geerken, 1977); and 3) assessments of specific symptom reporting are inconsistent with the response bias argument. That is, if the response bias hypothesis were true, women would be more likely than men to report the core symptoms of depression (feeling sad or depressed), but equally likely to report less stigmatising symptoms (sleep disturbance, lack of energy), however, the reverse has been found (Kessler, McGonagle, Nelson et al., 1994; Young, Fogg, Scheftner, Keller, & Fawcett, 1990).

2.4.1.3. Recall

The recall hypothesis proposes that the gender difference in depression is due to variations in remembering past depressive symptoms. That is, that men are less likely to remember their experiences of depression than women (Ernst & Angst, 1992). This theory emerged based on studies such as that conducted by Angst and Dobler-Mikola (1984), where reported rates of depression were found to be similar across genders over recent months, but were substantially higher for women over a one year period. However, a more recent study tested the recall of symptoms at 6 month follow-up and found that the quality of recall was identical between the sexes (Kuehner, 1999). Other research conducted by Coryell (1994) and Fennig (1994) has also found no interaction between gender and time with regard to reporting symptoms of depression. Furthermore, in his review Bebbington (1996) points out that in most studies the magnitude of the gender difference is similar regardless of whether prevalence statistics are based on one month or longer time periods. If there is differential recall in past symptoms experienced, it is unlikely to explain much of the gap in depression prevalence (Piccinelli & Wilkinson, 2000).

2.4.1.4. Substance use masks depression in men

It has been suggested that alcohol or substance use masks the identification of depression in men (Araujo & Monteiro, 1995; Coryell, Endicott, & Keller, 1992; Winokur, 1979), creating an artefactual gender difference. This hypothesis was supported by an early study that found no depression gap between men and women in an Amish community where alcohol was strictly prohibited (Egeland & Hostetter, 1983). However, other research has found that the gender difference in depressive symptoms is maintained in those who abuse alcohol (Golding, Burnam, Benjamin, & Wells, 1993; Windle & Miller,

1989). It has also been suggested that alcohol abuse might be the male equivalent to depression (Winokur & Clayton, 1967). Although it is clear that alcohol problems and depression are highly comorbid, research indicates that alcoholism in men is not equivalent to depression in women. Several studies of familial transition indicate that depression and alcoholism have a different genetic identity (Merikangas, Weissman, & Pauls, 1985). The balance of evidence indicates that the relationship between alcohol and depression does not significantly contribute to the gender difference in depression.

2.4.1.5. Clinical judgement bias

Clinical judgement bias - clinicians diagnosing females with depression more often than males who have equivalent symptoms - has also been suggested as a source of the gender difference in depression. This hypothesis was prompted by studies demonstrating that swapping the gender of patient file notes can result in a change of diagnosis (Warner, 1978). However, other studies have shown no gender bias when identical vignettes (one presented as male and one as female) were rated for depression (e.g. DeVault & Dambrot, 1983). The similarity of sex ratios in both community and clinical samples suggests that clinical judgment is not a substantial factor.

2.4.1.6. Recurrence and chronicity

As mentioned previously, several large representative epidemiological studies indicate that the gender difference in prevalence is unlikely to be due to differences in recurrence and chronicity (Eaton et al., 1997; Kessler et al., 1993; Wells, Burnam, Rogers, Hays, & Camp, 1992). Kessler suggests that the elevated rate of depression in women is

due to a higher risk of first occurrence rather than greater frequency or length of episodes (1993).

2.4.1.7. Symptom differences and measurement bias

It has been proposed that men experience depression in roughly equal numbers to women, but that the symptoms they express are not well captured by assessment tools (Hammen & Peters, 1977). There are some differences in the clinical manifestation of depression for men and women. Females with depression more often report disturbances in fatigue, sleep and appetite (Silverstein, 1999; Young et al., 1990), whereas depressed males report irritability and antisocial behaviours (Rutz, 2001). Some assessment tools have been shown to contain those symptoms women are more likely to endorse, such as psychosomatic symptoms and crying (Cole, Kawachi, Maller, & Berkman, 2000; Salokangas et al., 2002). However, the majority of studies have shown that variations in symptoms and measurement bias are too small to account for much of the gender gap in prevalence, and that no consistent perceptible differences exist in men and women's experience of depression (Bebbington, 1996; Steer, Beck, & Brown, 1989; Stommel et al., 1993). Some commentators conclude that the possible impacts of measurement bias should be minimised wherever possible by using non-biased assessment tools (Kessler et al., 1993; Wilhelm, Parker, Geerligs, & Wedgwood, 2008).

2.4.1.8. Conclusions regarding the artefactual hypothesis

To date, the evidence suggests that artefactual hypotheses cannot explain the preponderance of depression in women. Although these hypotheses have some support in the literature, the magnitude of any effects is too small to account for the substantial

observed gender difference. A second failure of proposed artefactual mechanisms is their inability to account for probable changes in the gender ratio across the lifespan. For example, there is no evidence to suggest that the reduction of the gender gap in older adulthood is preceded by or coincides with a decrease in women's help-seeking. Nonetheless, it is good research practice to minimise the impact of possible artefactual effects in order to maximise the chances of determining true effects. One such precaution would be to screen assessment tools for gender-biased items prior to using them to describe or investigate explanations for the gender difference in depression.

2.4.2. Biological hypotheses

Traditionally, the term gender has been used to describe the social behaviours that define people's identity as either male or female, whereas the term sex has been used to define their biological features (Bebbington, 1996). As this section reports on biological explanations for the gender difference in depression prevalence, where appropriate the term 'sex differences' rather than 'gender differences' is adopted.

Biological explanations attribute the gender gap in depression rates to sex differences in biological factors, such as neuroendocrine and neurotransmitter systems, brain structure and function, fluctuations in female reproductive hormones, and genetic heritability. A list of the possible biological explanations identified can be seen in Table 2-3. Biological explanations are plausible given that higher rates of depression in women are found in a variety of cultures. Major hormonal changes for women also fit with the timing of the emergence (adolescence) and convergence (post-menopause) of the gender gap. However, support for the role played by biology is varied, and most investigations conclude that biological factors cannot alone account for the gender ratio.

Table 2-3. Summary of biological hypotheses for the gender difference in depression.

Biological hypotheses
Neuroendocrine systems (role of the Hypothalamic-pituitary-adrenal and thyroid axes in women)
Neurotransmitter systems
Female reproductive function:
Puberty
Premenstrual depression
Post-partum depression
Peri-menopause
Hormone Replacement Therapy
Oral contraceptives
Genetic heritability
Brain structure and brain function (neuropsychological systems)

2.4.2.1. Neuroendocrine and neurotransmitter systems

Sex differences in neuroendocrine and neurotransmitter systems have been explored as a possible explanation for the preponderance of depression in women. One of the most plausible neuroendocrine hypotheses is that oestrogen is involved in the deregulation of the hypothalamic-pituitary-adrenal (HPA) axis in response to stress and that this process increases the risk of depression for women (Young & Korszun, 1998). The role of the hypothalamic-pituitary-thyroid (HPT) axis has also been investigated. Women experience thyroid diseases in greater numbers than men, and clinical hypothyroidism has been found to be associated with severe depression (O'Keane, 2000; Whybrow, 1995). One theory is that depression in a subgroup of women can be attributed to masked subclinical hypothyroidism. Although this may be the case, hypothyroidism alone cannot account for the sizeable gap in depression prevalence (Piccinelli & Wilkinson, 2000). Sex differences in neurotransmitter systems have also been reported. Noradrenalin, serotonin, norepinephrine and their associated biological elements appear to

play a role in the development of mood disorders (Piccinelli & Wilkinson, 2000; Sprock & Yoder, 1997). Although the impact of neuroendocrine and neurotransmitter systems remains unclear, they are likely to play a role in conjunction with other social and psychological factors (Kuehner, 2003).

2.4.2.2. Hormonal hypothesis in relation to reproductive events

Hormonal hypotheses have been proposed as an explanation for the emergence of the gender difference in depression prevalence during puberty and the continuance of the difference in women's reproductive years (Wolk & Weissman, 1995). Many women report mood changes in association with reproductive events such as menstruation, pregnancy and menopause, adding further support to hormonal hypotheses (Kuehner, 2003). Despite the obvious correlations, systematic reviews have consistently failed to find that rates of Major Depression are substantially influenced by reproductive events (see Kessler, 2003). While there is some evidence that the neuroendocrine system is involved, specific reproductive events do not appear to account for the preponderance of depression in women. The following section describes the evidence in relation to several major hormonal transitions.

Puberty

As discussed, rates of depression begin to diverge around the onset of puberty. This finding has been used to support hypotheses that the gender difference in depression is due to hormonal processes. A longitudinal study conducted by Angold et al. (1999) found a link between changes in androgen and oestrogen and an increase in depression across puberty. The study demonstrated that changes in sex hormones rather than visible body morphology were associated with depression in adolescent girls. An earlier study

conducted by Angold et al., (1992) also found that the developmental Tanner Stage was more strongly associated with depression in girls than was age, indicating that it is biological changes, rather than a 'difficult life period', that contributes towards the rise of depression in adolescent girls. However, there is also evidence that changes in female hormones alone do not trigger the gender disparity (Hankin & Abramson, 1999). A study conducted by Warren and Brooks-Gunn (1989) found a link between rising oestradiol and depression in adolescent girls, however the impact of oestradiol was found to be minimal in comparison to social factors. The degree to which hormonal changes are risk factors for the emergence of gender differences in depression remains unclear. More research studying the effects of multiple groups of hormones and examining physiological and social changes in tandem is needed (Angold & Costello, 2006; Angold & Worthman, 1993).

Premenstrual depression

For a small number of women, affective syndromes are associated with abnormal responses to normal hormone cycles, leading to suggestions that menstruation is the cause of the gender difference in depression. Studies have shown that about 2% to 10% of women experience clinically severe symptoms of depression during the period prior to menstruation, meeting the criteria for Premenstrual Dysphoric Disorder (PMDD) (Angst, Sellaro, Merikangas, & Endicott, 2001; Noble, 2005; Ramcharan, Love, Fick, & Goldfien, 1992). It has been hypothesised that women with PMDD are either biochemically or behaviourally sub or super-sensitive to changes that occur in the serotonergic system. This suggestion has been supported by studies showing that Selective Serotonin Reuptake Inhibitors (SSRIs) are effective for many women with PMDD (Steiner & Born, 2000).

Although PMDD is a genuine depressive disorder that has associations with hormonal changes, the number of women with this illness is not sufficient to explain much of the gender difference in depression from an epidemiological standpoint.

Pregnancy and post-partum

Mild to moderate post-partum depression is common for women during the first two weeks after delivery (50%-80%). About 13% of women experience diagnosable Post-Partum Depression (PPD) (O'Hara & Swain, 1996; Steiner, Dunn, & Born, 2003). This figure is similar to the prevalence of depression in non-childbearing women. Studies investigating a possible relationship between hormonal fluctuations and mood during the week post-partum have inconsistent results. One study has shown a relationship between rapid fall in progesterone and negative affect (Harris et al., 1994), while another did not find this effect (Heidrich et al., 1994). Similarly, increases in cortisol levels have been correlated with mild post-partum depression in one study (Okano & Nomura, 1992), but not others (O'Hara, Schlechte, Lewis, & Wright, 1991; Smith et al., 1990). The results are varied and, at this stage, a coherent set of conclusions regarding the impact of hormonal change on depression post-partum cannot be drawn (Steiner et al., 2003). In any case, as about the same number of post-partum as non-post-partum women become depressed, reviews have concluded that pregnancy does not substantially contribute to the preponderance of depression in women (Gotlib, Whiffen, Mount, Milne, & Cordy, 1989; Kuehner, 2003).

Menopause

Menopause is the final reproductive phase that has been linked to changes in depression. During menopause major hormonal changes take place, including decreases in

oestrogen, androstenedione, testosterone and progesterone, and increases in follicle stimulating hormones and plasma luteinizing hormone (Longcope, 1990). Although considerable hormonal changes occur, most research concludes that there is no increase in the onset of depression during peri-menopause or menopause (Alder, 2000). Differences in cross-cultural settings support this suggestion. For example, two studies have found that Japanese women appear to experience very few physical and emotional symptoms during menopause (Lock, 1994; Nagata, Takatsuka, Inaba, Kawakami, & Shimizu, 1998). There is also research indicating that there may in fact be a decline in the onset of new depressive episodes during this period (Steiner et al., 2003).

Oral contraceptives and HRT

Female hormone medications such as oral contraceptives and hormone replacement therapy (HRT) have been investigated in association with women's depression. Although early studies linked oral contraceptives and depressive symptoms, other research has found no association (Parry & Rush, 1979; Slap, 1981; Vessey, McPherson, Lawless, & Yeates, 1985). Different findings may partly reflect improvements in contraceptive medications. Treatments for infertility and HRT have also been associated with depressive symptoms (Ensom, 2000; Kornstein, 1997). However, the opposite effect has also been found, that oestrogen replacement alleviates depressive symptoms due to an increase in serotonin levels (Sherwin & Gelfand, 1985). This theory was supported by a meta-analysis reporting a significant reduction in depressed mood as a function of HRT (Zweifel & O'Brien, 1997). Overall, a link between female hormone medications and the gender difference in depression remains unsupported (Wolk & Weissman, 1995).

2.4.2.3. Genetic contributions

Major Depression has been recognised as a familial disorder, with twin studies indicating that additive genetic effects account for about 40% of total familial aggregation (Sullivan, Neale, & Kendler, 2000). A number of studies have been undertaken to assess whether this association is moderated by sex. A population-based twin study conducted by Kendler (1996) found that the heritability of depressive disorders was equal for both men and women. A meta-analysis conducted by Sullivan, Neale and Kendler (2000), also concluded that there was no consistent sex difference in the heritability of depression. However, a more recent twin study conducted by Kendler et al. (2006) found that when broad definitions of depression were used, the heritability of depression was greater in women (42%) than men (29%). Results from a second large twin study also found that there was increased genetic heritability for depression amongst pubertal girls (Silberg et al., 1999). The authors concluded that a combination of greater genetic heritability for depressive disorders and negative life events for pubertal girls, contributed to the onset of the gender difference in depression prevalence. One possibility is that genetic factors indirectly increase the likelihood of depression in women through other inherent features such as coping responses to stressful life events (Goldberg, 2006), social and personality factors (Piccinelli & Wilkinson, 2000). The majority of reviews in this area conclude that more research is necessary to clarify the role of genetic heritability within gene-environment interactions (Kuehner, 2003; Piccinelli & Wilkinson, 2000).

2.4.2.4. Neuropsychological differences

There is ample evidence showing that men and women's brains differ both structurally and functionally (Heller, 1993). Sex-based differences in brain chemistry and

physiology may help to explain the varying rates of depression between the sexes (Okiishi, Paradiso, & Robinson, 2001). However, there has been little comprehensive research examining the associations between sex, neuropsychological functioning and depression. Instead, the available research is fractured focusing separately on a) sex differences in neuropsychological functioning, and b) neuropsychological functioning in depression, with little integrated research (Heller, 1993).

2.4.2.5. Conclusions regarding the biological hypotheses

The research evidence indicates that biological factors do play a role in explaining the gender difference in depression rates. However, biology alone does not entirely account for the disparity that exists. The roles played by neurotransmitter, neuroendocrine and neuropsychological systems remain unclear. It is probable that these systems interact with the occurrence of stressful events and other external variables to produce the preponderance of depression in women. There is insufficient evidence to support the genetic hypothesis as an explanation for the gender difference. This is also the case for specific hormonal events such as menstruation, pregnancy, menopause and hormone therapies. Although these events have been associated with changes in mood for women, their impact is not able to account for the extent of the gender difference from an epidemiological perspective. Furthermore, findings that depression has increased in recent years and that the gender gap may be narrowing suggest that the explanatory factors involved are more transient than biology allows for. While biological explanations clearly play some role, it is beyond the scope of the current thesis to investigate their impact further. From this point onwards, the focus of this thesis turns towards the psychosocial explanations proffered for the gender difference in depression.

2.4.3. Psychological hypotheses

The failure of artefactual and biological models to fully account for the gender difference in depression prevalence has turned researchers' attention towards the psychological and social factors that might play a role (Bebbington, 1996). A list of the most prominent psychological explanations identified can be seen in Table 2-4. Two main categories of psychological hypotheses are considered in this section. The first category concerns cognitive theories and focuses on gender differences in styles of coping with negative affect. The second involves personality factors such as self-confidence, neuroticism, instrumentality and passivity/aggression. There is some evidence to suggest that each of these factors plays a role in predicting the gender difference in depression.

Table 2-4. Summary of psychological hypotheses for the gender difference in depression.

Psychological hypotheses
Coping styles (distraction vs. rumination)
Personality (self-confidence, self-esteem, neuroticism, passivity/aggression, dependent, low instrumentality and high expressiveness)
Attitudes and attribution style
Learned helplessness theory (helplessness greater in women)

2.4.3.1. Cognitive theories

Cognitive theories of depression argue that some people think about negative experiences and emotions in a way that leaves them vulnerable to depressogenic effects (Hankin & Abramson, 1999). The most well-known cognitive theory for the gender difference in depression, the response style theory, was developed by Nolen-Hoeksema

(1987). The response style theory advocates that women are more likely to ruminate about depressed moods than men, increasing the likelihood that their depression will intensify or become entrenched. Men on the other hand, are more likely to distract themselves from depressed moods, leaving them less likely to remain depressed. Hoeksema based her theory on a study of college students which asked participants to list "things people do when depressed" (Nolen-Hoeksema, 1986). Women's responses tended to focus on the mood problem, whereas men's responses more often involved distraction from the problem. Other studies have found that rumination mediates the relationship between gender and depression in both high school students (Schwartz & Koenig, 1996) and adults (Butler & Nolen-Hoeksema, 1994; Kuehner, 1999). The reasons why women ruminate more than men have not been determined, although it has been proposed that sex role stereotypes and socialization enforced during childhood are important developmental factors (Nolen-Hoeksema, 1987). Other coping behaviours more commonly adopted by women that may be maladaptive include seeking support from others (Funabiki, Bologna, Pepping, & FitzGerald, 1980) and increasing food intake (Gruneberg & Straub, 1992). The research to date suggests coping styles are a probable risk factor for the gender difference in depression.

2.4.3.2. Personality theories

Gender-role theories maintain that certain personality traits are developed in girls and boys through the process of socialization (Nolen-Hoeksema & Girgus, 1994). Girls are encouraged and rewarded for adopting characteristics and behaviours that involve nurturing and understanding others, as well as being passive and dependent. The link between these characteristics and depression is made by the Learned Helplessness Theory.

This theory, proposed by Seligman (1975), argues that depression occurs when an individual believes they cannot control the events necessary to maintain their well-being and that women are more often depressed because they are socialised to feel helpless and dependent. The theory was remodeled by Abramson, Seligman & Teasdale (1978) to incorporate 'attributional style' as a determinant of depression. Attributional style refers to the way individuals ascribe blame for the adverse things that happen to them. The theory maintains that a person who attributes negative events to themselves and sees their effects as long-term is more likely to become depressed than someone who views negative events as both external and temporary. It has been suggested that during childhood women are more likely to develop a maladaptive attributional style than men are, predisposing them towards depression (Nolen-Hoeksema, 1987).

There is no clear support for learned helplessness or attributional style as major risk factors for the gender disparity in depression rates (Kuehner, 2003; Wolk & Weissman, 1995). While research has demonstrated that a maladaptive attributional style is a likely risk factor for depression (Clark, Watson, & Mineka, 1994), and that in some environments women may demonstrate more helplessness or dependency than men (Bornstein, Bowers, & Robinson, 1995), direct tests of the learned helplessness model in the context of gender differences in depression are few. Bebbington (1996) concludes that while this theory has theoretical strengths, the existing research is insufficient to draw any firm conclusions. Gender differences have been found in other personality characteristics linked to learned helplessness and depression, such as self-confidence, self-esteem (Kling, Hyde, Showers, & Buswell, 1999) and neuroticism (Feingold, 1994; Lynn & Martin, 1997). However, the

effects found were small and did not clearly demonstrate a link to the gender gap in depression.

2.4.3.3. Conclusions regarding the psychological hypotheses

The cognitive risk factor that has received the most attention and support in the literature is ruminative style. Less evidence has been found to support personality factors as playing a role in the gender difference. However, this is partially due to a lack of empirical investigation for theories surrounding attribution style and learned helplessness. One of the problems with investigating psychological explanations such as rumination and personality factors is overlap between these possible explanatory factors and depression. In some cases, potential explanatory variables could be considered extensions or components of depression, rather than separate factors (Bebbington, 1996). A further psychological explanation that has gone largely unexplored is the possible influence of cognitive capacity, such as intelligence and memory. A study conducted by Fuhrer, Antonucci and Dartigues (1992) found that the co-occurrence of cognitive impairment and depression was higher for women than it was for men in older adults (≥ 65), suggesting that cognitive impairment might play some role in explaining the preponderance of depression in women.

2.4.4. Social hypotheses

Social hypotheses attribute the gender difference in depression to variability in the social circumstances and expectations of men and women. A complete list of the social explanations identified can be seen in Table 2-5. Important social factors that have been proposed to play a role include the number and type of life events that women and men find stressful, gendered social roles and tasks, and gender differences in socio-economic

status, childhood sexual abuse, and social support. The research evidence suggests that social factors are an important component of the gender difference in depression.

Table 2-5. Summary of social hypotheses for the gender difference in depression.

Social hypotheses
Macro-social explanations (Socio-economic and socio-demographic factors)
Role strain and role overload (Marriage and family structure)
Social support
Childhood sexual abuse
Stressful life events
No. of stressful life events experienced (exposure)
Vulnerability to stressful life events (particularly interpersonal events)

2.4.4.1. Macro-social explanations

Women experience greater levels of poverty, have lower educational status, earn less, and are less likely to be employed than men (Reskin & Padavic, 1994), factors that have also been associated with depression (Lorant et al., 2007). The possibility that gender differences in indicators of socio-economic status are reflected in depression prevalence has been termed the 'social status hypothesis' (Weissman & Klerman, 1977). Numerous findings support the social status hypothesis. For example, in cultures where traditional female roles are valued equally to males, gender differences in depression are less prominent (Piccinelli & Wilkinson, 2000). College students are another population in which the gender difference appears to be smaller, adding credence to the social status hypothesis (Strangler & Pintz, 1980). Support also comes from an Australian study conducted by Wilhelm and Parker et al. (Wilhelm & Parker, 1989; Wilhelm et al., 2008; Wilhelm, Parker, & Hadzi-Pavlovic, 1997). This study followed a group of 170 male and

female teachers matched for social factors such as marital status, social class and occupation over a period of fifteen years. They reported little change in social factors over the time period, as well as no gender difference in depression. This research supports the theory that macro-social factors play a role in the gender difference in depression.

2.4.4.2. Role-strain

The basis for the 'social role' or 'role-strain' theory of gender differences in depression is that women's traditional roles are less rewarding and more stressful than men's, leading to higher rates of depression in women (Kessler, 2003). This theory emerged during the early 1970s and was founded on Gove and other's landmark papers (Gove, 1972; Gove & Geerken, 1977; Gove & Tudor, 1973), which showed that married women experience higher rates of depression than married men. In an effort to explain why marriage was particularly detrimental for women, Gove turned to examining the differences between women's and men's social roles in marriage (1972, 1979).

Following this early research, studies have continued to report that marriage is more detrimental for women than men (Bebbington, 1996, 1998). These studies have found that the gender-specific demands imposed on married women, such as home making, looking after small children and not participating in the workforce, are linked to depression (Bebbington, 1998). A study conducted by Mirowksy (1996) found that as women and men entered adulthood (and assumed unequal social statuses based on work and family roles), the gender gap in depression increased. The analyses for this study were based on data from three US national surveys: The US Survey of Work Family and Well-Being; The Illinois Survey of Well-Being; and The National Survey of Families and Households. It has also been suggested that the impact of stressful life events on

depression may be influenced by gender roles. For example, a study conducted by Nazroo et al. (1997) found that when examining the impact of recent stressful life events on depression in couples, women experienced greater depression than men only in those couples where there was a traditional allocation of gender tasks and roles. In more recent years, it has been suggested that role overload is an emerging possible problem for women. Females who are employed and have high family demands may be at risk of developing depression due to role overload and/or conflict (Roxburgh, 2004). The evidence suggests women's social roles and pressures have an impact upon the gender difference in depression (Kuehner, 2003; Nolen-Hoeksema, 1987; Piccinelli & Wilkinson, 2000).

2.4.4.3. Social support

It has been suggested that receiving inadequate social support is more detrimental for women than men, resulting in more women with depression (Brown et al. 1986). A recent twin study conducted by Kendler et al. (2005) found that women were more sensitive to low levels of social support than their twin brothers were. A second prospective population study conducted by Olstad, Sexton and Sogaard (2001) similarly found that social support buffered the impact of negative events on depression, and that this effect was greater for women than men. Conversely, it has been suggested that having a large social network might increase the likelihood of experiencing interpersonal stressors, which have been associated with depression for women. Two studies (Salokangas et al., 2002; Veiel, 1993) have shown that women with high social support are actually at a greater risk of depression. Overall, the evidence that the gender disparity in depression is related to social support is inconsistent.

2.4.4.4. Childhood sexual abuse

There is strong evidence that childhood sexual abuse (CSA) is a risk factor for the gender difference in depression rates. CSA is associated with the onset of adult depression (Paolucci, Genuis, & Violato, 2001). It has also been demonstrated that girls have a greater risk of being sexually abused than boys. Cutler (1991) reports that around 7-19% of girls experience CSA, significantly greater than the number of boys (3-7%). Additional research has shown that the relationship between gender and depression is mediated by CSA (Whiffen & Clark, 1997). More broadly, a study investigating the impact of general negative childhood experiences on depression concluded that there were no systematic gender differences (Kessler, 1997). This may indicate that it is CSA, rather than more general adverse factors experienced in childhood, which has an impact. The precise level of contribution CSA makes towards explaining the gender difference in depression is not known, however Nolen-Hoeksema and Girgus (1994) claim that up to 35% of the gender disparity in adults might be ascribed to the preponderance of CSA in girls.

2.4.4.5. Negative life events

It has been well-researched that the onset of depressive illness is often preceded by an excess of stressful life events (Kendler, Karkowski, & Prescott, 1999; Kessler, 1997; Paykel, 1994). Such stressful life events commonly include experiences such as job loss, the death of a close relative, divorce/separation, assault/robbery, and personal injury/illness (Kendler, Kuhn, & Prescott, 2004). Based on this finding, three dominant hypotheses for the gender difference in depression have emerged: a) that women experience more negative life events than men, b) that women's reaction to stressful life events is more maladaptive than men's, and c) that interpersonal life events are a particular trigger for

women's depression. The presented order of these hypotheses reflects the historical order in which they were first examined. As research has evolved, the dominant hypothesis has changed from the first, to the second, and more recently the majority of support has been for the third (Bebbington, 1996; Turner & Avison, 1998).

The first hypothesis - that women are more likely to experience negative life events and thus greater depression - emerged in the early 1970s. This hypothesis has received inconsistent support. While some studies have found that women encounter an excess of stressful life events (Bebbington, Dean, Der, Hurry, & Tennant, 1991; Brown & Birley, 1968), many others have shown no gender difference (Dohrenwend, 1973; Kendler, Thornton, & Prescott, 2001; Perugi et al., 1990; Wilhelm, Parker, & Dewhurst, 1998). On balance, the majority of community studies conclude that both genders experience around the same number of adverse events (Wolk & Weissman, 1995).

Findings of either no gender difference or only small differences in the number of stressful life events experienced led researchers to develop the second hypothesis - that women are more vulnerable to stressful events (or stress) than men ((Kessler, 1979). A number of studies have supported this suggestion (Sandanger, Nygard, Sorensen, & Moum, 2004; Uhlenhuth, Lipman, Balter, & Stern, 1974; Uhlenhuth & Paykel, 1973; Wolk & Weissman, 1995). An important component of this second theory involves identifying those factors that might predispose women to be more vulnerable to stress. These factors may be biological, social, psychological or involve a combination of these elements. For example, research by Weiss et al. (1999) indicates that an experience such as CSA may increase the risk of depression throughout the lifespan as it alters both biological and psychological responses to stress. Therefore, it may be the combination of CSA,

altered responses, and stressful life events that culminates in the preponderance of depression for women. Another possibility is that gender roles or the role of women in marriage predisposes them to develop depression in the face of stressful events (Turner & Avison, 1998).

The third hypothesis, that women are more vulnerable than men to events involving interpersonal difficulties (Hammen, 2003; Kessler & McLeod, 1984; Turner & Avison, 1998), is the most recent and well supported of the three theories. Milestone studies conducted by Kessler et al. (1984) termed this third theory 'the cost of caring hypothesis'. Kessler et al. found that women were more vulnerable to events that involve close social relationships than men were, and that the 'cost' of this vulnerability was higher depression. Subsequent studies have tested the cost of caring hypothesis and have found that women do appear to be more vulnerable to interpersonal conflicts or losses as well as household crises (e.g. Maciejewski, Prigerson, & Mazure, 2001; Turner & Avison, 1998). A study conducted by Turner and Avison (1998) found that women were more affected by negative life events that had happened to other people than men were, whereas there was no gender difference in the impact of self-focused events. A twin study conduced by Kendler et al. (2001) found that women experienced higher rates of interpersonal and network events and were also more vulnerable to these events, whereas men were more exposed and vulnerable to stressful work problems. While it seems unlikely that women experience more stressful life events than men do, the research evidence does suggest that women are more vulnerable to stressful events than men, particularly those events that involve social relationships.

2.4.4.6. Conclusions regarding the social hypotheses

There is considerable evidence that social factors play a role in the disparity between the genders in depression prevalence. As Bebbington (1996) states, "if higher rates of depression were solely due to a biological vulnerability, the sex ratio ought to be unaffected by socio-demographic attributes" (p. 304). Instead we see that many socio-demographic and social factors, such as socio-economic, marital and employment status, level of social support and childhood sexual abuse, are more strongly associated with depression for women than men. While it can be concluded that the number of stressful life events is unlikely to differentiate men and women's rates of depression, there is strong evidence that women are more vulnerable than men to interpersonal conflicts. Final support for social theories comes from findings that the gender difference in depression appears to be greatest during the child-bearing and child-rearing years of young to mid adulthood, the period in women's lives when unequal socio-economic status, pressure from social roles and interpersonal conflicts are likely to have their greatest impact (Jorm, 1987; Mirowsky, 1996).

2.4.5. Conclusions regarding explanations for the gender difference in depression

The gender difference in depression prevalence has been observed in a variety of life stages and cultures. Claims that the gender difference in depression is the result of artefactual processes have for the most part been successfully refuted. Biological factors certainly play a role, but are insufficient to solely explain the gender ratio. The inability of artefactual and biological hypotheses to wholly explain the gender gap has led researchers to explore psychosocial hypotheses - it is these explanations that are the focus of the current thesis. To date, the research does not support a single dominant explanation. Many

of the psychosocial factors introduced are potential contributors. Across the board, the review articles indicated a need for individual studies to examine multiple factors concurrently, as the gender difference in depression is likely to be the product of several factors.

2.5. Explanations for the gender difference in general anxiety

Compared to the vast body of literature examining the gender difference in depression, there has been much less research investigating the specific variables associated with the gender disparity in general anxiety. In the absence of this research, the categories of hypotheses generated from the depression literature are a useful starting point for identifying the possible explanations for the gender difference in anxiety. The following section examines some of the explanations applicable to anxiety, ordered by hypothesis category.

2.5.1. Artefactual hypotheses

Mackinaw-Koons and Vasey (2000) have conducted one of the most comprehensive reviews examining the gender difference in anxiety. The authors outline several possible artefactual hypotheses for the gender gap. First they examine the possibility that the difference in anxiety is the result of symptom differences and measurement bias by questioning whether the measures commonly used to assess anxiety include symptoms more frequently experienced by women than men. However, they find little confirmation for this idea. Studies conducted by Reynolds (1998) and Spence (1997) examining measurement invariance across gender have found little evidence that anxiety measures are gender biased. Mackinaw-Koons et al. then examine the possibility that

women are more likely to disclose their anxiety symptoms than men are. Although there is research confirming that men are more reluctant to report feeling fear (Pierce & Kirkpatrick, 1992) and that women are more influenced to respond in a socially desirable way (Arrindell & Buikhuisen, 1992), the gender difference in anxiety remains after accounting for these influences (Pierce & Kirkpatrick, 1992). Given that the gender difference in anxiety has been found in both primary care and community surveys, using a variety of measurement tools, it seems unlikely that much of the difference is explained by artefactual processes.

2.5.2. Biological hypotheses

Pigott (1999) thoroughly reviews the evidence that the higher rate of anxiety in women is partly due to fluctuations in the female gonadal hormones oestrogen and progesterone. In women, these hormones help regulate the neurotransmitter systems traditionally thought to mediate anxiety: the locus ceruleus-norepinephrine system, the serotonin system, and the γ-aminobutyric system (Seeman, 1997; Shear, 1997). There have been suggestions that the changes in oestrogen and progesterone that occur as part of the female reproductive cycle (e.g. menstruation, pregnancy, and menopause) cause vulnerability towards anxiety problems (Altshuler, Hendrick, & Cohen, 1998). Although there is likely to be an association between female hormone fluctuations and increased anxiety, hormonal processes only partially account for the gender difference in anxiety. The presence of anxiety problems in men, the increase in anxiety prevalence in recent years, and the success of cognitive-based therapy for anxiety problems, all suggest that there are additional social and psychological factors which play a role in predicting the

gender difference. Whilst acknowledging the possible role played by biological factors, the remaining investigations in this thesis focus on the impact of psychosocial factors.

2.5.3. Psychological hypotheses

There is some evidence that women ruminate about fearful experiences more than men, increasing their levels of anxiety. A study conduced by Kelly et al. (2006) found that although men and women experienced the same amount of physical arousal when exposed to a panicogenic stimulus, women felt greater emotional distress both at the exposure stage and 30 minutes after. Different socialisation processes during childhood for men and women also hint at the development of different personality types. Women have been found to score more highly than men on measures of neuroticism and inhibition, personality factors that have been correlated with anxiety (Feingold, 1994; Lynn & Martin, 1997). Although there are some indicators that psychological factors are important, more evidence is required.

2.5.4. Social hypotheses

Many of the social factors identified as important for gender differences in depression may also be relevant to understanding gender differences in anxiety. Women's more frequent exposure to CSA has been linked to an increased likelihood of agoraphobia, panic disorder, social phobia and OCD (Bekker & van Mens-Verhulst, 2007; Stein et al., 1996). From a gender-role perspective women's traditional roles have been linked with passivity and dependence, possibly causing them to feel helpless and anxious in stressful situations (Wolfe, 1984). Ginsburg and Silverman (2000) have also suggested that boys are socialised to be masculine, a factor that may be protective in fearful or anxious situations.

One of the few studies examining the social correlates of gender differences in anxiety symptoms was conducted by Lewinsohn et al. (1998). Using a sample of adolescents (mean age = 16.6 years) the authors found that factors associated with both being female and elevated anxiety included the number of negative life events experienced, and low social support from family and friends. However, these factors did not significantly reduce the gender difference in both anxiety symptom scores and diagnoses. More studies such as this one, using adult populations, are necessary to confirm the role of social factors as determinants of the gender difference in anxiety.

2.5.5. Conclusions regarding explanations for the gender difference in anxiety

A number of the explanatory factors identified for the gender difference in depression were also found to be relevant for the gender difference in anxiety. Suggestions that the gender difference in anxiety is wholly artefactual are not well supported. Evidence that the difference can be attributed to biological processes is also inadequate. However, it is probable that fluctuations in female gonadal hormones increase women's vulnerability towards developing an anxiety problem. Many of the psychological and social factors identified as playing a role in gender differences in depression were also found to be relevant to gender differences in anxiety. However, a lack of evidence prevents firm conclusions from being drawn.

2.6. Overlap between depression and general anxiety

Until this point, the current chapter has considered the gender difference in depression and anxiety separately, as two distinct psychological phenomena. However, the research evidence clearly shows that depression and anxiety are closely related and have

some impact on one another (Fergusson, Horwood & Boden, 2006; Moffitt et al., 2007). Across all age groups, anxiety and depressive disorders have been found to be highly comorbid (Maser & Cloninger, 1990), and scores on continuous measures are highly correlated (Feldman, 1993). The replication of the NCS found that the correlation between Major Depressive Disorder and GAD was one of the highest found between two diagnostic disorders (*Tetrachoric correlation* = 0.62) (Kessler, Chiu, Demler, Merikangas, & Walters, 2005).

The close relationship between depression and anxiety has led researchers to consider whether they are in fact products of the same underlying disorder. Major reviews in this area have been conducted by Mineka, Watson & Clark (1998) and Clark & Watson (1991). Clark and Watson (1991) argue that the overlap between anxiety and depression occurs because they share a substantial component of general affective distress. They find that anxiety and depression can be accurately assessed as separate, but that the inclusion of a diagnosis of mixed anxiety-depression would account for the common co-occurrence of high neuroticism and general negative affectivity. Two studies conducted by Feldman (1993) and Dobson (1985) examined whether a series of self-report depression and anxiety scales tapped separate constructs. Both studies found that the self-report scales did not discriminate successfully between depression and anxiety, but instead provided an overarching measure of general negative mood. However, other studies have shown that depression and anxiety scales do measure separate constructs. For example, Spinhoven et al. (1997) found that the Hospital Anxiety and Depression Scales (HADS) assessed two distinct factors. Wetherell, Gatz & Pederson (2001) similarly found that the items from the CESD and the State Anxiety subscale of the State–Trait Personality Inventory (STPI)

loaded on to separate depression and anxiety factors. As the level of distinction between depression and anxiety seems to vary greatly between assessment scales, research examining both constructs should investigate whether there are distinct 'depression' and 'anxiety' factors in the scales intended for measurement, prior to their application.

The persistent gender difference found in both depression and anxiety provides another source of overlap between the two constructs. This has led researchers to question whether gender differences in one syndrome are simply a reflection of gender differences in the other. Research does indicate that the gender difference in depression prevalence is partly due to differences in anxiety prior to the onset of depressive illness (Breslau, Schultz, & Peterson, 1995; Wetherell et al., 2001). Both Wilhelm (1997) and Breslau (1995) found that the relationship between gender and depression decreased substantially when prior anxiety was controlled for. However, Kessler (2000) points out the limitations of Breslau's analyses by demonstrating that when both anxiety disorders and substance use disorders (more common in men) were controlled for in an alternate analysis, the ratio of males to females was the same as when no controls were included. This has led to suggestions that there are different pathways to depression for men and women, and that substance use is comparable to anxiety as a pathway for men. In any case, it is apparent that based on the high comorbidity between anxiety and mood disorders, and the overlap in core psychological distress, gender differences in depression and anxiety are linked.

2.7. Depression and anxiety as dimensions

Debate surrounds not only the ability to distinguish between depression and anxiety, but also the extent to which each outcome is better captured by discrete/categorical or continuous measurement (Shankman & Klein, 2002). The current

classification system for psychopathology the DSM-IV is predominantly a categorical system, where individuals are grouped as either having or not having a disorder. However, critics of categorical systems have argued that most types of psychopathology are better represented by a dimensional approach. In an early paper, Eysenk, Wakefield and Friedman (1983) propose that the DSM psychiatric categories assigned to people are chiefly arbitrary and that a dimensional classification system would better represent the underlying constructs being measured. Angst and Merikangas (2001) have also suggested that depression might be better characterised as a continuum rather than a discrete illness. As the research evidence for a link between sub-threshold or sub-clinical cases of depression and major clinical depression becomes stronger (Gotlib, Lewinsohn, & Seeley, 1995; Kendler & Gardner, 1998; Lewinsohn, Solomon, Seeley, & Zeiss, 2000), the case for a dimensional approach gains further credibility.

The research reviewed in this chapter demonstrates that both discrete and dimensional approaches have identified a gender difference in depression and anxiety (Kuehner, 2003; Weissman & Klerman, 1977), and that both measurement methods show variation in these gender dispartities across the lifespan (Jorm, 1987). Throughout this thesis, research evidence from both approaches continues to be utilised to inform the analyses conducted and aid with the interpretation of results. However, the original research outcomes obtained in this thesis are based on the use of continuous measures of anxiety and depression. The Goldberg Anxiety and Depression Scales (Goldberg, Bridges, Duncan-Jones, & Grayson, 1988) are used in Chapters 5-8 to examine and explain the relationship between gender and *levels* of depression and anxiety. More information about the psychometric properties of these scales is provided in Chapters 4 and 5.

2.8. Chapter conclusions

The research evidence shows that the gender difference in depression and anxiety prevalence is not consistent across age. This observation forms the basis for the research questions addressed in the following chapters of this thesis. A number of potential psychosocial risk or explanatory factors require further investigation. These factors include: a) Socio-demographic factors: marital status, employment status, number of children, and education; b) Psychological factors: ruminative style, mastery, personality characteristics, and cognitive capacity (pre-morbid intelligence and working memory); and c) Social factors: role strain tasks, recent negative live events, social support from friends and family, and childhood sexual abuse or adversity. An additional category of factors 'Health and lifestyle factors' (substance use (tobacco, cannabis and alcohol), physical activity and physical health) is also investigated, along with the other potential risk factors identified, in Chapters 7 and 8. The following chapter outlines the methods and models used in this thesis to investigate the roles played by these potential risk factors.

3. MECHANISMS FOR INVESTIGATING THE GENDER DIFFERENCE IN DEPRESSION AND ANXIETY ACROSS THE ADULT LIFESPAN

3.1. Summary

This chapter outlines the mechanisms used in this thesis to identify correlates or potential risk factors of the gender difference in depression and anxiety, and to explore variation in these findings across the adult lifespan. The chapter is structured in two main sections. The first section introduces the two models used in this thesis to identify correlates – mediation and moderation. It is argued that the mediation/moderation framework is particularly suitable for conceptualising and testing the ways in which potential psychosocial risk factors might operate to influence the gender difference in depression and anxiety. Parallels are drawn between the mediation/moderation framework and two key hypotheses in the literature surrounding the gender difference in depression – the exposure and vulnerability hypotheses. The second section discusses the method used in this thesis to examine age variation in the gender difference in depression and associated correlates – cross-sectional analyses comparing three narrow age cohorts (20-24, 40-44 and 60-64). Both sections of this chapter outline the relevant restrictions involved in using cross-sectional or restricted longitudinal (two data points) analyses when adopting the methods described. For simplicity the current chapter focuses on the gender difference in depression, however the methods and issues discussed apply equally when anxiety is the outcome of interest.

3.2. Mechanisms for investigating potential risk factors

Four categories of potential psychosocial risk factors have been identified that might aid in explaining the gender difference in depression: socio-demographic factors, health and lifestyle factors, psychological factors and social factors. It has already been established that gender *per se* is a risk factor for depression, or that levels of depression are higher for women than for men. Therefore, the relevant models are those that examine how gender works through or in conjunction with these other factors to influence depression. Essentially, two mechanisms or models are commonly invoked to explain the influence of a second variable on a risk factor (gender) on an outcome (depression). These are mediation and moderation (Kraemer, Stice, Kazdin, Offord, & Kupfer, 2001). The following sections outline each of these processes in relation to identifying potential risk factors for the gender difference in depression. The benefits of using both models, as opposed to one or the other, to comprehensively understand the roles played by each risk factor are also discussed.

3.2.1. Clarifying terminology

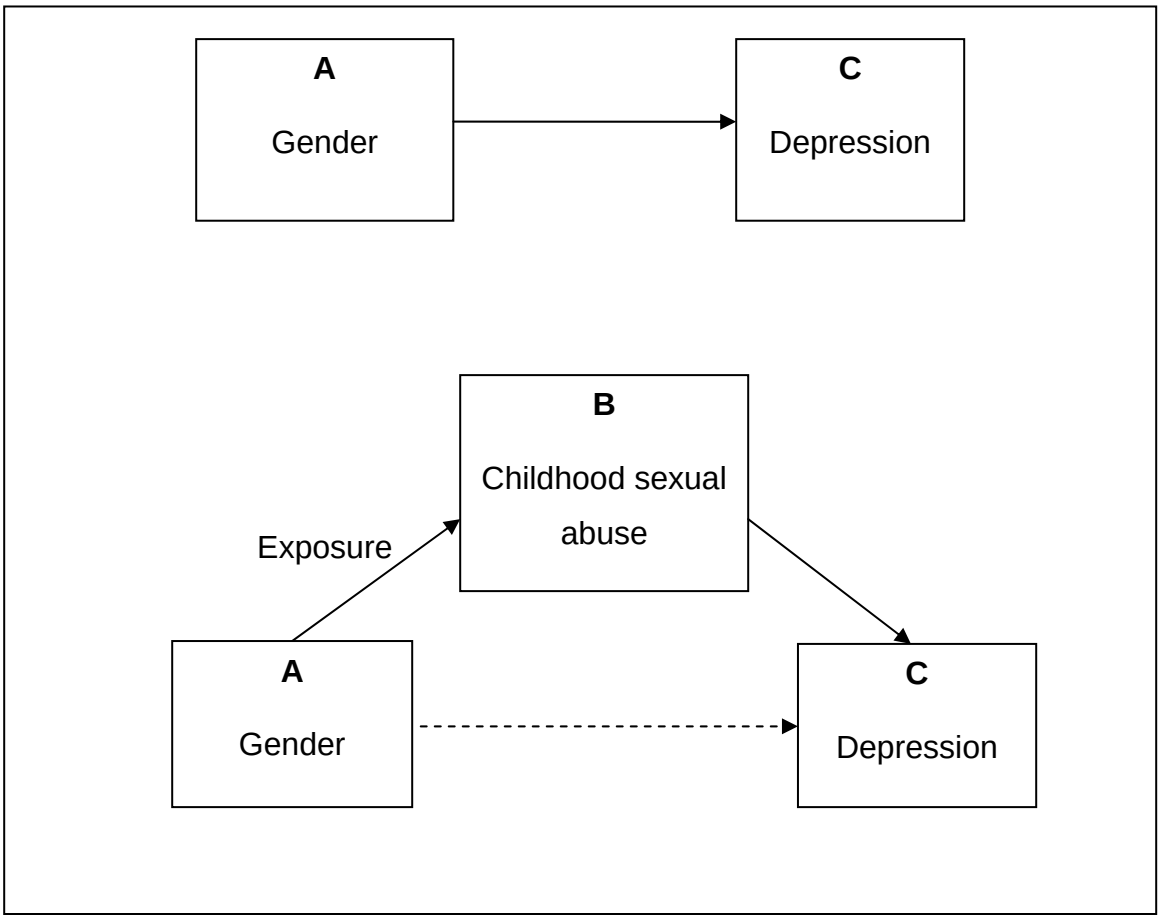
As much of this chapter focuses on risk factor identification, it is important to begin with clarifying some of the terminology used in psychological risk factor research. Most of the research that has examined the association between gender and depression has focused on identifying 'correlates' of this relationship, with the ultimate aim of identifying 'risk factors'. Although the terms 'correlate' and 'risk factor' are often used interchangeably, their technical meanings are different (Kraemer et al. 1997). Kraemer et al. (2001) argues that a clear understanding of each term is necessary for meaningful progression to occur in risk factor research. A correlate is a variable that co-varies or is correlated with an

outcome. A risk factor is a correlate that has been shown to *precede and cause* an outcome (Kraemer et al., 2001). In order to identify risk factors, some knowledge of causal associations is necessary, whether it be obtained from longitudinal data or from logic (e.g. gender obviously precedes depression). Causal status is not necessary for the identification of correlates, and as such they can be investigated using cross-sectional data. The identification of correlates is an extremely useful precursor to the identification risk factors, as all risk factors are also correlates. Although two waves of data were employed in the analyses conducted for this thesis, in most cases causal relationships could not be determined. Thus, this thesis focuses on identifying 'correlates' or '*potential* risk factors' of the gender difference in depression, rather than 'risk factors'.

3.2.2. Defining mediation and the exposure hypothesis

Mediation is the first mechanism by which gender (A) and a psychosocial factor (B) might work together to influence depression (C). Baron and Kenny (1986) have conceptually defined a *mediator* (B) as a variable that accounts for why or how another variable (A) affects an outcome (C). A mediator defines (part of) the causal pathway from the risk factor to the outcome. A relevant example of mediation is that the relationship between gender (A) and depression (C) might be totally or partially mediated by childhood sexual abuse (CSA) (B). In this example, the mediation model would hypothesise that women more frequently experience CSA than men do, and that it is CSA which gives rise to depression: because more women than men experience childhood sexual trauma, women have greater depression than men do. Figure 3-1 illustrates the basic or univariate mediation model using this example.

Figure 3-1. Basic mediation model: Childhood sexual abuse mediates the relationship between gender and depression.



Note: The dotted arrow indicates the weakened or no longer present association resulting from introducing the mediating variable into the system.

The mediation model or framework can be used to investigate what the depression literature has termed 'the exposure hypothesis'. This hypothesis purports that women are more exposed to certain factors which are in turn associated with depression (Turner & Avison, 1998). In the past, the exposure hypothesis has been linked to the impact of external temporal occurrences, such as childhood sexual abuse or negative life events. However, it is also applicable to a wide range of internal, more stable characteristics such as personality and lifestyle factors (Bebbington, 1996). Although it is somewhat awkward

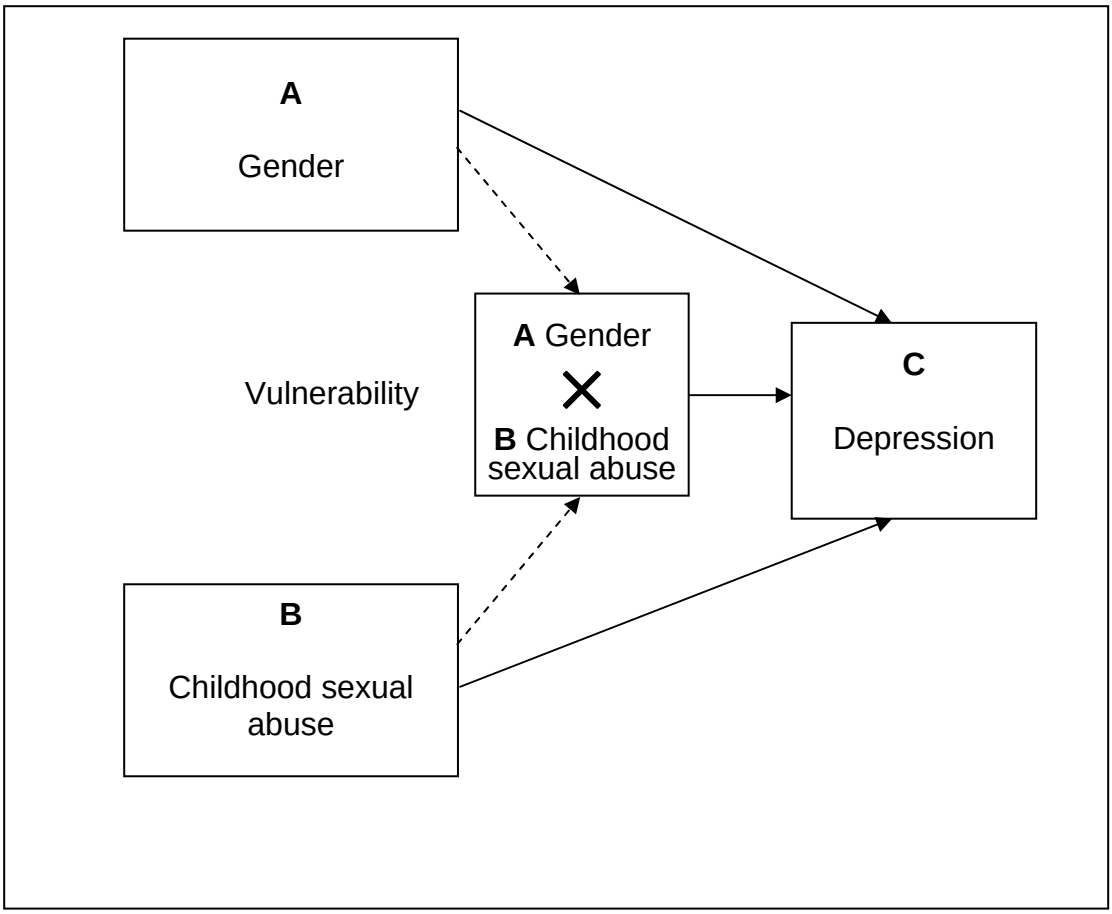
to use the term ‘exposure’ when referring to more stable characteristics (it might be more accurate to state that women *possess* more of a ruminative style than to say they are exposed to it) the basic concepts still apply. In the case of ruminative style, the mediation model or exposure hypothesis would propose that women more frequently adopt a ruminative coping style than men do, and that it is this rumination which gives rise to depression: thus the gender difference in rumination aids in explaining why there are more depressed women than men. In Chapter 7 of this thesis, the mediation model is adopted to examine whether gender differences in exposure to (or the possession of) a wide range of socio-demographic, health and lifestyle, psychological and social factors, is related to the gender difference in depression.

3.2.3. Defining moderation and the vulnerability hypothesis

Moderation is the second process by which gender (A) and a psychosocial factor (B) might work together to influence depression (C). Conceptually a *moderator* (B) affects the strength of the relationship between an independent variable (A) and an outcome (C) (Baron & Kenny, 1986). Moderation is typically modelled as an interactive or multiplicative effect. This springs from the common manner of its implementation in linear models such as regression. From a purely statistical perspective, describing A or B as the moderating variable, and the other as the effect that is moderated, is immaterial. The choice is often made on the basis of the variable whose effect on the outcome is of primary interest, in this case gender, being moderated by the other predictor. Using the same risk factors as the previous example, in the context of moderation it may be that CSA (B) moderates or modifies the effect of gender (A) upon depression (C) (or *vice versa* – it is the multiplicative effect of A and B, rather than which predictor is A and which is B, that

creates moderation). In this example, the moderation model hypothesises that women are more sensitive to the effects of CSA upon depression than men. Therefore, it is because of this greater sensitivity (as opposed to exposure) that women experience greater depression than do men. Figure 3-2 illustrates the basic or univariate moderation model using this example. Graphs in Chapter 8 depict the moderated relationships found in this thesis (for examples see pages 216-218).

Figure 3-2. Basic moderation model: Childhood sexual abuse moderates the impact of gender on depression.



Note: × indicates an interactive or multiplicative effect.

The moderation model or framework can be used to investigate what the depression literature has termed 'the vulnerability hypothesis'. This hypothesis argues that the relationship between certain factors or experiences and depression is stronger for women than men, or that women are more *vulnerable* to the effects of these factors (Turner & Avison, 1998). The vulnerability hypothesis has typically been applied to psychological characteristics thought to have some stability, such as personality traits and cognitive coping styles. However, like the exposure hypothesis, women may be more susceptible than men to a wide range of factors in the development of depression, including temporal occurrences such as negative life events. Chapter 8 of this thesis adopts the moderation model to examine whether gender differences in vulnerability to a wide range of socio-demographic, health and lifestyle, psychological and social factors, might aid in explaining the preponderance of depression for women.

3.2.4. Casual assumptions for mediation and moderation

An important theoretical assumption for both mediation and moderation is that the independent variables (A and B) temporally precede the outcome variable, or that they are in fact 'risk factors' for the outcome variable as described above (Baron & Kenny, 1986; Kraemer et al., 2001). This can be seen in the directionality of the models presented in Figures 3-1 and 3-2. However, many published studies have used the mediation framework to better understand how variables work together when the causal order of A, B and C are unclear, particularly the relationship between A and B. Maxwell and Cole (2007) reported that in a review of studies published in five American Psychological Association (APA) journals in 2005, 72 studies examined mediating relationships and 53% of these studies were essentially cross-sectional. A further 38% were considered to be 'half longitudinal',

in which only one of the independent variables could be established as preceding the outcome. Maxwell and Cole (2007) use these statistics to encourage future studies to adopt longitudinal designs when investigating mediation. However, there are many studies where mediation/moderation frameworks are useful for conceptualising and testing relationships, but longitudinal data are unavailable. In such studies, if care is taken when interpreting results, appropriate terminology is adopted (i.e. describing associated factors as correlates or potential risk factors), and the limitations on causal interpretations are clearly outlined, the mediation/moderation framework is a useful (and, pragmatically, almost the only) way of conceptualising the ways correlates might work together.

This is the case in the current thesis, where two waves of data are applied in Chapters 7 and 8 to investigating psychosocial correlates of the association between gender and depression through the adoption of mediation and moderation models. Although limited longitudinal data were available in the PATH dataset (i.e. two time points), this information was not extensive enough to determine causal relationships. To minimise confusion in the interpretation of results in these chapters, namely that in most cases the causal direction between investigated variables and the outcomes of interest (depression and anxiety) could not be demonstrated unambiguously, the word 'potential' was added when significant mediators or moderators were identified. This addition acknowledges that the terms mediator and moderator can only be fully applied when causal precedence is fully established, whilst allowing for the adoption of a useful framework of investigation. It is important to note that the purpose of this thesis is to identify correlates or potential risk factors for the gender difference in depression, and while the limitations surrounding

causality are acknowledged, this thesis does not attempt to provide a thorough discourse on the philosophy of causality.

3.2.5. The relative roles of mediation and moderation

A common approach in the literature has been to look at either the mediating or moderating roles played by potential risk factors of the gender difference in depression, rather than examine both possibilities. While in some studies this decision has been based on a theoretical model or hypotheses, in many others a statistical model is chosen without justification, and the statistics generated from this choice of model drives the results obtained. There is a danger that potential risk factors may be incorrectly dismissed as unimportant if they are only examined as either mediators or moderators. Using CSA again as an example, if this factor is only investigated in the context of moderation and it is shown that the effect of CSA on depression is equivalent for both genders, it may be concluded that CSA does not play a role in explaining why women are more depressed than men. However, it is quite likely that although the effect of CSA upon depression may be equivalent for both genders, the level of exposure to CSA is not. It may be that women are more exposed to CSA than men are, and in this context of mediation, CSA aids in explaining why more women are depressed than men.

The concept that both exposure and strength of association are important when assessing the role played by a single risk factor upon a disease outcome is analogous to the epidemiological measures of relative and attributable risk. Relative risk measures the strength of an association between a risk factor and a disease outcome, whereas attributable risk measures the amount of disease that can be attributed to levels of risk factor exposure (Kinlay, 1992). A factor can have a high relative risk, but if that factor is rare in the

population (or has a low attributable risk), its impact on the population will be small (Heller, Dobson, Attia, & Page, 2002). In context of the gender difference in depression, it may be that women are more vulnerable to CSA than men are in the development of depression (or have a higher relative risk), but if few women are exposed to CSA (low attributable risk) it is unlikely to account for much of the gender difference in depression prevalence. This example indicates that both vulnerability and exposure are important when examining the roles played by risk factors. Throughout this thesis, the terms vulnerability and exposure are utilised rather than relative and attributable risk, but it is useful to note the epidemiological foundations behind these concepts.

One area in the literature where both mediating and moderating effects or exposure and vulnerability have been considered concurrently is investigations of negative life events. Initially it was proposed that the higher level of depression in women occurs because they experience a greater number or are exposed to more negative life events than men (Brown & Birley, 1968). This view was then revised and it was suggested that the women are more vulnerable to the effects of negative life events than men. That is, that the *same* events are more toxic to women than men (Kessler, 1979; Uhlenhuth et al., 1974; Uhlenhuth & Paykel, 1973). Turner and Avison (1998) then moved forward to examine gender difference in both exposure and vulnerability to negative life events, in order to gauge their impact upon the gender difference in depression. Other more recent studies (Dalgard et al., 2006; Kendler et al., 2001) have followed and tested the impact of both exposure and vulnerability to negative life events. Consistent with this practice, this thesis aims to examine gender differences in both exposure and vulnerability, by testing a wide range of risk factors in both contexts.

3.3. Investigating age variation

The second part of this chapter outlines the methods adopted in this thesis to examine age variation in both the gender difference in depression levels and associated correlates. A supplementary aim for each of the study chapters (5-8) within this thesis is to examine the stability of findings across age. In Chapter 5, age variation in the properties of the Goldberg Anxiety and Depression Scale is investigated. In Chapter 6, age variation in the gender difference in levels of depression and anxiety is explored. And in Chapters 7 and 8, age variation in the psychosocial factors hypothesised to explain the gender difference in depression is examined. In each of these chapters, age variation is assessed by comparing the findings for each of the narrow age cohorts (20-24, 40-44 and 60-64) available in the PATH dataset. Although in some of these chapters two waves of data are employed to investigate short time periods of change, the majority of analyses that investigate age differences are cross-sectional.

These subsidiary investigations add a developmental or lifespan perspective to the relationships under investigation. The gold standard for assessing developmental processes is to conduct longitudinal studies that track changes in a cohort of participants across their lifespan. In the absence of such complete longitudinal data, cross-sectional cohort studies are often used as a basis for making developmental inferences, as is done in the current thesis. Two main pitfalls can arise from taking this approach, and methodologies need to account for these when interpreting results from cross-sectional datasets. Each of these difficulties is briefly introduced below, although greater detail is provided wherever appropriate in the relevant chapters.

The first pitfall involves adopting inappropriate terminology. Kraemer et al. (2000) state that cross-sectional studies should take care to report age differences accurately. Statistics such as means and coefficients should not be described as having "increased" or "decreased" when comparing results across age groups. These terms give the impression that a change in a variable has been measured across time, when such differences could theoretically be due to some type of age bias (such as sampling or measurement). Instead, differences between age groups are more accurately described by terms such as "higher" or "lower". The likelihood that age differences are in fact developmental differences (increases or decreases) that change as people age can then be evaluated as a possibility in later discussion. The current thesis adopts the terminology suggested by Kraemer et al. to avoid misleading the reader when cross-sectional comparisons are made between age groups.

The second pitfall involves making inferences about differences across age groups without acknowledging that such differences may instead be due to cohort effects. The separation of age from cohort effects concerns the question of whether change in an effect occurs at a particular age (across all cohorts), or whether it happens to a group of people born in the same time period (Warshaw, Klerman, & Lavori, 1991). Unfortunately, cross-sectional data is not able to distinguish between age and cohort effects. Indeed, most longitudinal data have similar problems, as only a full panel of longitudinal data stretching across the lifespan for several cohort groups has the information necessary to separate age and cohort effects. Background research may help in determining whether a cohort effect might be present. In any case, the issue of confounding age and cohort effects should be acknowledged. In the current thesis, the specific problem of disentangling age and cohort

effects in relation to gender differences in depression and anxiety is discussed further in Chapter 5.

3.4. Chapter conclusions

There is a need to undertake theoretically driven research that identifies the wide range psychosocial factors which impact the gender difference in depression and anxiety prevalence. The current chapter has put forward the mediation and moderation models as a suitable framework for examining how potential risk factors might have an influence. Chapters 7 and 8 report analyses which apply these models to the research question outlined in Chapter 1, namely*: identifying potential psychosocial risk factors (mediators and moderators) for the preponderance of depression and anxiety in women.* As a lifespan approach is also preferable when investigating gender differences in depression and anxiety, as outlined in Chapter 2, age differences are examined across three cohort groups in each of the research studies conducted in Chapters 5-8.

4. METHODOLOGY FOR THIS THESIS: WAVES 1 AND 2 OF THE PATH THROUGH LIFE PROJECT

4.1. Summary

The PATH (Personality and Total Health) Through Life Project is a longitudinal community survey designed to investigate risk factors for common mental health problems such as depression and anxiety across the adult lifespan. Data from Waves 1 and 2 of this survey were used throughout this thesis to examine the research questions outlined in Chapter 1. The current chapter describes the important features of the survey including the characteristics of the sample, the survey procedure, the relevant measures, and the possible effects of attrition between waves. The key psychosocial measures described in this chapter include the socio-demographic, health and lifestyle, psychological and social factors under investigation, as well as depression and anxiety.

4.2. The Survey

The data utilised in the present thesis was collected within Waves 1 and 2 of the PATH Through Life Project. The PATH project is a community survey recording the health and well-being of residents from Canberra and Queanbeyan in Australia. The survey investigates risk factors for common mental health issues such as depression, anxiety, cognitive ageing and suicidality. The project plans to follow three cohorts of participants, 20-24, 40-44 and 60-64, interviewing them once every four years over a 20-year period. At this stage, two waves of data have been collected: Wave 1 in 2000 and Wave 2 in 2004. This thesis makes use of both the cross-sectional (Wave 1) and longitudinal (Waves 1 and

2) data available, as well as utilising the three narrow aged-cohorts to make comparisons across the adult lifespan.

4.3. Participants

The Australian Electoral Roll for the Canberra and Queanbeyan region was used as a comprehensive list of all potential participants for Wave 1 of the survey, as registration is compulsory for all adults aged 18 and above. The recruitment process targeted people in three age brackets: 20-24, 40-44 and 60-64. Potential participants in the two younger age brackets were drawn from a 10-year age range, as this was the minimum age range released for research purposes by the Australian Electoral Commission at this time. A modification of these laws provided a more targeted 5-year age range for the 60-64 year olds.

To contact participants aged 20-24, an introductory letter explaining the study was sent to 12414 people listed as 20-29 year olds on the electoral role. To contact participants aged 40-44 the letter was sent to 9033 people listed as 40-49 year olds. A more targeted group of 4831 people listed as 60-64 year olds was also sent the introductory information. Table 4-1 shows the Wave 1 response rates and non-response reasons for each age group. Participation rates for those who were in the correct age range and could be located were: 20-24 - 58.6%, 40-44 – 64.6%, 60-64 – 58.3%. The final sample for Wave 1 of PATH was: 1163 males and 1241 females aged 20-24, 1192 males and 1338 females aged 40-44, and 1319 males and 1232 females aged 60-64.

Table 4-1. Response rates and non-response reasons for Wave 1.

	Letter sent	Not in age range	Moved out of region	Deceased	Could not be located	Declined to participate	Interviewed[a]
20-24	12414	5058 (40.7%)	1061 (8.5%)	0 (0.0%)	2190 (17.6%)	1701 (13.7%)	2404 (19.4%)
40-44	9033	4222 (46.7%)	280 (3.1%)	0 (0.0%)	612 (6.8%)	1389 (15.4%)	2530 (28.0%)
60-64	4831	34 (0.7%)	182 (3.8%)	28 (0.6%)	209 (4.3%)	1827 (37.8%)	2551 (52.8%)

Note: [a] Final response rates were 58.6%, 64.6% and 58.3% for those who met the age and location specifications.

Four years later participants were recontacted and asked if they would participate in Wave 2 of the survey. Of the 2404 participants in the 20-24 age group 2139 (89%) agreed to be reinterviewed. The 11% that did not participate again included 7.9% who refused, 0.3% had died and 2.8% could not be found. Of the 2530 participants in the 40-44 age group 2354 (93%) were reinterviewed. The 7% that did not participate again included 5.3% who refused, 0.3% had died and 1.3% could not be located. In the 60-64 years age group 2222 (87%) were reinterviewed. The 13% that were not reinterviewed included 9.2% who refused, 2.7% had died and 1.0% could not be found. A total of 770 (10.3%) participants who did participate in Wave 1 were not reinterviewed in Wave 2. The final sample for Wave 2 consisted of: 1013 males and 1126 females aged 24-28, 1103 males and 1251 females aged 44-48, and 1147 males and 1075 females aged 64-68.

4.4. Procedures

For Wave 1 of the survey, persons were randomly selected from the electoral roll and sent a letter with information about the survey, explaining that an interviewer would contact them (see Appendix 3). A convenient time and place for the interview was

arranged for those who agreed to participate. The interview took one-and-a-half to two hours and was usually conducted at either the person's home or at the Centre for Mental Health Research in Canberra. The interviewer took the participant through the first set of questions, demonstrating how to enter responses into a Hewlett-Packard 620LX palmtop personal computer using Surveycraft software. The majority of the survey was then completed by the respondent alone. This self-report method of data collection was chosen based on previous research indicating that people are more likely to reveal personal information and be less concerned about providing 'socially desirable' answers when responding to a self-administered questionnaire rather than a face-to-face or telephone interview (Aquilino, 1992; Jorm, Duncan-Jones, & Scott, 1989; Perlis, Des Jarlais, Friedman, Arasteh, & Turner, 2004). Using a computerised questionnaire also simplified the administration, completion and data-entry of the survey, as the software was programmed to skip unnecessary items and minimised common data-entry errors. Direct testing by the interviewer was required for some of the physical and cognitive tests, as well as a cheek swab from which DNA was extracted. For Wave 2 of the survey, participants were re-contacted by telephone approximately four years later and asked whether they would like to continue participation in the second wave of the study. Those who agreed were re-interviewed following a similar process as originally carried out in Wave 1. In Wave 2, responses were recorded using a laptop computer (Toshiba Portege 3500 tablet PC) with Surveycraft software.

Several methods were utilised to maintain contact with participants and minimise attrition in future waves of data collection. Participants were sent an annual Christmas card and newsletter, which included a reply paid 'change of address card' to help keep track of

changes in name, address, contact phone numbers and email. During the first interview, participants were also asked to provide the details of two people who could be contacted in the event that direct contact could not be made. In the case where participants could not be reached either directly or via the contacts provided, most recent addresses were obtained via the Australian Electoral Roll using full name and date of birth. The Electronic White Pages directory was used as a final source, if all other methods failed.

4.5. Ethics

The PATH Through Life Project complies with the National Medical Health and Research Council (NHMRC) guidelines for ethical practice in research. Participants were informed that participation was voluntary, that they could decline to answer any or all questions, and that consent could be withdrawn at any time. Protocol (No. M9807) for Wave 1 of the PATH project was approved by the Australian National University Human Research Ethics Committee on the 22nd September 1998. Protocol (No. 2002/189) for Wave 2 of the PATH project was approved by the Australian National University Human Research Ethics Committee on 11th November 2002. Copies of the approval certificates from the University Ethics Committee are included in Appendix 4 and 5.

4.6. Measures

The measures and scales from the PATH data utilised in the current thesis can be broadly categorised into five domains: a) socio-demographic factors, b) health and lifestyle factors, c) psychological factors, d) social factors and e) mental health outcomes. The following section outlines the details of each measure used and descriptive statistics for each gender and age cohort (20s, 40s and 60s). All measures used in this thesis were

collected at both Waves 1 and 2. Cronbach's alphas are provided for each continuous scale (based on Wave 1 data) as an indicator of internal consistency.

4.6.1. Socio-demographic factors

Table 4-2 provides general descriptive information about each of the socio-demographic factors.

4.6.1.1. Age and gender

Age was grouped into three separate age cohorts: a) respondents aged 20-24 at Wave 1 and 24 to 28 at Wave 2, b) respondents aged 40-44 at Wave 1 and 44-48 at Wave 2 and c) respondents aged 60-64 at Wave 1 and 64-68 at Wave 2. Gender was coded such that female was '0' and male was '1'.

4.6.1.2. Marital status and children

Respondents provided information as to whether they were in a marriage or defacto relationship ('0' no and '1' yes), and as to whether they were separated or divorced ('0' no and '1' yes). Participants were also asked about the number of children they had.

4.6.1.3. Employment status

Information about employment status was gathered using 5 categories: 1) employed full-time, 2) employed part-time but looking for full-time work, 3) employed part-time, 4) unemployed and looking for work, and 5) not in the labour force. These categories were collapsed into a single variable where '1' represented employed full or part-time employment and '0' represented unemployed or not in the labour force.

4.6.1.4. Education level

The PATH survey also asked about time spent undertaking education. Six items enquired about the highest level of schooling completed, the highest level of post secondary/tertiary education completed and current study. These items were used to construct a single variable ‘total years of education completed’.

Table 4-2. Descriptive statistics for socio-demographic factors, by gender, age group and wave.

		20s				40s				60s			
		Males		Females		Males		Females		Males		Females	
		Total N	% *or* Mean (SD)	Total N	% *or* Mean (SD)	Total N	% *or* Mean (SD)	Total N	% *or* Mean (SD)	Total N	% *or* Mean (SD)	Total N	% *or* Mean (SD)
No. of children	W1	1156	.09 (.39)	1232	.22 (.60)**	1191	2.05 (1.34)	1336	2.24 (1.34)**	1314	2.85 (1.51)	1234	2.82 (1.60)
	W2	1012	.26 (.68)	1123	.45 (.87)**	1101	2.11 (1.38)	1248	2.56 (1.33)*	1147	2.86 (1.49)	1073	2.77 (1.60)
Married/def (yes)	W1	1157	18.6%	1232	27.8%**	1192	81.5%	1336	77.5%*	1315	86.7%	1233	68.8%**
	W2	1013	49.8%	1124	56.8%*	1102	81.1%	1250	75.1%**	1147	87.3%	1074	66.8%**
Separated/div (yes)	W1	1157	0.3%	1232	4.6%*	1192	8.9%	1136	14.7%**	1315	9.3%	1233	15.4%**
	W2	1012	1.8%	1123	3.6%*	1102	14.3%	1249	21.7%**	1146	12.6%	1074	16.5%*
Employed (yes)	W1	1157	85.8%	1232	84.3%	1192	94.8%	1336	85.7%**	1314	49.2%	1233	31.9%**
	W2	1012	91.8%	1124	85.8%**	1101	93.6%	1249	86.8%**	1147	23.3%	1074	19.6%**
Years education	W1	1157	14.46 (1.54)	1232	14.69 (1.61)**	1191	14.76 (2.34)	1336	14.41 (2.32)**	1261	14.20 (2.85)	1162	13.33 (2.76)**
	W2	1011	15.23 (1.64)	1121	15.46 (1.66)*	1101	15.11 (2.17)	1249	14.72 (2.25)**	1144	14.38 (2.74)	1070	13.46 (2.61)**

Note: Percentages are within gender and age group categories. Significance tests identifying gender differences were: Independent samples t-tests for continuous variables, and chi-square tests for categories. * p<.05, ** p<.001. Further description of the significant gender differences found for each variable is provided in Chapter 7.

4.6.2. Health and Lifestyle Factors

Descriptive statistics for each of the health and lifestyle measures can be seen by gender and age group in Table 4-3.

4.6.2.1. Tobacco and Cannabis use

Tobacco use or smoking was assessed by asking "Do you currently smoke?" Possible responses were either '1' yes or '0' no. Cannabis use was assessed by the question "How often do you use marijuana/hash?" This question was drawn from the National Campaign Against Drug Abuse Social Issues Survey (1993). Participants answered using a five-point scale where the possible responses were: a) don't use, b) use once a week or more, c) use once a month, d) use once every 1-4 months, and e) use once or twice a year. These responses were collapsed into a singe item with two categories: '1' regular use of once a month or more, and '0' less than once a month.

4.6.2.2. Alcohol Use

Alcohol use was measured using the frequency and quantity items from the Alcohol Use Disorders Identifications Test (AUDIT) (Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). This test was developed by the World Health Organisation as a screening tool to identify harmful alcohol consumption within primary care settings (Conigrave, Saunders, & Reznik, 1995). The first item asked "How often do you have a drink containing alcohol?" The possible responses were: "never", "not in the last year", "less then monthly", "2-4 times a month", "2-3 times a week, or "4 or more times a week". The second item asked "How many standard drinks do you have on a typical day when you are drinking?" The multiple choice response categories were: "1-2", 3-4", 5-6" "7-9" and "10 or more". These items were used to derive a measure of weekly alcohol consumption

(Redman, Sanson-Fisher, Wilkinson, Fahey, & Gibberd, 1987; Shakeshaft, Bowman, & Sanson-Fisher, 1999). Participants were then classified into one of three categories based on the National Health and Medical Research Council (2001) guidelines: a) non-drinkers or occasional drinkers (0-13 standard drinks per week for men and 0-7 for women), b) moderate drinkers (14-27 drinks for men and 8-13 for women), or c) hazardous or harmful drinkers (28 or more drinks for men and 14 or more for women).

4.6.2.3. Physical Activity

Participants were asked "How often do you take part in sports or activities that are moderately energetic (eg. scrubbing, polishing car, dancing, golf, cycling, etc)?" and "How often do you take part in sports or activities that are vigorous (eg. running, hard swimming, tennis, squash, etc)?". The possible responses to both questions were: "never/hardly ever", "about 1-3 times a month", "once or twice a week" and "3 times a week or more". These categories were recoded into a single item which assessed whether moderate or vigorous exercise took place at least once a week (0 'no', 1 'yes').

4.6.2.4. General Physical Health

The 12-Item Short Form Health Survey (SF-12) physical component was used as a measure of physical health (Ware & Kosinski, 2001; Ware, Kosinski, & Keller, 1996). The SF-12 was designed for use in population samples and epidemiological research (Ware & Kosinski, 2001; Ware et al., 1996). The scale asks about participants' functioning in the four weeks prior to interview. A standardised scoring system was derived to produce a mean of 50 and standard deviation of 10 when used in normal populations. Higher scores indicate better physical health. As the responses to each item vary, it was not feasible to produce a Cronbach's alpha statistic for the scale based on the PATH sample. However,

the scale has previously been found to have good reliability, validity and consistency (Haywood, Garratt, & Fitzpatrick, 2005). It should be acknowledged that the SF-12 is predominantly used in population research to broadly assess quality of physical health, but is not a diagnostic measure of health problems or health status.

Table 4-3. Descriptive statistics for health and lifestyle factors, by gender, age group and wave.

		20s				40s				60s			
		Males		Females		Males		Females		Males		Females	
		Total N	% *or* Mean (SD)	Total N	% *or* Mean (SD)	Total N	% *or* Mean (SD)	Total N	% *or* Mean (SD)	Total N	% *or* Mean (SD)	Total N	% *or* Mean (SD)
Smoker (yes)	W1	1155	31.9%	1228	31.1%	1192	20.4%	1336	17.8%	1314	11.9%	1233	9.7%
	W2	1012	29.1%	1123	25.9%	1102	16.7%	1249	17.2%	1147	8.2%	1074	7.6%
Cannabis (regular)	W1	1153	18.5%	1230	8.8%**	1191	7.0%	1336	1.9%**	1314	0.2%	1232	.0%
	W2	1009	14.0%	1117	5.7%**	1100	5.5%	1247	1.7%**	1147	.1%	1074	.0%
Alcohol (abstain)	W1	1162	27.5%	1242	36.4%**	1193	19.6%	1337	35.1%**	1317	20.9%	1234	40.4%**
	W2	1013	20.8%	1126	32.5%**	1103	19.9%	1250	32.1%**	1145	20.2%	1072	37.6%**
Alcohol (moderate)	W1	1162	65.7%	1242	55.6%**	1193	73.8%	1337	57.7%**	1317	72.1%	1234	53.9%**
	W2	1013	71.2%	1126	60.7%**	1103	73.1%	1250	59.0%**	1145	74.0%	1072	58.3%**
Alcohol use (heavy)	W1	1162	6.1%	1142	6.9%	1193	6.3%	1337	7.0%	1317	6.7%	1234	5.3%
	W2	1013	7.6%	1126	6.3%	1103	7.0%	1250	8.7%	1145	5.9%	1072	4.1%*
Mod. Activity (yes)	W1	1155	87.4%	1228	73.1%**	1182	73.3%	1328	60.6%**	1312	74.5%	1227	59.7%**
	W2	1007	82.3%	1118	72.3%**	1096	72.4%	1241	59.4%**	1128	75.1%	1054	62.1%**
SF-12 health	W1	1151	53.37 (6.40)	1229	52.67 (7.19)*	1190	52.06 (7.44)	1335	51.24 (7.54)*	1310	48.86 (9.67)	1231	47.25 (10.58)**
	W2	994	53.54 (6.19)	1106	52.10 (7.43)**	1069	51.79 (7.36)	1227	50.72 (8.50)*	1100	49.19 (8.93)	1018	46.92 (10.50)**

Note: Percentages are within gender and age group categories. Significance tests identifying gender differences were: Independent samples t-tests for continuous variables, and chi-square tests for categories. * p<.05, ** p<.001. Further description of the significant gender differences found for each variable is provided in Chapter 7.

4.6.3. Psychological Factors

Descriptive statistics for each of the health and lifestyle measures are shown for each gender and age group in Table 4-4.

4.6.3.1. Mastery

Perceived control over one's future, or mastery, was measured using a 7-item scale developed by Pearlin et al. (1981). This scale was created for use in community-based samples. Each item was responded to using a 4-point Likert scale ranging from "Strongly Disagree" (1) to "Strongly Agree" (4). A total scale score was obtained by summing each of the items and ranged from 7 to 28. Higher scores indicate a greater level of mastery. In the PATH sample, Cronbach's alpha for this scale showed good internal consistency (α = .82).

4.6.3.2. Eysenck's Personality Questionnaire

Neuroticism, extraversion and psychoticism (a measure of aggression) were measured using the short form of the Eysenck Personality Questionnaire (EPQ) (Eysenck, Eysenck, & Barrett, 1985). Each personality component was measured using 12 dichotomous items, where the responses were either "yes" (1) or "no" (0). Total scale scores were obtained by summing all of the item scores and ranged from 0 to 12. Higher scores on each measure indicate greater levels of the associated personality trait. Two of the EPQ scales showed good internal consistency (neuroticism α = .84; extraversion α = .82), whilst the remaining scale showed only moderate internal consistency (psychoticism α = .48). Eysenck's psychoticism scale was not changed or transformed to improve reliability, as it has been frequently used (unchanged) in psychological research. However, findings related to this scale should be interpreted conservatively.

4.6.3.3. Ruminative Style

Ruminative style, a type of emotion-focused coping categorised by chronic focus on negative emotions and their meaning, was measured using a 10-item short scale drawn from the 21-item Ruminative Response Scale (Nolen-Hoeksema & Morrow, 1991; Nolen-Hoeksema, Parker, & Larson, 1994). This scale consisted of 10 items that were responded to using a 4-point Likert scale ranging from "Never" (0) to "Always" (3). Total scale scores range from 0 to 30, where a higher score indicates a greater degree of rumination about negative feelings and experiences. Based on the PATH sample, the internal consistency for this scale was shown to be good ($\alpha = .88$).

4.6.3.4. Behavioural Activation Scales (Drive, Fun and Reward)

The 24-item Behavioral Inhibition and Activation Scale (BIS-BAS) was used to measure tendency towards approach and avoidant behaviour (Carver & White, 1994). Each item was responded to using a 4-point Likert scale where '0' was "Very false for me" and '3' was "Very true for me". Behavioral inhibition (BIS) is associated with avoiding negative outcomes, whereas behavioral activation (BAS) is associated with seeking out reward and goal-directed activity. There were three elements to the BAS measure: BAS-drive, BAS-fun seeking and BAS reward-responsiveness. Each of these subscales showed adequate internal consistently ($\alpha = .80$, $\alpha = .72$, $\alpha = .70$, respectively). The BIS scale also demonstrated adequate internal consistency ($\alpha = .76$). For each BIS-BAS scale greater scores indicated more of the associated construct.

4.6.3.5. Cognitive Tests

Verbal intelligence was measured using Version A of the Spot-the-Word (STW) test (Baddeley, Emslie, & Nimmo-Smith, 1992). Participants identified words from 60

pairs of text items consisting of one word and one non-word. The total number of correct items was summed to provide a scale score ranging from 0 to 60. The Cronbach's alpha for the Spot-the-Word test using the PATH sample was (α = .83). Working memory was assessed using the Digit Span Backwards subtest from the Weschler Memory Scale (Wechsler, 1945). In this test, participants were verbally presented with a list of digits and then asked to recall them in the reverse order. The span of digits began at 2 and increased to a maximum of 5. A point was scored for each correctly recalled item providing a total scale score of 0-10, where higher scores reflect better working memory. This test has been shown to have good test-retest reliability (Kappa = 0.83) (Smith, 1982) and had adequate internal consistency based on the PATH sample (α = .79).

Table 4-4. Descriptive statistics for psychological and cognitive factors, by gender, age group and wave.

		20s				40s				60s			
		Male		Female		Male		Female		Male		Female	
		Total N	Mean (SD)	Total N	Mean (SD)	Total N	Mean (SD)	Total N	Mean (SD)	Total N	Mean (SD)	Total N	Mean (SD)
Mastery	W1	1152	23.11 (3.42)	1226	22.54 (3.46)**	1182	22.23 (3.59)	1330	21.84 (3.58)*	1311	22.23 (3.65)	1224	21.50 (3.46)**
	W2	1006	22.98 (3.48)	1119	22.51 (3.44)*	1096	22.16 (3.56)	1244	21.81 (3.67)*	1129	22.29 (3.44)	1059	21.28 (3.34)**
EPQ Extraversion	W1	1151	8.19 (3.38)	1227	8.41 (3.37)	1182	6.72 (3.66)	1330	7.26 (3.54)**	1311	6.55 (3.47)	1227	6.81 (3.44)
	W2	1006	7.86 (3.45)	1115	8.08 (3.45)*	1095	6.59 (3.66)	1237	7.03 (3.51)*	1129	6.34 (3.39)	1052	6.67 (3.23)*
EPQ Psychoticism	W1	1154	3.13 (1.81)	1228	2.35 (1.66)**	1183	2.43 (1.63)	1330	1.85 (1.51)**	1313	1.86 (1.43)	1227	1.59 (1.36)**
	W2	1006	3.10 (1.84)	1119	2.14 (1.60)**	1095	2.39 (1.63)	1245	1.86 (1.53)**	1132	1.97 (1.55)	1059	1.58 (1.37)**
EPQ Neuroticism	W1	1154	4.02 (3.28)	1228	5.57 (3.32)**	1182	3.53 (3.16)	1330	4.54 (3.27)**	1313	2.92 (2.99)	1227	3.73 (3.02)**
	W2	1008	3.84 (3.35)	1119	5.43 (3.45)**	1096	3.34 (3.11)	1243	4.43 (3.29)**	1132	2.69 (2.91)	1060	3.58 (2.90)**
Behav A. (drive)	W1	1154	11.40 (2.31)	1229	10.93 (2.30)**	1182	10.35 (2.39)	1328	9.76 (2.46)**	1309	10.05 (2.40)	1226	9.19 (2.61)**
	W2	1007	11.45 (2.37)	1119	10.90 (2.30)**	1096	10.36 (2.40)	1244	9.80 (2.37)**	1130	9.88 (2.35)	1058	9.05 (2.54)**
Behav A. (fun)	W1	1155	12.61 (2.10)	1229	12.11 (1.98)**	1181	11.04 (2.12)	1329	10.79 (2.11)*	1308	10.26 (2.30)	1226	10.40 (2.27)
	W2	1007	12.44 (2.09)	1119	11.99 (2.10)**	1096	11.03 (2.13)	1245	10.83 (2.12)*	1130	10.27 (2.16)	1061	10.46 (2.16)*
Behav A. (reward)	W1	1154	17.12 (1.99)	1229	17.47 (1.84)**	1182	16.20 (2.09)	1329	16.72 (1.96)**	1308	16.00 (2.11)	1226	16.57 (2.15)**
	W2	1007	17.14 (1.99)	1118	17.59 (1.82)**	1095	16.15 (2.13)	1245	16.70 (1.97)**	1129	15.79 (2.13)	1059	16.44 (2.10)**
Behav inhibition	W1	1155	19.14 (2.23)	1229	21.70 (3.27)**	1180	19.77 (3.32)	1327	21.50 (3.14)**	1307	19.50 (3.17)	1226	20.90 (3.02)**
	W2	1006	19.29 (3.51)	1116	21.98 (3.33)**	1096	19.73 (3.36)	1245	21.49 (3.22)**	1127	19.51 (3.02)	1057	20.77 (3.06)**
Ruminative Style	W1	1153	8.70 (5.08)	1229	10.80 (5.33)**	1182	8.03 (4.46)	1330	9.20 (4.52)**	1311	6.33 (3.85)	1227	7.69 (3.78)**
	W2	1007	8.89 (5.48)	1120	10.56 (5.83)**	1097	7.16 (4.33)	1243	8.58 (5.05)**	1128	5.29 (3.63)	1058	6.56 (3.89)**
Spot-the-Word	W1	1155	47.78 (5.56)	1229	47.42 (5.12)	1177	50.79 (5.82)	1329	50.23 (5.57)*	1283	25.01 (5.94)	1202	51.62 (5.73)
	W2	954	49.16 (4.97)	1072	48.77 (4.90)	1066	51.66 (4.85)	1218	50.88 (5.45)**	1076	53.28 (50.05)	1012	52.63 (5.35)*
Digit Symbol Back	W1	1155	5.47 (2.32)	1230	5.23 (2.27)*	1190	5.35 (2.36)	1329	5.10 (2.24)*	1312	5.00 (2.27)	1231	4.75 (2.22)*
	W2	976	6.00 (2.22)	1082	5.68 (2.22)*	1090	5.64 (2.31)	1234	5.52 (2.24)	1116	5.24 (2.21)	1043	4.95 (2.20)*

Note: Percentages are within gender and age group categories. Significance tests identifying gender differences were: Independent samples t-tests for continuous variables, and chi-square tests for categories. * p<.05, ** p<.001. Further description of the significant gender differences found for each variable is provided in Chapter 7.

4.6.4. Social Factors

Descriptive statistics for each of the health and lifestyle measures can seen by gender and age group in Table 4-5.

4.6.4.1. Role Strain

Role strain was assessed in three domains: housework, financial planning and financial provision. In three separate questions participants were asked "To what extent are you responsible for: a) household tasks, b) financial management in your household, and c) providing the money for the household". The possible responses to each question were: "Not at all responsible" (1), "25% responsible" (2), "50% responsible" (3), "75% responsible" (4), and "Fully responsible" (5). Responses were recoded into one variable with two categories: (0) "50% or less responsible" or (1) "75% or more responsible".

4.6.4.2. Negative Life Events

Participants were asked about eight negative life events during the past six months. Six of these events were taken from Brugha and Cragg's (1990) List of Threatening Experiences, and enquired about personal injury/illness, family illness/injury, close family death, close friend or other relative's death, a steady relationship ending, and any serious problems with a close friend, neighbour or relative. Two further questions taken from the British National Survey of Health and Development (Rodgers, 1996) referred to a work or career crisis and the threat of losing employment. Each of these items was responded to with either "not experienced" (0) or "experienced" (1). It is acknowledged there may have been additional relevant life events not assessed in this list.

4.6.4.3. Social interactions

Positive social support and negative social interactions with family and friends were assessed using a series of items developed by Schuster et al. (1990). Positive social support was assessed using two pairs of items. The first two items measured positive interactions with family (e.g. "How often do family make you feel cared for?") and showed good internal consistency ($\alpha = .85$). The second two measured positive interactions with friends (e.g. "How often do friends make you feel cared for?") and also demonstrated good internal consistency ($\alpha = .86$). Possible responses for both pairs of items were: "Never" (0), "Rarely" (1), "Sometimes" (2) and "Often" (3). For both pairs of items, scores were added providing two scales ranging from 0-6. Negative social interactions were also assessed separately for family and friends, using two sets of three items (eg. "How often do friends make demands on you?"). The possible responses were the same as those listed above for positive support. Item scores were added for each set of items, providing two scale scores ranging from 0-9. For each scale, higher scores indicated more of the associated positive and negative social interactions. Cronbach's alphas for the negative social interaction scales for family and friends were $\alpha = .78$ and $\alpha = .71$ respectively.

4.6.4.4. Number of Childhood Adversities

Seventeen questions asked about participants' experiences of adversity up to sixteen years of age (Rosenman & Rodgers, 2004). This scale was developed from a number of sources including the Parental Bonding Instrument (Parker, 1979), the US National Comorbidity Survey (Kessler et al., 1997) and the British National Survey of Health and Development (Rodgers, 1996). Items asked about perceived lack of affection, emotional problems and substance use by parental figures. Questions were also asked

about household conflict, and either experiencing or witnessing psychological abuse, sexual and physical abuse within the family. Three items enquired about positive childhood experiences. Three of the 17 childhood adversity items involved multiple response options (parental affection and household conflict). These were recoded into dichotomous variables (0/1). Responses to the remaining 14 items were dichotomous: "Experienced" (1) or "Not experienced" (0). A total scale score ranging from 0-17 was obtained by summing the scores, where a higher score indicated greater childhood adversity. This scale was found to demonstrate adequate internal consistency ($\alpha = .76$).

Table 4-5. Descriptive statistics for social factors, by gender, age group and wave.

		20s				40s				60s			
		Male		Female		Male		Female		Male		Female	
		Total N	% *or* Mean (SD)	Total N	% *or* Mean (SD)	Total N	% *or* Mean (SD)	Total N	% *or* Mean (SD)	Total N	% *or* Mean (SD)	Total N	% *or* Mean (SD)
Household tasks (yes)	W1	1154	19.3%	1231	39.3%**	1192	23.1%	1336	79.1%**	1314	24.4%	1233	80.7%**
	W2	1012	26.6%	1121	56.4%**	1100	24.7%	1248	76.0%**	1146	22.2%	1074	78.9%
Finance tasks (yes)	W1	1154	26.8%	1230	33.3%**	1192	56.2%	1336	55.5%	1314	62.9%	1233	51.6%
	W2	1011	41.5%	1121	47.5%*	1099	56.0%	1247	55.5%	1143	60.2%	1069	51.2%**
Provide money (yes)	W1	1154	19.8%	1230	18.9%	1191	67.8%	1336	28.1%**	1313	65.3%	1232	35.5%**
	W2	1010	38.4%	1120	26.8%**	1099	64.9%	1246	31.5%**	1146	59.8%	1067	37.0%**
Recent illness/injury	W1	1150	11.0%	1228	7.4%*	1192	7.8%	1336	6.5%	1314	8.8%	1233	8.4%
	W2	1011	7.0%	1122	7.0%	1102	5.3%	1248	6.3%	1146	8.0%	1073	8.5%
Recent family ill/injury	W1	1150	19.3%	1228	23.6%*	1191	21.4%	1336	22.3%	1314	14.5%	1233	17.4%*
	W2	1011	1.60%	1121	18.9%	1101	16.1%	1248	20.6%**	1145	11.5%	1073	15.6%*
Recent family death	W1	1152	1.0%	1230	1.1%	1192	2.6%	1336	3.2%	1314	3.0%	1233	3.6%
	W2	1008	0.6%	1122	1.2%	1102	4.4%	1249	4.2%	1145	3.8%	1073	3.9%
Recent other death	W1	1153	20.6%	1230	20.2%	1192	14.8%	1336	19.5%*	1314	18.8%	1233	20.4%
	W2	1012	19.8%	1122	21.7%	1102	16.0%	1249	19.0%*	1145	20.3%	1073	19.1%
Recent relationship end	W1	1153	16.7%	1230	20.0%*	1192	3.4%	1336	3.5%	1314	1.1%	1233	1.0%
	W2	1011	10.5%	1122	10.3%	1101	3.5%	1248	4.2%	1145	1.0%	1073	1.3%
Recent social problem	W1	1154	16.6%	1230	23.7%**	1192	11.2%	1336	16.2%**	1314	6.1%	1233	11.0%**
	W2	1010	12.7%	1122	17.0%*	1101	8.8%	1248	14.7%**	1144	5.0%	1072	7.3%*
Recent work crisis	W1	1155	19.8%	1230	22.0%	1192	21.7%	1336	18.3%**	1314	6.5%	1233	2.6%**
	W2	1011	17.3%	1122	20.2%	1102	15.6%	1247	14.1%	1144	3.0%	1073	1.3%*
Recent threat to job	W1	1155	15.3%	1230	11.6*	1192	13.4%	1336	8.7%**	1314	3.0%	1233	1.2%*
	W2	1011	15.2%	1121	8.8%**	1100	8.5%	1246	6.3%*	1144	1.5%	1073	.9%
Pos. support friends	W1	1153	4.84 (1.33)	1230	5.26 (1.09)**	1190	4.46 (1.34)	1336	5.09 (1.16)**	1308	4.96 (1.31)	1233	5.39 (1.04)**

	W2	1012	4.81 (1.31)	1122	5.31 (1.03)**	1101	4.60 (1.32)	1246	5.19 (1.09)**	1143	5.03 (1.22)	1069	5.46 (1.00)**
Pos. support family	W1	1154	5.32 (1.13)	1230	5.43 (1.01)*	1191	5.21 (1.19)	1335	5.16 (1.25)	1312	5.43 (1.06)	1232	5.46 (1.07)
	W2	1012	5.39 (1.05)	1122	5.50 (1.01)*	1102	5.21 (1.14)	1248	5.20 (1.17)	1147	5.42 (1.08)	1068	5.47 (1.05)
Neg. interactions friends	W1	1150	3.47 (1.82)	1230	3.23 (1.68)*	1189	3.00 (1.60)	1334	2.78 (1.68)**	1303	2.54 (1.64)	1227	2.30 (1.68)**
	W2	1011	3.12 (1.74)	1120	2.87 (1.74)*	1100	2.87 (1.59)	1244	2.63 (1.55)**	1134	2.25 (1.56)	1057	2.01 (1.56)**
Neg. interactions family	W1	1154	3.97 (2.04)	1230	4.23 (2.21)*	1189	4.24 (2.00)	1335	4.62 (2.13)**	1309	3.34 (1.87)	1224	3.37 (1.94)*
	W2	1012	3.53 (2.13)	1122	3.88 (2.17)**	1102	4.12 (1.95)	1247	4.54 (2.05)**	1139	2.94 (2.94)	1058	2.98 (2.00)
Childhood adversity	W1	1151	1.34 (1.94)	1228	1.79 (2.39)**	1184	1.74 (2.32)	1330	2.13 (2.59)**	1311	1.41 (1.90)	1228	1.66 (2.16)**

Note: Percentages are within gender and age group categories. Significance tests identifying gender differences were: Independent samples t-tests for continuous variables, and chi-square tests for categories. * p<.05, ** p<.001. Further description of the significant gender differences found for each variable is provided in Chapter 7.

4.6.5. Mental Health Outcomes

4.6.5.1. Depression and Anxiety Symptoms

The Goldberg Depression and Anxiety Scales were used to assess levels of depression and anxiety (Goldberg et al., 1988). The Goldberg Scales contain two sets of nine items, with one subscale measuring depression and the other anxiety (a list of the items is provided in Table 6-1 on pg. 147). Respondents are asked to respond to questions concerning "How you have been feeling in the past month." Total scale scores for anxiety and depression are calculated by summing the number of items endorsed. This provides two scales which range from 0 to 9, where a higher score indicates greater symptomology.

The Goldberg Depression and Anxiety scales were created by Goldberg and colleagues as a screening tool for anxious and depressive illnesses. At specified cut-off scores, the anxiety scale has been shown to have a sensitivity of 82% and the depression scale a sensitivity of 85%, implying they can detect Major Depressive Episodes and Generalised Anxiety Disorder effectively (Goldberg et al., 1988). As a continuous count of symptoms experienced, the scales have also been found to detect elevated levels of depression and anxiety in community samples (Mackinnon et al., 1994). However, the scales are not often normally distributed when used in community research, as was the case for both genders and age groups in the PATH data (see Figures 4-1 and 4-2). Therefore this thesis adopts statistical methods such as bootstrapping (Chapter 7) and robust standard errors (Chapters 5 and 8), to compensate for non-normality whenever these scales are adopted as outcome measures.

While the correlation between the two Goldberg Scales is high (r=.71, p<.001 in the current sample) a two factor model with separate depression and anxiety dimensions

has been found to fit the symptoms substantially better than a single factor model (Christensen et al., 1999). Both scales were found to have good internal reliabilities when applied to the PATH sample (depression scale: $\alpha = .81$; anxiety scale $\alpha = .78$). Table 4-6 provides the descriptive statistics for each scale, by gender and age group.

4.6.5.2. General Mental Health

The 12-item Short Form Health Survey (SF-12) mental component was used as a general measure of mental health (see Table 4-6). Properties of this scale have been previously outlined for the measure "General Physical Health". As previously mentioned the responses to each item vary, making it unfeasible to produce a Cronbach's alpha statistic for the scale. However, the SF-12 has previously been found to have good reliability, validity and consistency (Haywood et al., 2005). A scoring system derived from population norms produces a mean of approximately 50 and a standard deviation of 10 when a normal population is assessed. The mental health component has also been shown to be a valid measure of common mental disorders in the general population (Gill, Butterworth, Rodgers, & Mackinnon, 2007). It should be acknowledged that the SF-12 is predominantly used in population research to broadly assess quality of mental health, but is not a diagnostic measure of mental health problems or status.

Figure 4-1. Distribution for the Goldberg Depression Scale (0-9) for each age group in the PATH sample.

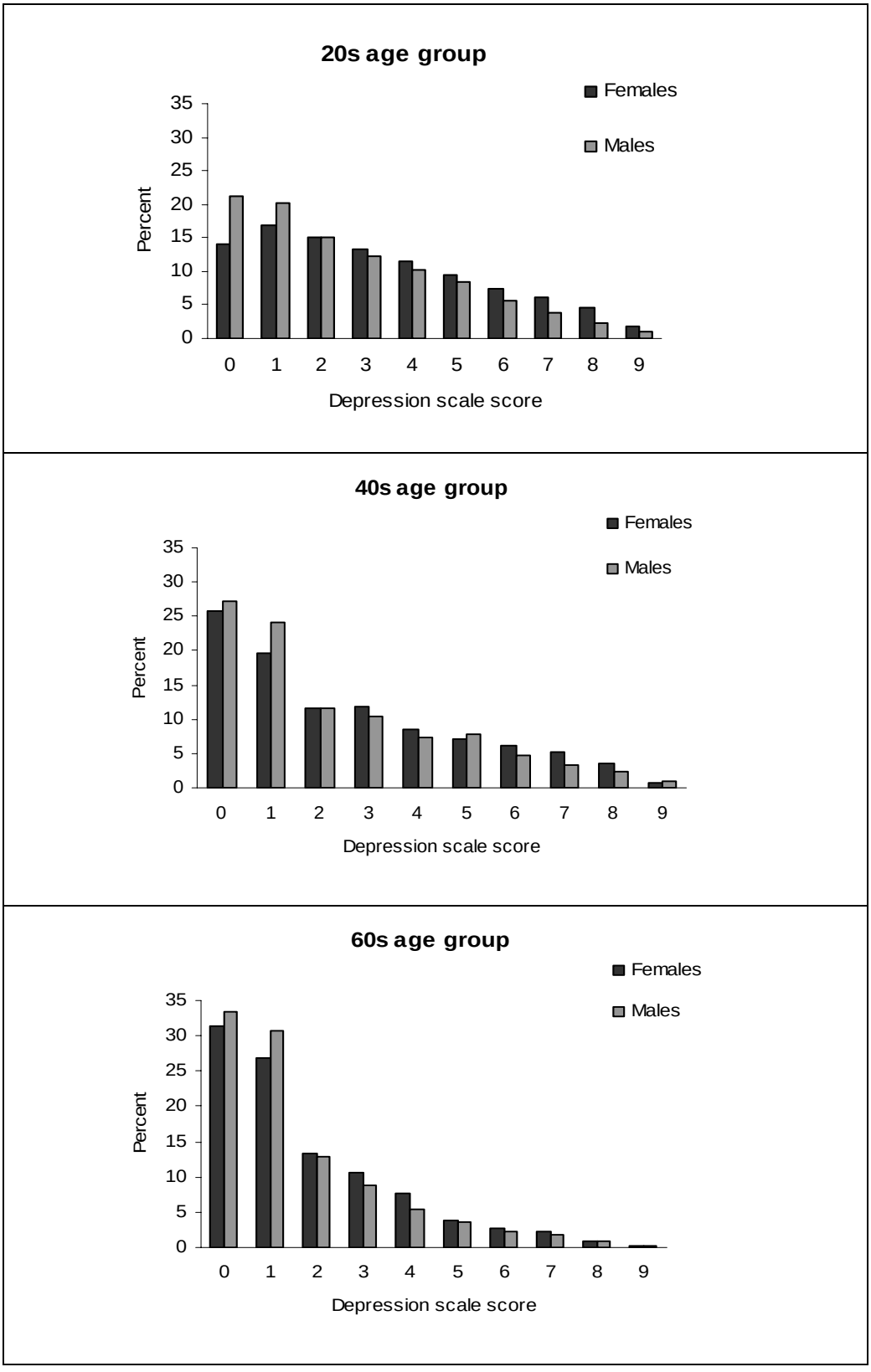


Figure 4-2. Distribution for the Goldberg Anxiety Scale (0-9) for each age group in the PATH sample.

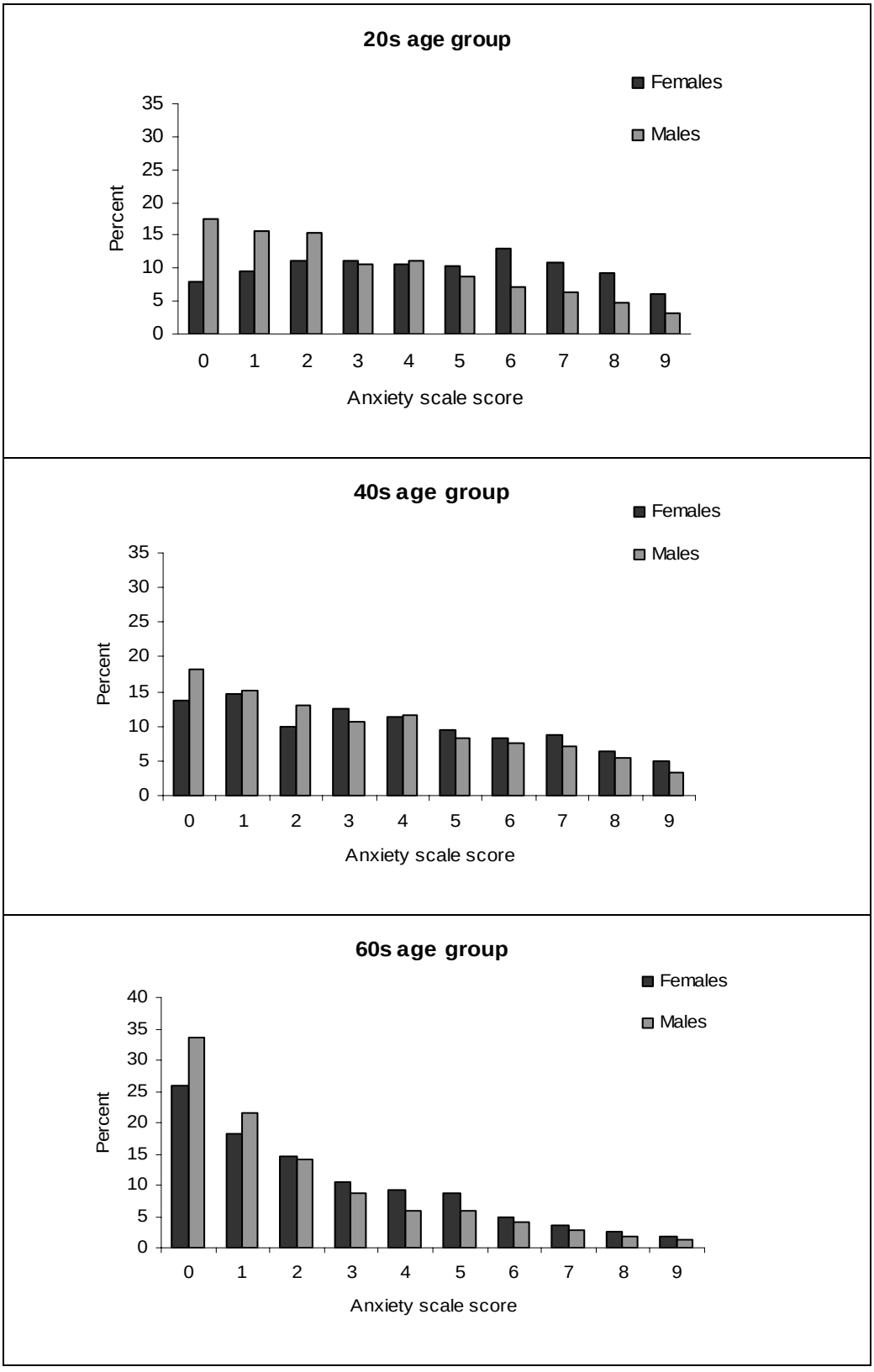


Table 4-6. Descriptive statistics for mental health outcomes, by gender, age group and wave.

		20s				40s				60s			
		Males		Females		Males		Females		Males		Females	
		Total N	Mean (SD)	Total N	Mean (SD)	Total N	Mean (SD)	Total N	Mean (SD)	Total N	Mean (SD)	Total N	Mean (SD)
Depression	W1	1155	2.58 (2.28)	1231	3.18 (2.44)**	1184	2.27 (2.30)	1331	2.56 (2.43)*	1313	1.58 (1.83)	1227	1.78 (1.93)*
	W2	1010	2.54 (2.49)	1119	3.08 (2.44)**	1098	2.04 (2.19)	1244	2.38 (2.41)**	1135	1.53 (1.80)	1061	1.80 (1.91)*
Anxiety	W1	1154	3.19 (2.60)	1231	4.44 (2.67)**	1183	3.29 (2.67)	1331	3.72 (2.73)**	1313	2.00 (2.25)	1227	2.50 (2.38)**
	W2	1010	3.18 (2.68)	1120	4.23 (2.67)**	1098	2.87 (2.55)	1246	3.45 (2.75)**	1135	1.89 (2.17)	1062	2.46 (2.36)**
SF-12 (Mental Health)	W1	1155	48.78 (9.68)	1229	45.45 (10.90)**	1190	50.07 (9.59)	1335	48.82 (10.21)**	1310	54.36 (7.12)	1231	54.07 (8.12)
	W2	994	48.79 (9.76)	1106	46.79 (10.37)**	1069	20.58 (8.90)	1227	49.70 (9.85)*	1100	55.14 (6.98)	1018	54.16 (8.00)*

Note: Significance tests were: Independent samples t-tests for continuous variables, and chi-square tests for categories. * p<.05, ** p<.001. Further description of the significant gender differences found for each variable is provided in Chapter 7.

4.7. Investigating the effect of attrition at Wave 2

A total of 770 (10.3%) participants who were interviewed in Wave 1 were not reinterviewed in Wave 2. The effect of attrition between Waves 1 and 2 was examined by comparing those who participated in both waves to those who only completed the first wave of the survey. The data in Table 4-7 compares the socio-demographic status and mental health of these two groups. In comparison to those who completed both waves, those who dropped out after the first wave were significantly more likely to be male, in the 60s age group and not employed. They also had less education, were less likely to be in married or de facto relationships, had higher levels of depression, and poorer general mental health.

Table 4-7. Comparing those who did and did not participate in Wave 2 for socio-demographic characteristics, and mental health outcomes.

	Wave 2 sample (n=6715)	Wave 2 non-participants (n=770)
Socio-demographic factors		
Gender (males)	48.6%	53.1%**
Age group		
20s	31.9%	34.4%
40s	35.1%	22.9%**
60s	33.1%	42.7%**
Married/de facto (yes)	61.7%	54.2%**
Separated/divorced (yes)	8.4%	10.2%
Number of children	1.75 (1.67)	1.75 (1.69)
Employed full or part-time (yes)	72.9%	60.4%**
Education	14.36 (2.29)	13.65 (2.67)**
Mental health outcomes		
Depression	2.29 (2.63)	2.55 (2.38)*
Anxiety	3.17 (2.66)	3.34 (2.80)
General mental health	50.39 (9.78)	49.50 (10.72)*

Note: Significance tests: Independent samples t-tests used for continuous variables, chi-square for categories. * $p<.05$, ** $p<.001$.

Table 4-8 shows the difference in mental health outcomes between those who completed both waves and those who dropped out, separated by gender and age group. The table shows that the higher levels of depression, anxiety and overall poorer mental health in those who did not complete Wave 2 is specific to men and women in the 60s age group. There was no difference in mental health outcomes between those who were reinterviewed and those who weren't for the 20s and 40s age groups. The possible effects of attrition should be kept in mind when interpreting results that use both waves of the PATH data and in particular effects related to the oldest cohort.

Table 4-8. Comparing those who did and did not participate in Wave 2 for mental health outcomes, by gender and age group.

	Wave 2 sample (total n=6715)	Wave 2 non-participants (total n=770)
Depression		
20s Males	2.57 (2.28)	2.73 (2.29)
20s Females	3.16 (2.23)	3.34 (2.51)
40s Males	2.26 (2.28)	2.40 (2.56)
40s Females	2.55 (2.42)	2.73 (2.62)
60s Males	1.49 (1.75)	2.22 (2.20)**
60s Females	1.73 (1.90)	2.11 (2.13)*
Anxiety		
20s Males	3.17 (2.59)	3.39 (2.69)
20s Females	4.44 (2.65)	4.44 (2.91)
40s Males	3.27 (2.66)	3.45 (2.85)
40s Females	3.70 (2.71)	4.03 (2.94)
60s Males	1.92 (2.17)	2.54 (2.69)*
60s Females	2.45 (2.36)	2.88 (2.49)*
General mental health		
20s Males	48.79 (9.65)	48.73 (9.92)
20s Females	45.55 (10.73)	44.52 (12.39)
40s Males	50.13 (9.22)	49.41 (10.17)
40s Females	48.92 (10.15)	47.48 (11.05)
60s Males	54.68 (7.43)	52.24 (9.13)**
60s Females	54.36 (7.71)	52.07 (10.34)*

Note: Significance tests: Independent samples t-tests used. * $p<.05$, ** $p<.001$.

4.8. Chapter conclusions

Waves 1 and 2 of the PATH dataset are used throughout this thesis to investigate gender differences in anxiety and depression across the adult lifespan. The current chapter described the sample, procedure and relevant measures from the PATH survey. The sample consists of three narrow aged cohorts, initially aged 20-24, 40-44 and 60-64. At Wave 1, 7485 respondents were interviewed and 6175 respondents were re-interviewed for Wave 2. The measures described in this chapter were grouped as socio-demographic, health and lifestyle, social and psychological measures. The key outcome measures described were the Goldberg Anxiety and Depression Scales. Several differences were found between participants who completed both waves of the survey, and those who were not reinterviewed after Wave 1. Those who did not complete both waves were more likely to be male, in the 60s age group, unemployed, and unpartnered. They also had poorer mental health. Subsequent gender and age comparisons showed that the poorer mental health of 'drop outs' was confined to participants in the 60s age group. Further information on the analyses techniques adopted and the specific samples used is provided as needed in each of the study chapters (5-8).

5. STUDY 1: DESCRIBING THE GENDER DIFFERENCE IN LEVELS OF DEPRESSION AND ANXIETY ACROSS THE ADULT LIFESPAN

5.1. Summary

Although it is well established that women more frequently experience depression and anxiety than men, the age distribution for the gender difference in both outcomes across the lifespan is yet to be determined. The current chapter utilises two waves of the PATH data to examine the gender difference in levels of depression and anxiety across three age group samples (Wave 1: 20-24, 40-44 and 60-64). The primary research question under investigation is: *How do gender differences in levels of depression and anxiety differ across the adult lifespan?* Based on the research evidence available it was hypothesised that the gender differences in both outcomes would vary across the three age groups assessed. At all three ages, women experienced higher levels of depression and anxiety than did men. Cross-sectional analyses showed that the gender difference in both outcomes varied significantly between the age groups, with the greatest disparities occurring in the youngest age group. Longitudinal analyses examined change in the gender gap across a four year period, and found that the gap in anxiety narrowed over time for the 20s age group in comparison to the 40s group. The gender difference in a general measure of psychological distress was also found to narrow across time for the 20s age group in comparison to the 60s group. These findings confirm that a lifespan approach is an important aspect of describing the gender difference in levels of depression and anxiety, and that a simple description of a 2:1 ratio without considering age variation is inadequate.

5.2. Background

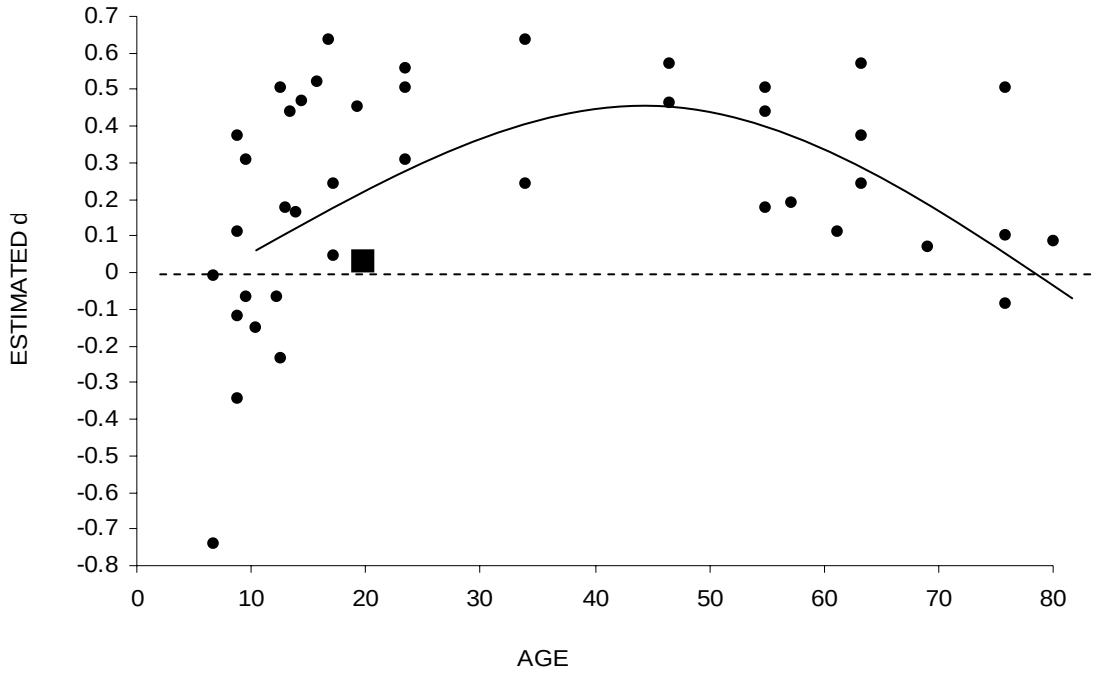
This chapter begins with a review of prior research examining the age distribution for the gender difference in depression and anxiety primarily in adulthood. Two research questions are considered in this review: a) at which stage of the lifespan do gender differences in depression and anxiety peak? and b) are gender differences maintained in older age groups or is there a narrowing of the gender gap later in life? The bulk of available research concerns depression and is cross-sectional, while less is known about the age distribution of the gender difference in anxiety.

5.2.1. Depression: Determining the peak age of the gender difference

Findings regarding the age point at which the gender difference in depression peaks are inconsistent. The two main time points under consideration are late adolescence/early adulthood and mid-life. As outlined in Chapter 2, results from a meta-analysis conducted by Jorm (1987) suggest that the gender difference in depression grows during young-adulthood, peaks mid-life, and decreases in older age (see Figure 5-1). Jorm analysed 25 studies which reported the prevalence of categorised depressive states and 11 studies which provided norms on depression inventories. A large number of studies were excluded as they did not provide data for gender differences at age ranges of 10 years or less. The magnitude of gender differences was quantified by calculating effect sizes - Cohen's 'h' where depression was categorised and Cohen's 'd' where depression was measured on a continuum. Scatter-plots of both Cohen's h and d against age revealed a clear inverted U-shaped trend. These findings suggest that the gender gap in depression is age specific, with the peak difference reached in mid-life. Jorm highlights that the gender disparity was found to be greatest at an age where male and female employment and social roles diverge most.

His findings and interpretations compliment the 'the age increment hypothesis' proposed by Mirowsky (1996). This hypothesis proposes that the gender gap grows throughout adulthood as women and men enter unequal statuses based on financial, employment and role status.

Figure 5-1. Scatter-plot reproduced from Jorm (1987). Depicts effect sizes for the gender difference in depression across age.



"Figure 1. Regression line predicting sex differences for depression inventories (d) from age. The single point at age 20 represents data from university students."

Note: Reproduced with permission from the author (Professor Anthony Jorm).

A number of other studies have found that the largest gender difference for depression does not occur during mid-life, but instead transpires during late adolescence or young adulthood. In a case register study of inner London residents who made contact with psychiatric services, Der & Bebbington (1987) found that the gender ratio of incidence rates for both mild and severe depression peaked at ages 15-24, and subsequently declined in older age groups (as shown in Table 5-1).

Table 5-1. Gender ratio of Depressive Disorder incidence by age: data from Camberwell Register 1964-1982 (Data source: Der & Bebbington, 1987).

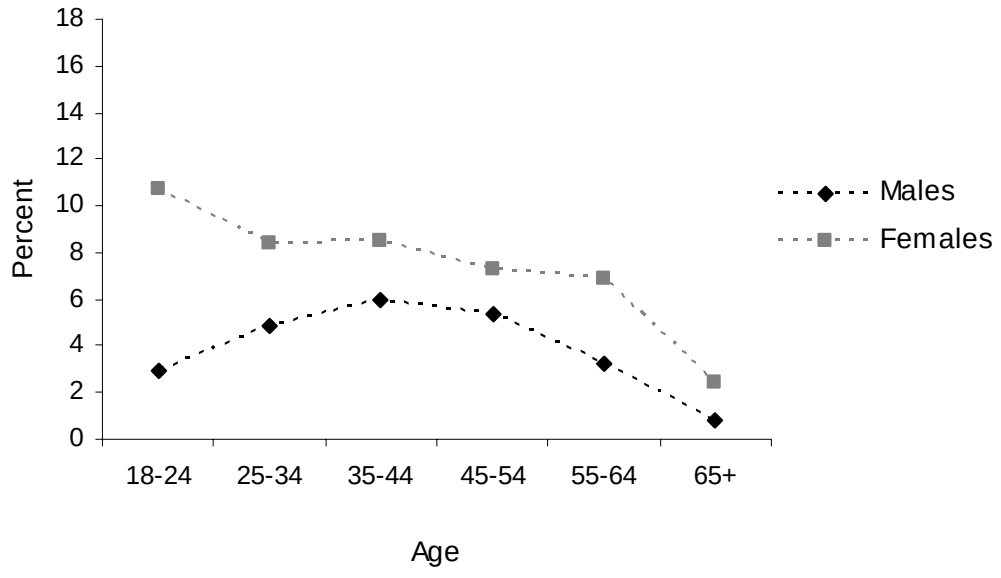
Disorder	15-24	25-34	35-44	45-54	55-64	65-74	75+
Severe depression	2.9	2.2	1.9	1.5	1.3	1.2	1.4
Mild depression	2.9	2.4	1.7	1.5	1.3	1.2	1.0
All depressions*	2.7	2.3	1.8	1.4	1.3	1.2	1.0

Note: * Including 'not otherwise stated'.

Data from a number of large population based studies have also indicated that it is during this earlier age point that the gender gap is greatest. The National Institute of Mental Health Collaborative (NIMH) Study of the Psychobiology of Depression found that the discrepancy between incidence rates for men and women was highest for adolescents and young adults (Leon et al., 1993). The Australian National Survey of Mental Health and Wellbeing (NSMHWB) used the Composite International Diagnostic Interview (CIDI v2.1; World Health Organisation, 1997) to assess the epidemiology of various mental illnesses. The results showed that the greatest gender difference for 12 month prevalence of affective disorders (Major Depression or Dysthymia) was for ages 18-24, as shown in Figure 5-2 (ABS, 1997). Analyses conducted using the National Survey of Psychiatric

Morbidity in the UK also indicated that the gender difference in one-week prevalence of a Major Depressive Episode, based on ICD-10 criteria, was greatest in the 25-34 year old age group (Bebbington et al., 1998). Results from the first National Comorbidity Survey (NCS) in the US are less clear. The gender difference in 12 month prevalence of Major Depression remained fairly consistent across age, with the largest differences occurring at both the 15-24 and 45+ age points (Kessler et al., 1993). Results from the NIMH Epidemiologic Catchment Area Studies (ECA) are also unclear, partly due the wide age ranges provided in published data. Weissman et al. (1988) found that the gender ratios for the 12 month prevalence of Major Depressive Disorder for the age groups 18-44, 45-64 and 65+ were 3.0, 2.2 and 3.5 respectively.

Figure 5-2. 12 month prevalence of affective disorders (Major Depression and Dysthymia) from the NSMHWB (Data source: ABS, 1997, catalogue no. 4326.0).



When comparing the results from each of these epidemiological studies more closely, it becomes apparent that at least some of the contradictions in findings may be due to methodological differences. Once these differences are considered, further support emerges for the suggestion that the gender disparity in depression prevalence is greatest in young adulthood. For example, the youngest age range reported in the ECA studies for Major Depression prevalence is 18-44 (Weissman et al., 1988). It may be that the gender disparity is greatest for young adults in the ECA, but the grouping of age categories makes this hypothesis untestable. The meta-analyses conducted by Jorm (1987) offers a further example of how the age range studied might affect the results obtained. This study analysed data from both adults and children. As rates for depression have been shown to be relatively equal among children (Angold & Rutter, 1992), it is likely that including this sample weighed down the inverted u-shaped curve at the young end of the lifespan (see Figure 5-1). It is reasonable to assume that the gender gap between young and middle aged adults would have appeared more similar if the sample were truncated to include adults only. Although it is difficult to conclude at which life stage the gender difference in depression is greatest, after considering the methodological differences between studies, young adulthood appears to be the most likely candidate period.

5.2.2. Depression: Maintenance of the gender difference in older age groups

Investigations of the gender gap in depression for older age groups have also provided inconsistent findings. While some research indicates that the gender difference disappears or even reverses in the elderly, other research has shown that a strong difference is maintained or even increases. These contradictions were highlighted in an early review conducted by Feinson (1987). This review found that of ten studies examining depression

in the elderly, six showed greater depression for women, three had mixed results, and one suggested men experienced greater symptoms. A more recent review conducted by Djernes (2006) also found inconsistencies. While the majority of studies reviewed (68%) showed that being female was associated with both depressive disorder and symptom levels, a gender difference in depression was not evident in a third of studies examined.

Further contradictory results are revealed when comparing the findings from large population based studies. Cairney & Wade (2002) reported that in the Canadian National Population Health Survey gender differences in 1-year population prevalence rates of Major Depressive Episode were maintained after age 54. Mirowsky (1996) also investigated the gender gap during old age. This study combined data from three surveys (1990 US Survey of Work, Family and Well-being, 1985 Illinois Survey of Well-Being, and the 1998-1989 National Survey of Families and Households) and found that using the CES-D as a depression measure, the gender difference was not only maintained in older populations but was greater in comparison to younger age groups. Results from the ECA studies also indicate that in later life the gender difference in depression is greater than in younger years (Weissman et al., 1993). However, the complete converse of this finding was shown in data from the British National Survey of Psychiatric Morbidity. Jenkins & Meltzer (1995) showed a clear reversal of the gender difference in 1-week prevalence of depressive episode for those aged over 55, supporting the view that the gender gap reverses post-menopause (Bebbington et al., 1998).

Perhaps the most probable description of what happens to the gender difference in older age groups is that the gap does narrow, but a female excess of depression is still maintained. This was found to be the case in the meta-analysis conducted by Jorm (1987),

where gender differences were shown to exist at a decreased level in the elderly. Support for this pattern can also be seen in a three-year follow-up study conducted by Green et al. (1992), where incidence of depression was still greater for women than men post age 65. Stallones et al. (1990) similarly found an excess of depressive symptoms in females when interviewing a community sample of over 65 year olds using the CES-D. The Australian NSMHWB also seems to suggest that the gender difference in depression is maintained in a narrower form in later life (see Figure 5-2). A longitudinal study conducted by Barefoot, Mortensen, Helms, Avlund, and Schroll (2001) measured depression levels for a single cohort of community residents using the Obvious Depression Scale at age 50, 60, and 80. This study found that women had higher levels of depression than men at ages 50 and 60, however there was no difference at aged 80 due to an increase in depression for men. This longitudinal study suggests that it may only be in 'old old' age that the gender ratio for depression converges.

5.2.3. Depression: Age effects versus cohort effects

Clarifying the age distribution for the gender difference in depression is made more complex by the enmeshment of possible cohort effects. The separation of age effects from cohort effects concerns the question of whether change in an outcome occurs at a particular age (across all cohorts), or whether it occurs to a group of people born in the same time period. An example of an age effect offered by Warshaw, Klerman and Lavori (1991) is the increase of Alzheimer's disease (AD) in the elderly. In this example the risk of developing AD increases with age independent of birth cohort. An example of a cohort effect is the decrease in polio morbidity for cohorts born after the introduction of a vaccine

(Warshaw et al. 1991). In this second example, the event affects a particular birth cohort rather than a specific age group.

In the case of the gender ratio for depression, it has been suggested that changes in the distribution across age could be due to a cohort effect. Specifically, research by Weissman et al. (1993) using data from the ECA studies has indicated that gender differences in the onset of depression have narrowed for cohorts born after 1945 (World War II), due to an increase in depression for males and a stabilisation for females. However, data from the NCS suggests that lifetime prevalence rates for depression have increased for both men and women in more recent cohorts, with no major change in the sex ratio for the 40-year period covered (Kessler, McGonagle, Nelson et al., 1994). Also, no cohort effects were found in the Psychobiology of Depression study conducted by Leon et al. (1993).

In order to disentangle age effects from cohort effects longitudinal data is required. This type of data allows researchers to track several cohorts over time and compare how they change at certain age points. Both retrospective and prospective follow-up studies have been used to examine gender differences in depression however the majority of studies have been retrospective. One problem with retrospective interviews is that the data quality is subject to the memory of participants. For this reason further prospective longitudinal research is necessary to more reliably describe the pattern of the gender difference in depression across the lifespan and to identify possible cohort effects. The two waves of longitudinal data analysed in the current chapter do not cover a time period long enough to distinguish between age and cohort effects. This limitation is noted.

5.2.4. General Anxiety: Determining the peak age of the gender difference

In parallel to research examining depression, there is evidence to suggest that the gender difference in levels of general anxiety is not stable across age. However, there is less research describing the possible patterns of distribution. Data from large epidemiological surveys provide the best sources of evidence to examine at which life-stage the gender difference in anxiety might peak. In the NSMHWB the largest gender difference in the 12-month prevalence of Generalised Anxiety Disorder (GAD) was for young adults (see Figure 5-3) (ABS, 1997). However, results from the NCS suggest that the gender difference in the 12-month prevalence of GAD is greatest for those aged 45-54, rather than young adults (Wittchen et al., 1994). Results from the ECA studies are difficult to interpret due to the large age categories adopted, but the two younger age groups (18-24 and 25-44) have a greater gender difference in 12 month prevalence for any anxiety disorder than the two older age categories (45-64, 65+) (Regier, Narrow, & Rae, 1990). Results for the NCS and the ECA studies are shown in Figures 5-4 and 5-5. Taken together, these results do not provide much certainty as to the age at which the gender difference in anxiety peaks.

Figure 5-3. 12 month prevalence of GAD from the NSMHWB (Data source: ABS, 1997, catalogue no. 4326.0).

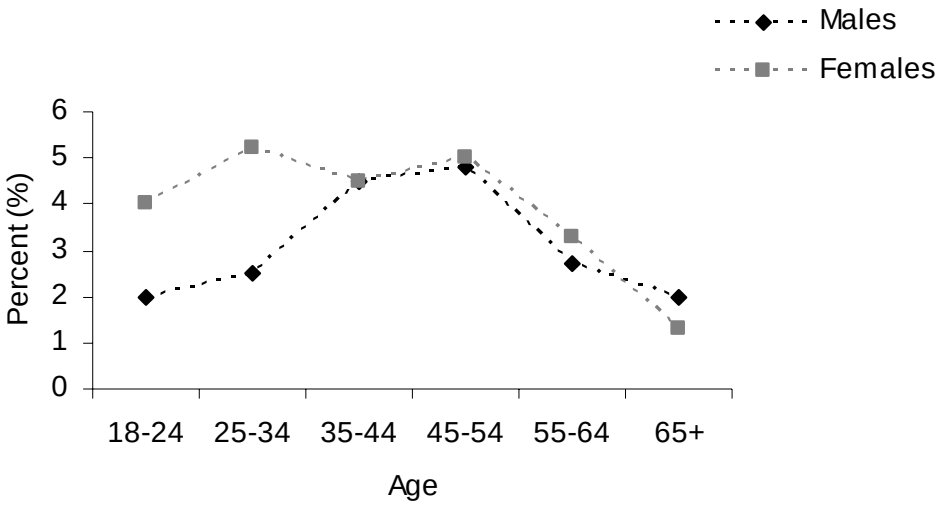


Figure 5-4. 12 month prevalence of GAD from the NCS (Data source: Wittchen, et al., 1994).

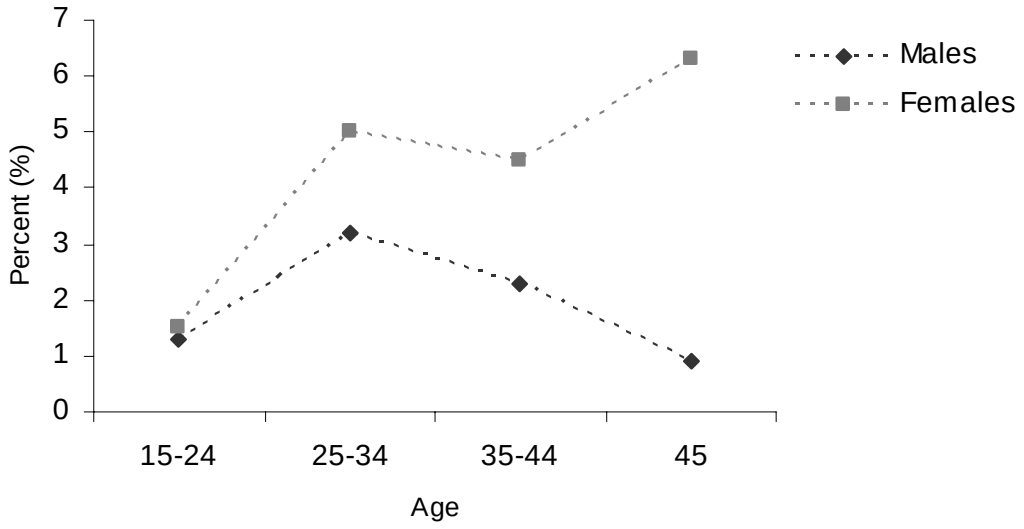
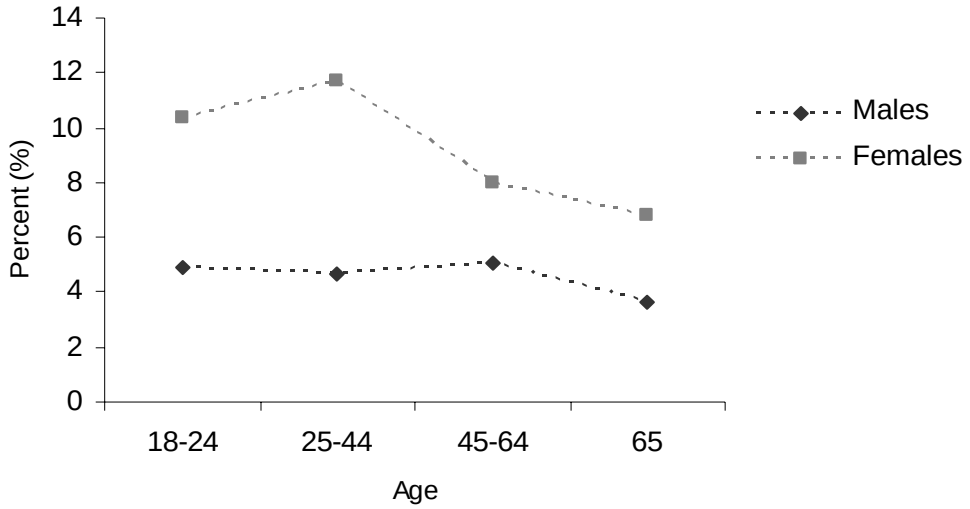


Figure 5-5. 12 month prevalence of any anxiety disorder from the ECA (Data source: Regier et al., 1990).



5.2.5. General Anxiety: Maintenance of the gender difference in older age groups

It is also unclear whether the gender difference in anxiety increases, converges, or disappears during old age. The NSMHWB indicates that the prevalence of GAD converges after age 35, with males showing a slight preponderance after age 65. There is also some convergence of the gender gap in GAD results from the ECA after age 45. However, the NCS suggests that the gender difference in experiencing any anxiety disorder is largest at age 45. The age distributions for each of these surveys are shown in Figures 5-3, 5-4 and 5-5. Perhaps it is unreasonable to expect comparable results from these three national surveys due to differing age ranges and diagnostic categories utilised. The general consensus from other large epidemiological studies focused on ageing populations is that a female preponderance of anxiety symptoms is maintained in the elderly. This was shown to be the case in the Longitudinal Study of Amsterdam (Beekman et al., 1998), where in a large random sample of 55-85 year olds the six month prevalence rate for having any anxiety

disorder was almost twice as high for women (13%) than it was for men (7%). A review conducted by Flint (1994) of anxiety disorders in late life similarly concluded that being female was associated with a higher prevalence of any anxiety disorder in those aged 65 and above. Again, the possibility of cohort effects should be acknowledged when investigating the age distribution for the gender difference in anxiety. To date, there has been very little research examining the intersection between possible age and cohort effects across gender for anxiety problems.

5.3. Aims

The aim of the present study was to describe gender differences in levels of depression and anxiety in a large representative sample of Australians, and investigate the pattern of variation across three narrow age cohorts (20s, 40s and 60s) representing the adult lifespan. This study also investigated longitudinal change (4 years) in the gender difference for these outcomes over two time points, and whether this varied between the age groups. In conducting these analyses, the current chapter aimed to clarify the age distribution for gender difference in both outcomes. Based on the research evidence reviewed above it was hypothesised that the gender difference in levels of depression and anxiety would vary significantly across the three age groups assessed, suggesting that a lifespan approach is an important aspect of describing the gender differences in these outcomes

5.4. Methodology

Data from the three narrow age cohorts (20s, 40s, 60s) in Waves 1 and 2 of the PATH Through Life Survey were analysed in the current study. General information about

the PATH survey sample, procedure and measures has been described previously in the methodology chapter (4). The primary outcome measures used in the current study were the Goldberg Anxiety and Depression Scales (Goldberg et al., 1988). The Mental Health Component Summary Scale from the SF-12 was also used as an outcome measure in the current study (Ware & Kosinski, 2001; Ware et al., 1996). When interpreting the results in this chapter, it is important to recall that higher scores on both Goldberg Scales indicate greater symptomology, whereas higher scales on the SF-12 scale indicate better mental health.

5.4.1. Statistical analyses

The analyses were conducted for two samples, those with data on the Goldberg Depression and Anxiety Scales at time 1 and time 2, and those with data on the SF-12 Mental Health Component Summary Scale (SF-12) at both time points. The analyses were conducted first using the Goldberg Scales, and were then repeated using the SF-12 as an outcome to investigate the consistency of results. Due to the small number of variables included in each analysis (gender, age group and outcome variables), it was decided to remove the cases with missing data rather than impute information. Therefore, 854 participants (770 due to attrition between waves) were omitted from the Goldberg analyses with the final sample being 2112 in the 20s age group (47.5% male), 2329 in the 40s (46.8% male), and 2190 in the 60s (51.7% male). One thousand participants were omitted in the SF-12 analyses, with the final sample being 2083 in the 20s age group (47.5% male), 2292 in the 40s (46.5% male), and 2110 in the 60s (51.8% male). Details regarding differences between those participants who completed both waves of the survey, and those who completed only the first wave were provided in Chapter 4.

Analyses were conducted using both SPSS (Statistical Package for the Social Sciences) version 15.0 and Stata (Data Analysis and Statistical Software) version 9.0 and proceeded in three stages. The first stage produced a series of descriptive statistics describing the variability in depression and anxiety scores across time 1 and 2, for each gender and age group. The second stage involved cross-sectional analyses which aimed to establish that the gender difference in scores varied across the age groups, both at time 1 and time 2. In the third stage, longitudinal analyses were conducted to determine whether the gender difference in each outcome changed differently over time for each age group. Each of these stages is described in more detail below.

Initially, descriptive statistics and line graphs were obtained to examine the variability of depression and anxiety scores across the two time points. The line graphs mapped scores at time 1 against scores at time 2 for each gender and age group. Comparing the line graphs for men and women gave an indication of whether the variation in scores across time differed by gender. To accompany this information, Ordinary Least Squares (OLS) regressions assessing the interaction between gender and time 1 scores when predicting time 2 scores were also conducted for each age group. These regressions examined whether the impact of time 1 scores upon time 2 scores (or variability in scores across waves) differed for each gender. Following the descriptive analyses, a series of cross-sectional OLS regressions were conducted separately for time 1 and time 2. The purpose of these analyses was to examine whether gender, age group, and the interaction between gender and age group predicted depression, anxiety and overall mental health at each wave. The presence of interaction effects between gender and age group were of principal interest as they indicated gender differences varied across the age groups. Lastly,

a series of longitudinal mixed models were conducted using the xtreg command and the General Least Squares (GLS) random effects estimator option in Stata. These analyses primarily investigated change in the gender difference in psychological outcomes over the two time points (a 4 year period). The main effect of gender, age group and time upon each mental health outcome was investigated, as well as the two and three-way interactions between these variables.

Longitudinal analysis is often associated with the ability to model both fixed parameter estimates (average between-person effects such as intercepts or slopes) as well as 'random' effects (the amount of between-person variability surrounding these estimates, representing within-person rates of change) (Nezlek, 2001). However, as the present investigation was limited to two measurement occasions, there were insufficient observations for each person to investigate estimates of variability (a random effect) for the regression coefficients. Therefore, the regression coefficients provided represent fixed effects only.

As preliminary analyses showed that the distributions of residuals between the primary predictor 'gender' and the outcomes 'anxiety' and 'depression' were non-normal, robust standard errors were adopted in all regressions as a conservative measure. The reference category used for age group in both cross-sectional and longitudinal regression analyses was the 40s age group.

5.5. Results

5.5.1. Descriptive statistics and line graphs

Descriptive statistics and basic tests of gender difference (t-tests) for each outcome measure are shown by age group in Table 5-2. Across all age groups, women experienced

a significantly higher mean number of depression and anxiety symptoms at both time 1 and 2. Women also experienced significantly poorer mental health (SF-12) across all age groups and time points, except for the 60s age group at time 1.

Table 5-2. Descriptive statistics for mental health outcomes by age group and gender.

	20s		40s		60s	
	Men mean (SD)	Women mean (SD)	Men mean (SD)	Women mean (SD)	Men mean (SD)	Women mean (SD)
Time 1						
GB Dep.	2.56 (2.28)	3.16 (2.43)**	2.27 (2.28)	2.55 (2.42)*	1.47 (1.75)	1.74 (1.90)*
GB Anx.	3.16 (2.59)	4.43(2.65)**	3.28 (2.66)	3.69 (2.71)**	1.90 (2.15)	2.45 (2.36)**
SF-12	48.81 (9.60)	45.46 (10.75)**	50.09 (9.22)	48.96 (10.14)*	54.69 (7.43)	54.41 (7.63)
Time 2						
GB Dep.	2.54 (2.49)	3.09 (2.44)**	2.03 (2.18)	2.39 (2.41)**	1.53 (1.80)	1.80 (1.92)*
GB Anx.	3.17 (2.68)	4.24 (2.67)**	2.86 (2.43)	3.45 (2.75)**	1.89 (2.17)	2.45 (2.36)**
SF-12	48.80 (9.77)	46.78 (10.40)**	50.58 (8.90)	49.70 (9.85)*	55.14 (6.98)	54.17 (8.00)*

Note: *=p<.05, **p<.001. GB – Goldberg Scale.

Graphs plotting time 1 depression scores against time 2 scores for each gender and age group are shown in Figure 5-6. Complimenting this figure, Table 3 shows the interactions between time 1 depression scores and gender, predicting time 2 scores, for each age group. For the 20s age group, graph 'a' shows that scores at time 1 explained more of the variation in depression at time 2 for men (R^2=.25), than for women (R^2=.19), indicating greater stability in scores for men. This can also be seen in Table 3, where there is a significant gender by time 1 score interaction. The interaction indicated that women's scores were more likely to change upwards if they had a low score at time 1, and downwards if they had a high score at time 2, whereas men's scores were more stable. For the 40s age group, graph 'b' shows there was no gender difference in the variation at time 2 explained by time 1 depression scores. This is reflected by the lack of interaction

between gender and time 1 scores in Table 5-3. For the 60s, graph 'c' shows that scores at time 1 explained more of the variation in depression at time 2 for males (R^2=.38) than females (R^2=.28). This is also reflected by the interaction in Table 5-3. Once again, it appeared that women's scores were more likely to change upwards if they had a low score at time 1, and downwards if they had a high score at time 2, whereas men's scores were more stable. These results suggest that across time, depression scores were more stable for men in the 20s and 60s age groups than for women, but there was little difference in stability in the 40s.

Table 5-3. The effect of Wave 1 on Wave 2 outcome scores by gender, for each age group.

	20s		40s		60s	
	Model 1 β (SE)	Model 2 β (SE)	Model 1 β (SE)	Model 2 β (SE)	Model 1 β (SE)	Model 2 β (SE)
Gender	-.26 (.10)*	-.58 (.15)**	-.21 (.08)*	-.19 (.12)	-.12 (.07)	-.27 (.09)*
Depression W1	.49 (.02)**	.44 (.03)**	.53 (.02)**	.53 (.02)**	.58 (.02)**	.54 (.03)**
Gender × Depression W1		.11 (.04)*		-.01 (.03)		.01 (.04)*
Gender	-.44 (.11)**	-.66 (.18)**	-.38 (.09)**	-.05 (.15)	-.25 (.08)*	-.36 (.11)*
Anxiety W1	.50 (.02)**	.47 (.03)**	.52 (.02)**	.56 (.02)**	.57 (.02)**	.55 (.02)**
Gender × Anxiety W1		.06 (.04)		-.10 (.04)*		.05 (.04)
Gender	.65 (.41)	-4.72 (1.94)*	.39 (.35)	1.83 (1.86)	.85 (.29)*	-6.18 (2.13)*
SF-12 W1	.41 (.02)**	.36 (.03)**	.43 (.02)**	.45 (.02)**	.44 (.02)**	.38 (.03)**
Gender × SF-12 W1		.11 (.04)*		-.03 (.04)		.13 (.04)*

Note: *=p<.05, **p<.001. Robust standardised errors are shown. × indicates the interaction effect..

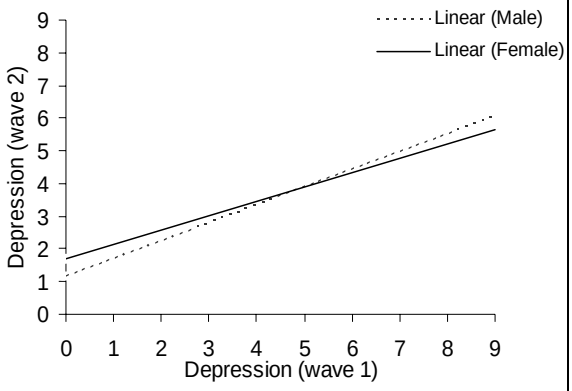
The graphs plotting time 1 anxiety scores against time 2 scores for each gender and age group are shown in Figure 5-7. For the 20s and 60s age groups, there was no significant gender difference in the variation at time 2 explained by time 1 scores. These results are reflected in Table 5-3 where there is no gender by anxiety (Wave 1) interaction. For the 40s age group, graph 'b' shows that scores at time 1 explained more of the

variation in anxiety at time 2 for females (R^2=.30) than they did for males (R^2=.24). This gender difference is shown to be significant in Table 5-3, where there is an interaction between gender and anxiety at Wave 1. The graph shows that women who had high scores at time 1 more consistently maintained these high scores at time 2, than did men with high scores.

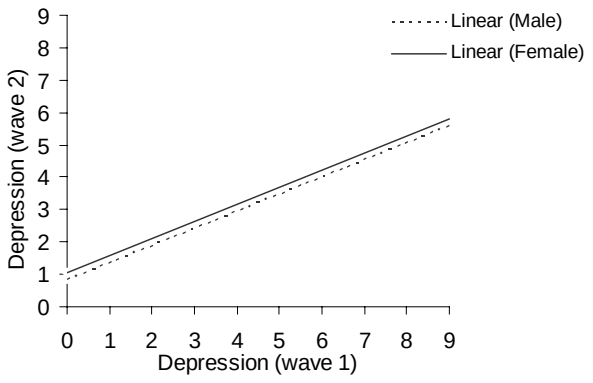
The graphs plotting time 1 SF-12 scores against time 2 scores for each gender and age group are shown in Figure 5-8. For the 20s age group, graph 'a' shows men's SF-12 scores were more stable (R^2=.22) than women's (R^2=.14). This is reflected in Table 3, where there is a gender by time 1 score interaction. For the 40s age group, graph 'b' shows there was no gender difference in the variation at time 2 explained by time 1 SF-12 scores. This finding is reflected by the lack of interaction in Table 5-3. For the 60s, graph 'c' shows that scores at time 1 explained more of the variation in SF-12 scores at time 2 for men (R^2=.29) than they did for women (R^2=.13). This is also reflected in Table 3, where there is a gender by time 1 score interaction. These results suggest that across time, SF-12 scores were more stable for men in the 20s and 60s age groups than they were for women, with little difference in stability in the 40s. These results mirror those found for depression.

Figure 5-6. Line graphs plotting time 1 depression scores against time 2 depression scores.

Graph (a): Time 1 by Time 2 for the 20s age group (n=2112)



Graph (b): Time 1 by Time 2 for the 40s age group (n=2329)



Graph (c): Time 1 by Time 2 for the 60s age group (n=2190)

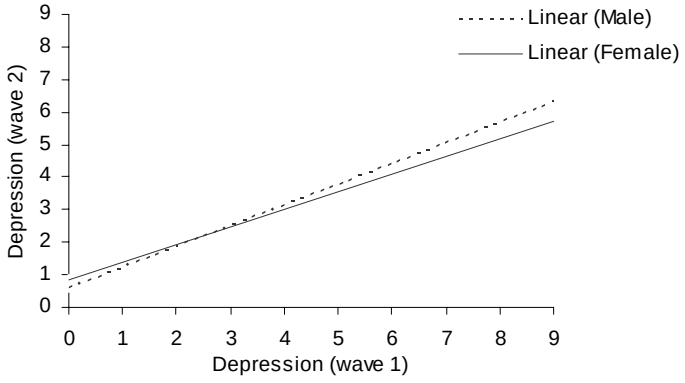
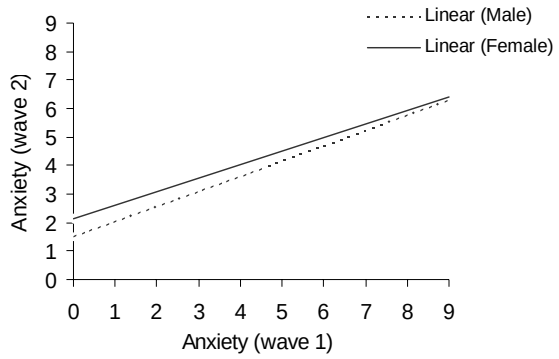
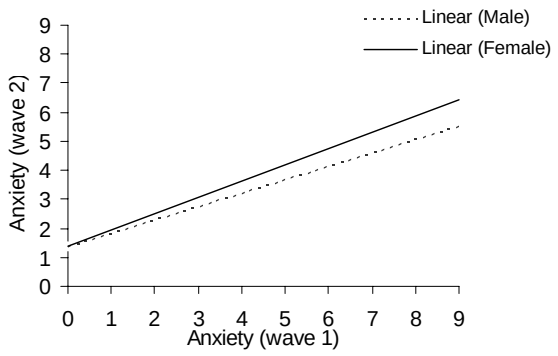


Figure 5-7. Line graphs plotting time 1 anxiety scores against time 2 anxiety scores.

Graph (a): Time 1 by Time 2 for the 20s age group (n=2112)



Graph (b): Time 1 by Time 2 for the 40s age group (n=2329)



Graph (c): Time 1 by Time 2 for the 60s age group (n=2190)

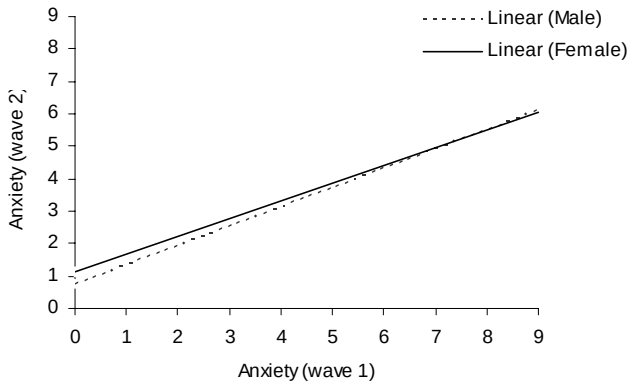
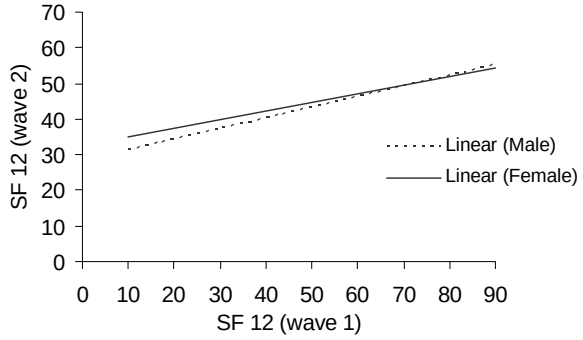
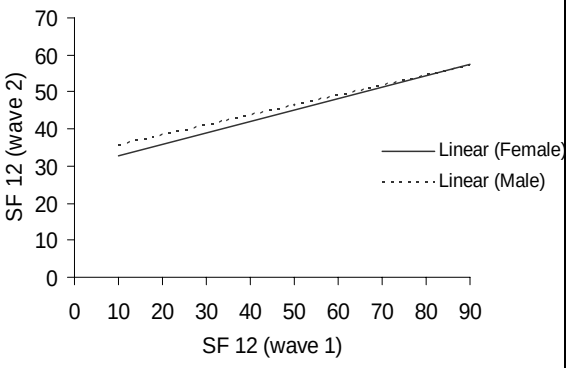


Figure 5-8. Line graphs plotting time 1 SF-12 scores against time 2 SF-12 scores.

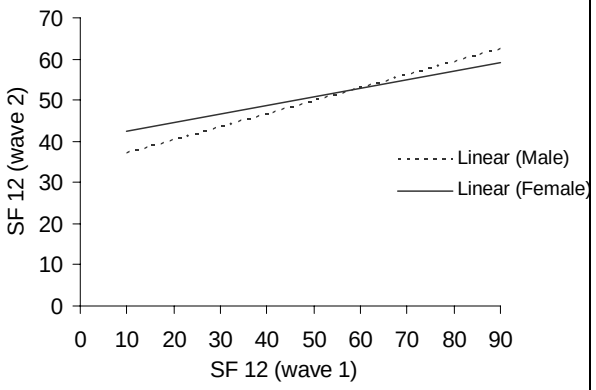
Graph (a): Time 1 by Time 2 for the 20s age group (n=2083)



Graph (b): Time 1 by Time 2 for the 40s age group (n=2292)



Graph (c): Time 1 by Time 2 for the 60s age group (n=2110)



5.5.2. Cross-sectional analyses at Wave 1 and Wave 2

Results for the cross-sectional analyses conducted separately for time 1 and 2 can be seen in Table 5-4. For the Goldberg Depression Scale, significant predictors at time 1 were being female, being in the 20s age group, and not being in the 60s age group (in comparison to the 40s). The first interaction between age group and gender was significant, indicating that the gender difference in depression was greater in the 20s age group in comparison to the 40s. The main effects for these results were replicated at time 2, however no significant interactions were observed. For the Goldberg Anxiety Scale, significant predictors at time 1 were being female, being in the 20s age group, and not being in the 60s age group (in comparison to the 40s). The first interaction between age group and gender was again significant, indicating that the gender difference in anxiety was greater in the 20s age group in comparison to the 40s. These results were replicated in the cross-sectional analyses conducted at time 2. Results for the SF-12 in Table 5-4 also show that at time 1 and 2 poorer mental health was associated with being female and younger. While there was a significant interaction between age group and gender at time 1, indicating that the gender gap was greatest for the 20s in comparison to the 40s, this interaction was not significant at time 2.

Table 5-4. Age and sex effects for the Goldberg and SF-12 scales (cross-sectional).

	Goldberg Depression		Goldberg Anxiety		SF-12	
	Model 1 β (SE)	Model 2 β (SE)	Model 1 β (SE)	Model 2 β (SE)	Model 1 β (SE)	Model 2 β (SE)
Time 1						
Gender (male)	-.37 (.05)**	-.28 (.10)*	-.73 (.06)**	-.41 (.11)**	1.57 (.23)**	1.13 (.40)**
Age group (20s)	.46 (.07)**	.61 (.10)**	.34 (.08)**	.74 (.11)**	-2.45 (.30)**	-3.49(.44)**
Age group (60s)	-.80 (.06)**	-.81 (.09)**	-1.30 (.07)**	-1.24 (.11)**	4.99 (.26)**	5.45 (.38)**
Gender X Age (20s)	-	-.32 (.14)*	-	-.85 (.16)**	-	2.22 (.60)**
Gender X Age (60s)	-	.02 (.12)	-	.14 (.15)	-	-.85 (.52)
Time 2						
Gender (male)	-.39 (.05)**	-.35 (.10)**	-.74 (.06)**	-.60 (.11)**	1.28 (.23)**	.88 (.39)*
Age group (20s)	.61 (.07)**	-.70 (.10)**	.57 (.08)**	.79 (.11)*	-2.38 (.30)**	-2.92 (.42)**
Age group (60s)	-.54 (.06)**	-.58 (.09)**	-.98 (.07)**	-.99 (.11)**	4.49 (.26)**	4.47 (.38)**
Gender X Age (20s)	-	-.20 (.14)	-	-.47 (.16)*	-	1.13 (.59)
Gender X Age (60s)	-	.08 (.12)	-	.03 (.15)	-	.09 (.51)

Note: *p<.05, **p<.001. Robust standardised errors are shown. G = Gender, A = Age, T = Time.

5.5.3. Longitudinal analyses

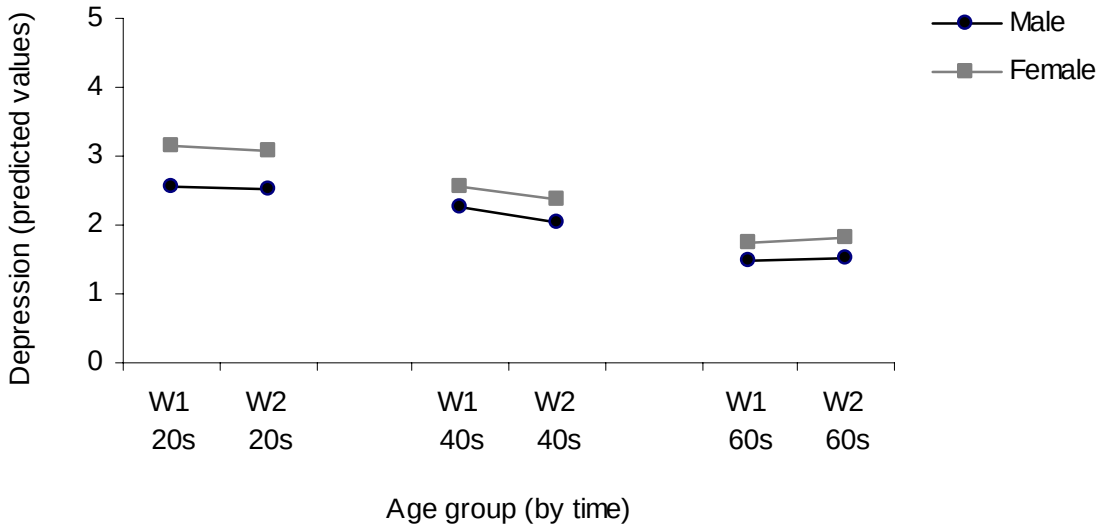
Age and gender effects for the Goldberg Depression Scale over two time points are shown in Table 5-5 and Figure 5-9. Model 1 shows the grand mean for depression (2.26, $p<.001$). The addition of time in model 2 was significant, indicating that depression scores decreased over time. The main effects in model 3 were also significant, such that being female and in the 20s group were associated with higher depression, and being in the 60s was associated with lower depression. The two-way interaction (model 4) comparing the average change in depression across time by gender was not significant. The two-way interactions in model 5 show that the change (decrease) in depression over time was greater for the 40s in comparison to the 20s and 60s. The first two-way interaction between age group and gender (model 6) was significant, reflecting that the gender gap was greater for the 20s in comparison to the 40s, when averaged across both time points. Neither of the three-way interactions in model 7 was significant, indicating that change in the gender difference over time did not differ when comparing the 20s and 60s to the 40s age group.

Table 5-5. Age and sex effects for depression across time.

	Model 1 β (SE)	Model 2 β (SE)	Model 3 β (SE)	Model 4 β (SE)	Model 5 β (SE)	Model 6 β (SE)	Model 7 β (SE)
Intercept	2.26 (.02)**	2.29 (.03)**	2.53 (.05)**	2.53 (.05)**	2.59 (.05)**	2.50 (.06)**	2.55 (.07)**
Time (Wave 2)		-.06 (.03)*	-.06 (.03)*	-.06 (.04)	-.19 (.05)	-.06 (.03)*	-.16 (.07)*
Gender (male)			-.38 (.05)**	-.38 (.05)**	-.38 (.05)**	-.32 (.08)**	-.28 (.10)*
Age group (20s)			.54 (.06)**	.54 (.06)**	.46 (.07)**	.66 (.09)**	.61 (.10)**
Age group (60s)			-.67 (.05)**	-.67 (.05)**	-.80 (.06)**	-.70 (.08)**	-.81 (.09)**
Gender X Time				-.01 (.05)	-	-	-.07 (.09)
Age (20s) X Time				-	.15 (.07)*	-	.09 (.10)
Age (60s) X Time				-	.26 (.06)**	-	.23 (.09)*
Gender X Age (20s)				-	-	-.26 (.12)*	-.44 (.24)
Gender X Age (60s)				-	-	.05 (.11)	-.04 (.22)
G X A (20s) X T							.12 (.14)
G X A (60s) X T							.06 (.12)

Note: *p<.05, **p<.001, N=6631. Robust standardised errors are shown. G = Gender, A = Age, T = Time.

Figure 5-9. Time 1 and 2 age and sex effects for depression.



Note: A higher score on the Goldberg Depression scale indicates greater symptoms.

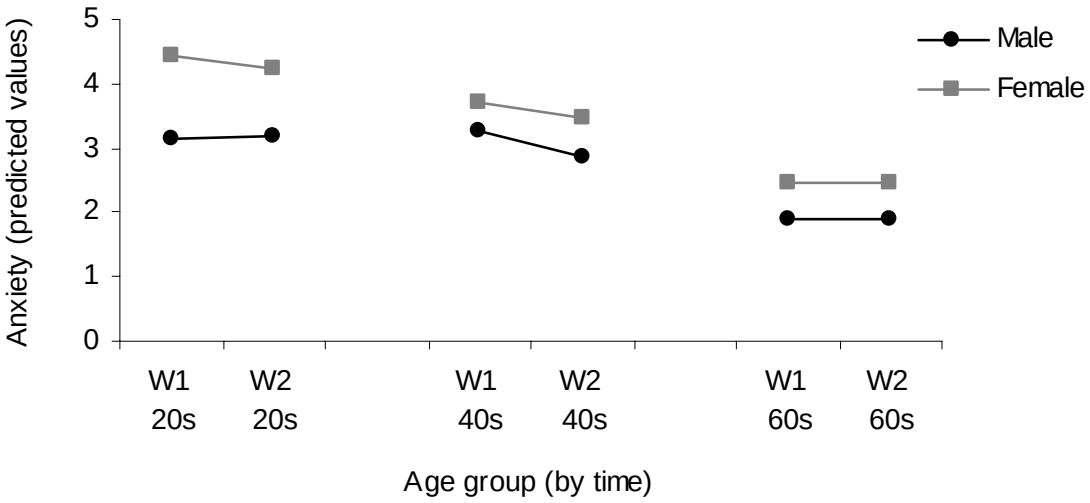
Table 5-6 shows age and sex effects for the Goldberg Anxiety Scale over time. A large proportion of the results showed a similar pattern to those found for depression. The main effects for time (model 2), gender and age group (model 3) were all significant. The two-way interaction between gender and time (model 4) was not significant. Both two-way interactions in model 5 were significant, indicating that the change (decrease) in anxiety from time 1 to time 2 was less for the 20s and 60s age groups, when compared to change for the 40s. The first two-way interaction between age group and gender in model 6 was significant, reflecting a larger gender gap in anxiety for the 20s age group. In model 7 the first three-way interaction was significant; indicating that change in the gender difference in anxiety across time differed between the 20s and 40s age groups. This can be seen in Figure 5-10, where the gender difference narrows over time for the 20s, but appears to increase for the 40s.

Table 5-6. Age and sex effects for anxiety across time.

	Model 1 β (SE)	Model 2 β (SE)	Model 3 β (SE)	Model 4 β (SE)	Model 5 β (SE)	Model 6 β (SE)	Model 7 β (SE)
Intercept	3.09 (.03)**	3.16 (.03)**	3.75 (.06)**	3.75 (.06)**	3.84 (.06)**	3.64 (.07)**	3.69 (.08)**
Time (Wave 2)		-.14 (.03)**	-.14 (.03)**	-.15 (.04)*	-.32 (.05)*	-.14 (.03)**	-.24 (.08)*
Gender (male)			-.74 (.05)**	-.74 (.06)**	-.74 (.05)**	-.51 (.10)**	-.41 (.11)**
Age group (20s)			.45 (.07)**	.45 (.07)**	.34 (.08)**	.77 (.10)**	.74 (.11)**
Age group (60s)			-1.14 (.06)**	-1.14 (.06)**	-1.30 (.07)**	-1.12 (.09)**	-1.24 (.11)**
Gender X Time				.00 (.06)	-	-	-.18 (.11)
Age (20s) X Time				-	.23 (.08)*	-	.05 (.11)
Age (60s) X Time				-	.32 (.07)**	-	.24 (.10)*
Gender X Age (20s)				-	-	-.66 (.14)**	-1.23 (.27)**
Gender X Age (60s)				-	-	-.06 (.13)	-.31 (.25)
G X A (20s) X T							.38 (.16)*
G X A (60s) X T							.17 (.14)

Note: *p<.05, **p<.001, N=6631. Robust standardised errors are shown. G = Gender, A = Age, T = Time.

Figure 5-10. Time 1 and 2 age and sex effects for anxiety.



Note: A higher score on the Goldberg Anxiety scale indicates greater symptoms.

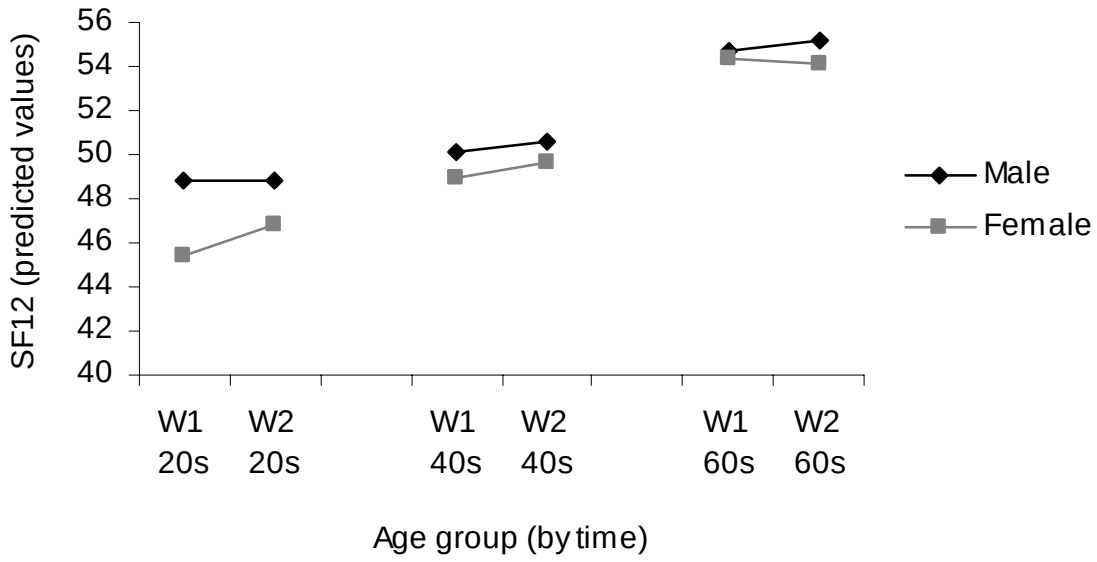
Table 5-7 shows age and sex effects over time for the SF-12 mental health scale. Model 1 shows that the grand mean was 50.59 (p<.001). Once again, the main effects for time, gender and age group were significant, indicating that overall mental health improved over time, and was poorer for females and the youngest age group. Neither the two-way interactions between gender and time (model 4), or age group and time (model 5) were significant. However, the first two-way interaction between age group and gender was significant. This indicated that averaged across time the gender difference in mental health was greater for the 20s in comparison to the 40s. None of the three-way interactions in model 7 were significant. These results can be seen in Figure 5-11.

Table 5-7. Age and sex effects for SF-12 across time.

	Model 1 β (SE)	Model 2 β (SE)	Model 3 β (SE)	Model 4 β (SE)	Model 5 β (SE)	Model 6 β (SE)	Model 7 β (SE)
Intercept	50.59 (.10)**	50.35 (.12)**	48.89 (.21)**	48.82 (.22)**	48.82 (.22)**	49.09 (.25)**	48.96 (.29)**
Time (Wave 2)		.48 (.12)**	.48 (.12)**	.63 (.18)**	.63 (.21)*	.48 (.12)**	.74 (.30)*
Gender (male)			1.42 (.19)**	1.58 (.23)**	1.42 (.19)**	1.01 (.34)*	1.13 (.40)*
Age group (20s)			-2.41 (.25)**	-2.41 (.25)**	-2.45 (.30)**	-3.21 (.37)**	-3.50 (.44)**
Age group (60s)			4.74 (.22)**	4.74 (.22)**	5.00 (.26)**	4.96 (.32)**	5.45 (.38)**
Gender X Time				-.31 (.24)	-	-	-.25 (.42)
Age (20s) X Time					.06 (.32)	-	.58 (.46)
Age (60s) X Time					-.51 (.27)	-	-.99 (.40)*
Gender X Age (20s)						1.67 (.51)*	3.30 (1.08)*
Gender X Age (60s)						-.38 (.44)	-1.79 (.94)
G X A (20s) X T							-1.08 (.64)
G X A (60s) X T							.94 (.55)

Note: *p<.05, **p<.001, N=6485. Robust standardised errors are shown. G = Gender, A = Age, T = Time.

Figure 5-11. Time 1 and 2 age and sex effects for the SF-12.



Note: A higher score on SF-12 indicates better mental health.

5.5.4. Supplementary analyses – comparing the 20s and 60s age groups

As all previous comparisons were made using the 40s age group as the reference category, additional analyses were conducted to investigate comparisons directly between the 20s and 60s age groups. Cross-sectional analyses showed that the 20s age group had higher levels on all mental health measures compared to the 60s. Further cross-sectional analyses found several significant interactions between age group and gender, indicating that the gender difference in the Goldberg Depression and Anxiety scales was greater for the 20s than the 60s at both time points. This was also the case for the SF-12 mental health scale at time 1. Longitudinal analyses demonstrated a significant three-way interaction between gender, age group and time, when predicting SF-12 scores. This interaction indicates that change in the gender difference for mental health scores across time differed

between the 20s and 60s age groups. This can be seen in Figure 5-11 where the gender difference narrows over time for the 20s and increases slightly for the 60s.

5.6. Discussion

Results from the current study found that women had higher symptom levels of depression and anxiety than men across the adult lifespan. However, the gender disparity for all three mental health outcomes was greatest for young adults in comparison to the two older age groups. Although the longitudinal analyses showed little change in the gender gap over a four year period, some differences were found between the age groups. The gender difference in anxiety levels narrowed over time for young adults in comparison to those middle aged, and the gender difference in overall mental health narrowed for young adults in comparison to the oldest age group. These findings support the hypothesis that age variation in the gender difference in both depression and anxiety would be present.

5.6.1. Stability of scores across time

Gender differences in the stability of scores across the two time points were observed for each age group. Scores for depression and overall mental health were more variable across time for women than men in the 20s and 60s age groups, whereas scores for anxiety were more stable for women than men in the 40s age group. These findings suggest that in comparison to men there were more women moving both in and out of depressive states at either end of the lifespan, than during midlife. They also suggest that midlife is a time where women's higher anxiety levels are maintained in comparison to men's. Although a more accurate interpretation of these results would require either more time points of data, or more detailed retrospective questioning of respondents about their

prior depressive symptoms, these findings suggest that younger and older women may have briefer but more frequent fluctuations in symptoms than men – or that their scores are less stable. There are few research studies available to compare with these findings. Although the research evidence indicates there are no gender differences in the recurrence of depression and anxiety when all age groups are combined (Kessler et al., 1993; Simpson et al., 1997), specific effects within age bands have not frequently been explored.

5.6.2. Peak gender differences across age

The current study found that the gender difference in each mental health outcome was greatest for the youngest age group (20s). These findings accord with other studies conducted by Der and Bebbington (1987), Leon (1993) and the Australian NSMHWB (ABS, 1997). Although a number of other studies do not appear to support this finding, (Jorm, 1987; Weissman et al., 1988) as previously suggested this may in part be due to methodological variation.

The finding that gender differences in depression and anxiety are largest for young adults prompts questions about this particular life stage, and the factors that might be responsible for polarising females' and males' affective states during young adulthood. The results from the current investigation point towards the early 20s as being a particularly stressful time for young women. Transitions that are particular to this life phase for both women and men include tertiary education, leaving home, gaining employment and forming adult romantic relationships (Arnett, 2000). There is little research investigating why these transitions might be particularly stressful for young women as opposed to men. Further investigation is required exploring the gender specific social and psychological risk factors relevant to this life phase.

The large gender disparity found in young adults also calls into question explanations for the gender difference in depression which rely on peak differences during the middle phase of life. Such theories suggest that gender differences in depression are predominantly the product of social factors or inequities between the genders that are most apparent in the middle of life. e.g. gender differences in pressure resulting from work and family life responsibilities (Mirowsky, 1996). Data from the longitudinal analyses conducted also conflicts with these theories. Presumably, if these hypotheses were accurate, gender differences in mental health outcomes would have increased for the 20s age group over time as they entered a more family and work oriented life phase. However, the gender gap in anxiety and overall mental health were instead found to narrow over time in comparison to the two older age groups. One possibility for the smaller gender difference in the 40s is that life changes linked to gender inequity are more relevant to people in their 30s. Although the average age of first birth was the highest on record during 2006, this figure is still in the early 30s (median for men is 33.1 and for women is 30.8), suggesting that by 40 many women may have reached a level of stability with regard to family life (ABS, 2006a). Unfortunately, the PATH data does not presently have data for a 30s age group, preventing further investigation into these hypotheses.

5.6.3. Gender differences in older age groups

In this study, a female preponderance of depression and anxiety was maintained across the lifespan, including the oldest age group. This finding is consistent with previous research conducted by Jorm (1987), Green et al. (1992), and Stalones et al. (1990). Each of these studies, as well as the current investigation, found that although the gender difference in depression might be smaller for older age groups than younger ones, a significant gap

was still evident. This narrowed maintenance conflicts with alternate suggestions that either: a) the female preponderance of depression increases consistently with age throughout the lifespan (Mirowsky, 1996), b) the gender difference completely converges in older age groups (particularly post-menopause), or c) the gender difference reverses in older age groups (post-menopause) leaving more depressed men than women (Bebbington et al., 1998).

Evidence that the gender gap in depression and anxiety is maintained during old age informs speculation about the reasons gender differences in affective symptoms emerge and resolve. It is particularly relevant to biological theories, which suggest that women's greater levels of depression are due to reproductive hormone processes (Kuehner, 2003). If gender differences were predominantly due to women's reproductive hormones, we would expect to see these differences disappear post-menopause. As this has not been consistently found to be the case, research has turned to investigate alternate social and psychological risk factors that may be involved in narrowing the gender gap rather than resolving it. In the current study, a similar pattern of results was found for depression, anxiety and overall mental health scores, suggesting that the causal mechanisms involved for reducing the gender difference in each outcome might overlap. It is important to note that the oldest age group in the current study was people in their 60s, prohibiting investigation into gender differences in the oldest old. Barefoot et al.'s (2001) longitudinal study found that the gender difference in levels of depression was maintained at ages 50 and 60, and only disappeared when the cohort reached 80. It could be that gender differences for the current sample will also dissolve at a later life stage. If this were found

to be the case, it would raise important questions about the specific risk factors that emerge or dissipate for men and women late in life.

5.6.4. Limitations

There are some potential limitations specific to the current chapter that should be noted. First, the analyses were limited to the narrow age cohorts available in the data collected. This limited the extent to which a comprehensive lifespan approach could be taken as information regarding gender differences during adolescence, the 30s age period and for the elderly beyond aged 60, was not available. There may be important transitions or lifestyle changes during these phases that affect the age distribution of gender differences in depression and anxiety. Second, only two waves of data were available for this study restraining the potential for longitudinal analyses. As more waves of data from the PATH study become available more detailed longitudinal analysis can take place. With subsequent waves each cohort will move through different life phases, allowing for the opportunity to distinguish between cohort and age effects and more thoroughly assess the impact of life transitions on gender differences in affective symptoms. The current analyses were not able to distinguish between whether the age effects found might be the result of cohort factors. It could also be argued that the four year period assessed between Waves 1 and 2 is not long enough to allow for or make substantial conclusions about changes in gender differences across time.

5.7. Chapter conclusions

The current study suggests that women experience a preponderance of depression, anxiety and general symptoms of psychological distress across the lifespan. These gender

differences were greatest for the 20s age group when compared to two older aged cohorts (40s and 60s). Although there was little change in the gender gaps observed across time, there were some indications that the disparities were narrowing for the youngest age group. These findings do not support an inverted u-shaped pattern for the distribution of gender differences, and instead suggest that the peak differences occur for young adults. Overall, these results provide evidence for the notion that a lifespan approach is a necessary aspect of describing and investigating explanations for the gender difference in depression and anxiety. The findings also query social theories of gender inequity and hormone-based explanations for the gender difference in affective symptoms, and prompt further causal questions about the gender disparity during early adulthood.

6. STUDY 2: IDENTIFYING GENDER-BIASED ITEMS IN THE GOLDBERG ANXIETY AND DEPRESSION SCALES

6.1. Summary

Measurement bias or biased assessment tools has been offered as one potential explanation for why gender differences in depression and anxiety are consistently found. The current chapter investigates the possibility that gender differences in the PATH sample (as identified in the previous chapter) are due to gender-biased items within the Goldberg Anxiety and Depression Scales. The primary research question under investigation is: *Can gender differences in levels of depression and anxiety be attributed to gender-biased items within the Goldberg Scales?* Based on the research reviewed, it was hypothesised that gender differences in the scales would in part be due to gender-biased items. The analyses provided two main findings: first a two-factor solution representing anxiety and depression fitted the scales well, and second the Goldberg Scales were not found to contain any gender-biased items. The results were shown to be consistent across three age groups and were replicated at a second time point. These findings indicate that gender differences in the endorsement of items from the Goldberg Scales are not because of gender-biased items. This study points to alternate psychosocial explanations for the gender disparity in depression and anxiety.

6.2. Background

It has been suggested that the preponderance of depression and anxiety in women is not "real" but is the result of one or more artefacts. Chapter 2 outlined the artefactual hypotheses commonly proposed, such as greater help seeking, illness disclosure and symptom recall among women, the possibility that depression is masked by substance use in men, and bias in the judgement of clinicians. Chapter 2 also concluded that these hypotheses have received insufficient support in reviews (1996; Kessler, 2003; Piccinelli & Wilkinson, 2000; Wolk & Weissman, 1995). However, one artefactual hypothesis that may have some influence and requires further investigation is measurement or item bias in the diagnostic tools and scales used to assess depression and anxiety (Salokangas et al., 2002; Sigmon et al., 2005; Stommel et al., 1993).

Bias or systematic inaccuracy in measurement has been acknowledged as a serious problem in the development and implementation of psychometric tests. Switzer, Wisniewski, Belle & Schultz (1999) reviewed the necessary steps for developing and evaluating research instruments, and highlighted respondent characteristics (e.g. age, gender, education) as a possible source of measurement bias. They state that these characteristics "may lead to under-endorsement or over-endorsement of items, biases in recalling events, and/or respondent difficulty in interpreting questions" (p. 400). One important respondent characteristic which has been found to affect responses to items and introduce bias is gender.

Gender bias is a form of differential item functioning (DIF), which is said to occur when people from different groups score different results after controlling for overall levels of the construct being measured (Millsap, 2006). An item can be considered free from

gender bias if after matching both genders on the construct being measured, the only variation in scores across gender is random (Camilli & Shepard, 1994). In the context of gender differences in depression and anxiety, gender-biased items are those that women endorse more frequently than men, given equal levels of the total outcome measure. The consequence of using gender-biased items to measure levels of depression and anxiety is an artificial preponderance of these constructs in women. Gender-biased items have been investigated in scales measuring both depression and anxiety; however, the great majority of this research has focused on depression.

6.2.1. Gender-biased items in scales measuring depression

Previous investigations of gender-biased items in depression assessments can be categorized in terms of the methods used to match or control for depression. Each method has varying strengths and weaknesses. The first method involves comparing clinically diagnosed samples of men and women, who thus may be considered to be comparably depressed. In this case, diagnosis is considered to be a control measure. Examples of this approach include a study conducted by Carter et al., (2000) which found that depressed women reported weight gain, appetite increase, and emotionality significantly more often than depressed men when assessed using the Hamilton Rating Scale. Similarly, Wenzel et al. (2005) found that depressed women endorsed items about appetite changes and fatigue from the Beck Depression Inventory (BDI) more often than depressed men.

A second and more direct group of methods used to identify gender-biased items are known as observed score methods. Millsap (2006) characterises these methods as 'choosing the sum of the item scores for the scale under study as the measure used for matching' (p. 171). Examples include the Mantel-Haenszel procedure, standardisation

methods and logistic regression. An extension of the Mantel-Haenszel method was used in a study conducted by Cole, Kawachi, Maller & Berkman (2002). This study found that the proportional odds of women endorsing the item 'crying spells' on the Centre for Epidemiologic Studies Depression Scale (CES-D) was 2.14 times that of men, after matching for overall depressive symptoms. A study conducted by Salokangas, Vaahtera, Pacriev, Sohlman and Lehtinen (2002) investigated gender-biased items in the Beck Depression Inventory (BDI) and the Depression Scale (DEPS) using a process of standardisation. The authors concluded that two items 'crying' and 'loss of interest in sex' from the BDI might give gender-biased results when measuring depression. While observed score methods are easy to implement, require fewer numbers than more complex analyses and have been shown to be sensitive to certain forms of bias, they are not appropriate for investigating all types of measurement bias. Nor are they suitable in the case of short scales as the tool used to match individuals, their total scale score, is more likely itself to contain bias (Millsap, 2006).

The third way that gender-biased items in depression measures have been assessed is through latent variable models, such as those used in item response theory (IRT) and factor analytic methods. These methods investigate whether the same latent variable model for depression holds across both genders, if so, the items within the model can be considered unbiased (Millsap, 2006). A factor analytic method was used by Zuroff et al. (1990) to examine properties of the Depressive Experiences Questionnaire (DEQ). This study found that factor loadings derived from the DEQ were very similar across gender, indicating no gender bias. A study conducted by Stommel et al. (1993) also investigated gender bias items in the Centre for Epidemiologic Studies Depression Scale (CES-D) using

factor-analytic models. This study examined the degree to which the CES-D was factorially invariant across males and females by comparing a series of models that required males and females to be either equal or permitted them to vary on certain model parameters. The results showed that more women endorsed the item 'crying spells' and that more men endorsed the item 'talked less', given equal levels of depression across gender. A further study conducted by Christensen et al. (1999) examined items in the Goldberg Anxiety and Depression Scales for age bias using Multiple Indicators Multiple Causes (MIMIC) models. As an adjunct to investigating age bias, the study also provided information on items that have a gender bias. The authors found that for the same level of depression, men were more likely to report 'lost interest', 'difficulty concentrating' and 'waking early' than women were. While latent variable models require greater sample sizes, latent variable assumptions to be met and can be complex, they provide greater and richer information about possible forms of bias than observed score methods (Millsap, 2006). As such, there have been calls for future methodological work investigating bias in outcome measures to adopt methods based on IRT, such as latent variable models, where-ever possible (Kessler & Mroczek, 1995).

6.2.2. Gender-biased items in scales measuring anxiety

While discussion has taken place concerning the psychometric properties of scales measuring anxiety, and the different domains (state vs. trait) and characteristics of disorders (e.g. obsessions and compulsions) that might be assessed (Balon, 2005), there is a paucity of research investigating whether items commonly used to measure levels or symptoms of general anxiety produce gender-biased results. A search of the literature found only two studies examining gender-bias in scales measuring general anxiety.

Popular scales such as the Beck Anxiety Inventory (Beck, Epstein, Brown, & Steer, 1988) and the State-Trait Anxiety Inventory (Spielberger, 1983) do not appear to have been investigated for gender-biased items.

The first relevant study identified was conducted by Reynolds (1998). This study examined the anxiety subscale of the Checklist of Problems and Resiliency in a sample of 16-72 year olds. The study found that the items on the scale were not biased, and were appropriate for assessing anxiety in both males and females. The second relevant study identified (Christensen et al., 1999), investigated gender-biased items in the Goldberg Anxiety Scale. This study has already been mentioned with reference to findings for the Goldberg Depression Scale. Using a latent variable modelling technique, the study found that women were more likely to report 'worrying', 'headaches', and 'trembling' than men, when matched for overall anxiety symptoms. The results indicate that these particular items within the Goldberg Anxiety Scale are gender-biased. This finding fits with a broader literature surrounding gender differences in somatic symptoms. In large scale surveys of both community residents and clinical samples, it has been found that women report higher rates of somatic symptoms (Barsky et al., 2001). This gender difference persists regardless of whether physical symptoms can be medically explained, and when gynaecological problems are excluded. The link between gender differences in somatic symptoms and gender differences in emotional distress is strengthened by a study conducted by Piccinelli and Simon (1997). This study found that the association between gender and somatic symptoms ceased when emotional distress was taken into account. Although there are indications that items assessing somatic symptoms on anxiety scales

might be gender-biased, there is very little research available which directly tests this hypothesis.

6.3. Aims

The aim of the present study was to investigate the Goldberg Anxiety and Depression Scales for gender-biased items. As Chapter 5 used these scales to identify gender differences in levels of depression and anxiety, it was considered important to examine whether the scales themselves might have generated gender-biased estimates. Based on the research evidence reviewed above it was hypothesised that gender differences in levels of depression and anxiety would in part be due to gender-biased items. A latent variable method appropriate for factoring binary data was adopted for the analyses. This method allowed us to examine the factor structure of the scales in addition to investigating item bias, and was considered appropriate given the large sample size available. Most prior investigations of gender-bias in dichotomous items (including the investigation of the Goldberg Scales conducted by Christensen et al., 1999) have failed to account for each item's binary distribution. As the current thesis investigates gender differences across the adult lifespan, the analyses were conducted for three separate age ranges: 20-24, 40-44 and 60-64. The analyses were initially undertaken using the first wave of the PATH data and were then repeated using the second wave.

6.4. Methodology

This chapter used data from Waves 1 and 2 of the PATH Through Life Project. The sample for both waves has been described previously in Chapter 4, as have the survey procedures. The two outcome measures under investigation were the Goldberg Anxiety

and Depression Scales. The psychometric properties and descriptive statistics for these scales have been outlined previously in Chapter 4. For the purposes of this chapter, it is important to recall that both the Goldberg Scales consist of nine items, to which binary (yes, no) responses are required. Total scores for each scale range from 0 to 9.

6.4.1. Statistical analyses

In the analysis of Wave 1 data forty-two cases were removed due to missing data on all of the Goldberg Scale items. Fourteen cases with partial missing data remained in the analyses, and were included in model estimations by adopting the EM (Expectation Maximisation) algorithm in maximum likelihood estimation (Muthen & Muthen, 2006). The EM algorithm used has been previously described by Enders (2001). The key (untestable) assumption in this approach is that the missing data is either completely at random or can be predicted from observed values (missing at random; MAR). Given the very small proportion of data imputed, the effect of any violation of the MAR assumption would be negligible. Final samples included in the analyses were: 2387 in the 20-24 age-group (48.4% male), 2515 in the 40-44 age group (47.1% male), and 2541 in the 60-64 age-group (51.8% male). In the analysis of Wave 2 data forty-one cases were removed due to missing data. Sixty-five cases with partial missing data remained in the analyses. The final samples included were: 2131 in the 20s age-group (47.4% male), 2345 in the 40s age group (46.8% male), and 2199 in the 60s age-group (51.7% male).

Confirmatory factor analyses (CFA) was first undertaken to verify the underlying factor structure for the Goldberg Scales for the three age-group samples. For binary items, CFA models include the factor loading which indexes the strength of association between the item and the underlying dimension and the item threshold which is related to where on

this dimension the item lies (Millsap, 2006; Muthen & Muthen, 2006). Multiple group models were then fitted to the data to explore the comparability of the factor structure across gender. This set of multiple group analyses (MGA) compared a constrained model in which all item loadings and thresholds were constrained to be equal for both genders against an unconstrained model where loadings and thresholds were free to vary across gender (also known as the delta parameterisation method (Muthen & Muthen, 2006)). In the case where an unconstrained model fits substantially better than a constrained model, it can be concluded that there are considerable differences between the genders on item parameters and that each gender responds to the items in different ways. Subsequent analyses may then be undertaken to locate which items are the source of non-invariance. The Mplus DIFFTEST procedure was used to examine change in fit between constrained and unconstrained models (Muthen & Muthen, 2006). This procedure was used because the WLSMV estimator used in Mplus does not allow chi-square values of nested models to be compared directly. In both the confirmatory factor and multiple group analyses, model fit was evaluated using the chi-square statistic (χ^2), the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI) and the Tucker Lewis Index (TLI) (Muthen & Muthen, 2006). All analyses were conducted separately for each of the 20s, 40s and 60s age groups, rather than an all-inclusive gender by age model. This decision was made in the interest of parsimony and in accordance with the aims of the analyses – to investigate gender-biased items in the three age ranges. The full set of analyses was repeated using the second wave of the PATH dataset to investigate the repeatability of the results.

All statistical analyses were undertaken using Mplus version 4.10 (Muthen & Muthen, 2006). This program is able to factor analyse binary data (items) as it calculates tetrachoric correlation coefficients and then applies appropriate estimation procedures (Bartholomew & Knott, 1999). In the past, binary data has frequently been analysed by calculating Pearson's correlation coefficients and applying conventional factor analysis. This technique is inappropriate for categorical data and can result in low loading and artefactual factors (Geer, Dunlap, & Beatty, 2003). These problems are minimised in the current analyses through the adoption of tetrachoric correlations. Recognizing and appropriately analysing items as binary also provides information about the thresholds of each item, and invariance in thresholds across groups.

6.5. Results

6.5.1. Wave 1 analyses

Item responses for both Goldberg Scales are shown by gender and age group in Table 6-1. For every item where there was a significant gender difference in endorsement, females reporting experiencing the symptom more frequently. Means for the scales are also shown. As previously identified, higher levels of depression and anxiety were significantly associated with being female for all three age groups ($p<.05$). Cronbachs alpha's for the anxiety scale were .80, .81 and .78 for each of the age groups respectively, and were .76, .80 and .74 for the depression scale.

Table 6-1. Percentage of items endorsed by males and females in each age group.

	20s (Wave 1)		40s (Wave 1)		60s (Wave 1)		20s (Wave 2)		40s (Wave 2)		60s (Wave 2)	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
Anxiety[a]												
Have you felt keyed up or on edge?	37.3	47.8**	45.5	50.0*	23.2	31.6**	38.3	44.2*	38.2	45.0*	23.4	30.3**
Have you been worrying a lot?	43.9	61.9**	38.2	43.0*	20.0	27.3**	37.5	55.4**	31.8	40.6**	16.1	24.6**
Have you been irritable?	42.3	61.3**	40.5	51.7**	23.9	23.3	40.9	54.3**	35.1	43.9**	23.6	23.4
Have you had difficulty relaxing?	35.4	52.6**	38.8	42.8*	19.7	24.7*	35.5	47.6**	30.4	35.2*	18.7	23.1*
Have you been sleeping poorly?	35.3	45.2**	39.5	41.1	26.7	31.3*	35.2	44.6**	34.6	38.7*	26.3	33.4**
Have you had head/neckaches?	40.0	63.7**	43.1	57.3**	28.3	41.1**	39.4	61.9**	38.3	53.6**	21.6	35.7**
Have you had: trembling, tingling, dizzy spells, sweating, diarrhoea, need to pass water more than usual?	24.7	38.0**	21.7	24.9	18.5	22.2*	22.7	35.7**	17.2	22.7*	15.5	19.6*
Have you felt worried about health?	32.7	34.7	32.7	31.3	23.9	22.5	35.6	38.4	33.7	33.1	24.7	24.6
Have you had difficulty falling asleep?	28.1	38.6**	28.6	28.9	15.6	26.3**	33.6	41.0**	27.9	32.4*	19.0	31.3**
Depression[a]												
Have you been lacking in energy?	39.1	50.3**	37.8	46.1**	25.6	32.8**	41.8	60.3**	36.9	45.3**	26.9	36.1**
Have you lost interest in things?	27.7	28.5	23.9	22.1	11.3	9.2	29.0	27.1	21.4	21.2	9.6	8.1
Have you lost confidence in yourself?	17.8	28.1**	15.3	21.7**	7.6	10.1*	19.7	28.1**	13.6	22.5**	7.9	10.5*
Have you felt hopeless?	18.0	27.0**	12.2	18.0**	5.7	8.0*	19.6	22.1	11.9	17.1**	5.0	6.5
Have you had difficulty concentrating?	37.7	48.1**	33.1	33.8	17.2	17.8	34.5	40.5*	26.2	27.7	16.9	16.9
Have you lost weight (due to appetite)?	11.4	12.1	3.4	4.8	1.7	2.3	6.4	9.7*	2.8	4.3*	2.3	3.4
Have you been waking early?	41.9	43.6	45.4	42.4	48.9	47.2	37.7	41.4*	43.9	43.9	44.9	45.6
Have you felt slowed up?	30.2	41.7**	33.4	39.7*	26.8	31.4*	30.3	41.5**	29.1	33.9*	28.2	35.9**
Have felt worse in the morning?	32.5	38.6*	22.7	27.1*	13.1	18.9**	34.7	37.8	18.5	22.4*	11.3	16.8**
	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)	M (SD)
Total anxiety scale[b]	3.2(2.6)	4.4(2.7)**	3.3(2.7)	3.7(2.7)**	2.0(2.2)	2.5(2.4)**	3.2(2.7)	4.2(2.7)**	2.9(2.4)	3.5(2.8)**	1.9(2.2)	2.5(2.4)**
Total depression scale[b]	2.6(2.3)	3.2(2.4)**	2.3(2.3)	2.6(2.4)*	1.6(1.8)	1.8(1.9)*	2.5(2.5)	3.1(2.4)**	2.0(2.2)	2.4(2.4)**	1.5(1.8)	1.8(1.9)*

Note: a. χ^2 tests were used to calculate significant differences in percentages. b. T-tests were used to calculate significant differences in means. ** p<.001, *p<.05.

6.5.1.1. Confirmatory Factor Analysis

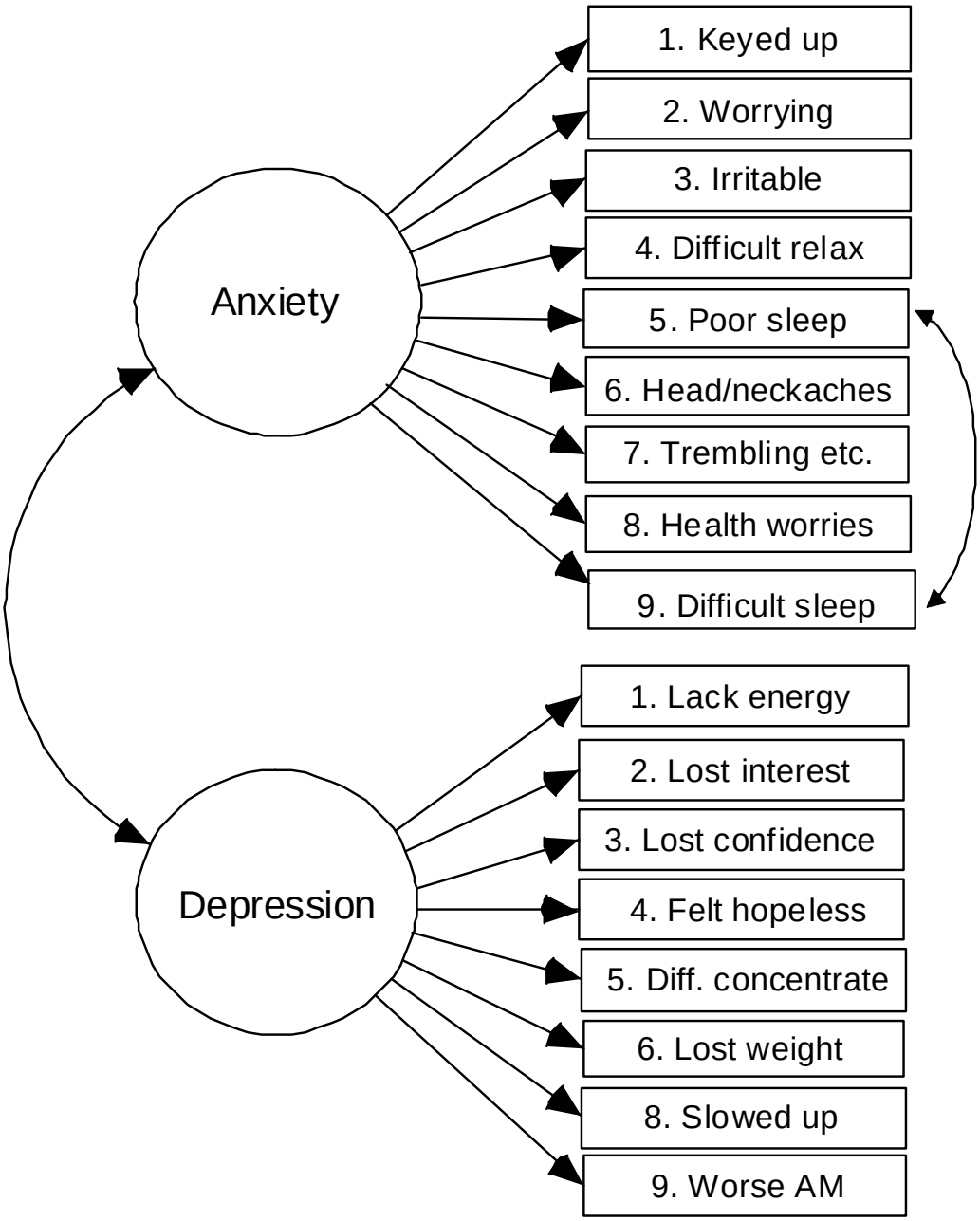
A two-factor model was fitted separately for each of the three samples. The model consisted of two latent variables - anxiety and depression - which were permitted to correlate. The nine items assessing anxiety loaded onto the anxiety variable, and the nine depression items loaded onto the depression variable. The goodness-of-fit indices indicated that this model was a fairly good fit for the 20s sample with a chi-square value of 1404.20 (100) $p<.001$, a CFI of .90, a TLI of .96 and a RMSEA value of .07. Similar results were found for the 40s sample with a chi-square value of 1377.92 (96) $p<.001$, a CFI of .92, a TLI of .97 and a RMSEA of .07, and again for the 60s sample (χ^2=1291.97, 88, $p<.001$; CFI=.90; TLI=.95; RMSEA=.07). In each sample the modification indices showed that the model would benefit from allowing anxiety items 5 (poor sleep) and 9 (difficult falling asleep) to correlate. The correlation matrices also showed that item 7 on the depression scale (waking early) correlated poorly with the other depression items, and might fit better on the anxiety factor. However, it was decided that the model would best benefit from removing this item in accordance with previous papers (i.e. Jorm et al., 2005). The above adjustments were made (taking into account both statistical and theoretical implications) and considerably improved the model fit for all three age samples. Details for the adjusted model are shown in Table 6-2. All of the items were significantly associated with the relevant latent factor, and the correlation between anxiety and depression was significant for the three samples. A diagram of the final factor structure is also shown in Figure 6-1.

Table 6-2. CFA fit statistics and standardised factor loadings for each age group.

	Wave 1			Wave 2		
	20s (n=2387)	40s (n=2515)	60s (n=2541)	20s (n=2131)	40s (n=2345)	60s (n=2199)
Model fit indicies						
χ^2, df, p-value	781.954, 89, <.001	776.991, 86, <.001	600.375, 80, <.001	649.767, 85, <.001	773.999, 81, <.001	568.540, 78, <.001
CFI	.948	.958	.955	.956	.953	.956
TLI	.977	.982	.978	.982	.981	.975
RMSEA	.057	.057	.051	.056	.060	.053
Factor loadings of the latent anxiety variable onto items[a]						
Keyed up	.66	.73	.76	.68	.79	.81
Worrying	.85	.84	.82	.81	.89	.84
Irritable	.78	.75	.75	.77	.76	.72
Difficulty relaxing	.84	.85	.84	.82	.85	.83
Sleeping poorly	.64	.72	.62	.65	.68	.57
Head/neckaches	.54	.52	.52	.54	.56	.50
Trembling, etc.	.59	.62	.59	.65	.63	.63
Health worries	.62	.67	.68	.62	.63	.86
Difficulty falling asleep?	.61	.63	.56	.57	.61	.52
Factor loadings of the latent depression variable onto items[a]						
Lacking energy	.78	.85	.87	.84	.85	.86
Lost interest	.77	.87	.83	.83	.87	.84
Lost confidence	.79	.86	.85	.84	.86	.85
Felt hopeless	.81	.84	.85	.82	.85	.82
Difficulty concentrating	.77	.81	.79	.81	.85	.78
Lost weight	.50	.59	.52	.51	.52	.56
Felt slowed up	.83	.88	.86	.86	.87	.87
Feel worse in the morning	.58	.67	.68	.60	.67	.66
Anxiety and depression (*r*)	.69	.72	.67	.73	.75	.68

Note: a. Standardised.

Figure 6-1. Final factor structure for the Goldberg Anxiety and Depression Scales.



6.5.1.2. Multiple Group Analysis

Multiple group analyses were conducted to assess the comparability of the factor structure across gender for each age sample. The DIFFTEST results in Table 6-3 indicate that for the 20s age group there was a significant difference in fit between the constrained and unconstrained models. However, as the other fit indices (CFI, TLI and RMSEA) in Table 6-3 indicate that both models fit equally well, it was concluded that the significant DIFFTEST was a reflection of the large sample size used (Bentler & Bonett, 1980). The similar factor loadings for males and females when left unconstrained also suggest that there was little difference between the unconstrained and constrained models (see Figure 6-2). This pattern of results was also found for the 40s and 60s age groups. Once again although the DIFFTESTs were significant, the CFI, TLI and RMSEA were virtually identical in both constrained and unconstrained models (Table 6-3). There was also very little difference between males and females in the factor loadings for the unconstrained models for both the 40s and 60s age groups (see Figure 6-2).

Table 6-3. MGA fit statistics for each age group, with parameters for gender unconstrained and constrained.

	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained
Wave 1 Model fit indices [a]						
χ^2, df, p-value	830.276, 167, <.001	846.535, 168, <.001	791.125, 159, <.001	787.551, 158, <.001	618.038, 143, <.001	609.003, 139, <.001
CFI	.946	.945	.961	.961	.957	.958
TLI	.975	.974	.983	.983	.978	.977
RMSEA	.058	.058	.056	.056	.051	.052
χ^2 DIFFTEST		56.724, 10, <.001		45.599, 9, <.001		48.181, 10, <.001
Wave 2 Model fit indices [b]						
χ^2, df, p-value	696.937, 158, <.001	768.570, 157<.001	786.465, 148, <.001	715.459, 140, <.001	574.947, 139, <.001	560.375, 135, <.001
CFI	.957	.952	.957	.961	.957	.958
TLI	.981	.978	.981	.982	.975	.975
RMSEA	.057	.060	.061	.059	.053	.054
χ^2 DIFFTEST		85.446, 9, <.001		27.998, 8, =.001		42.551, 10<.001

Note: [a]For the 20s age group, n = 2387; for the 40s age group, n = 2515; and for the 60s age group, n = 2541. [b]For the 20s age group, n = 2131; for the 40s age group, n = 2345; and for the 60s age group, n = 2199.

Figure 6-2. MGA Factor loadings for males and females on the Goldberg Anxiety and Depression Scales for each age group, at time 1.

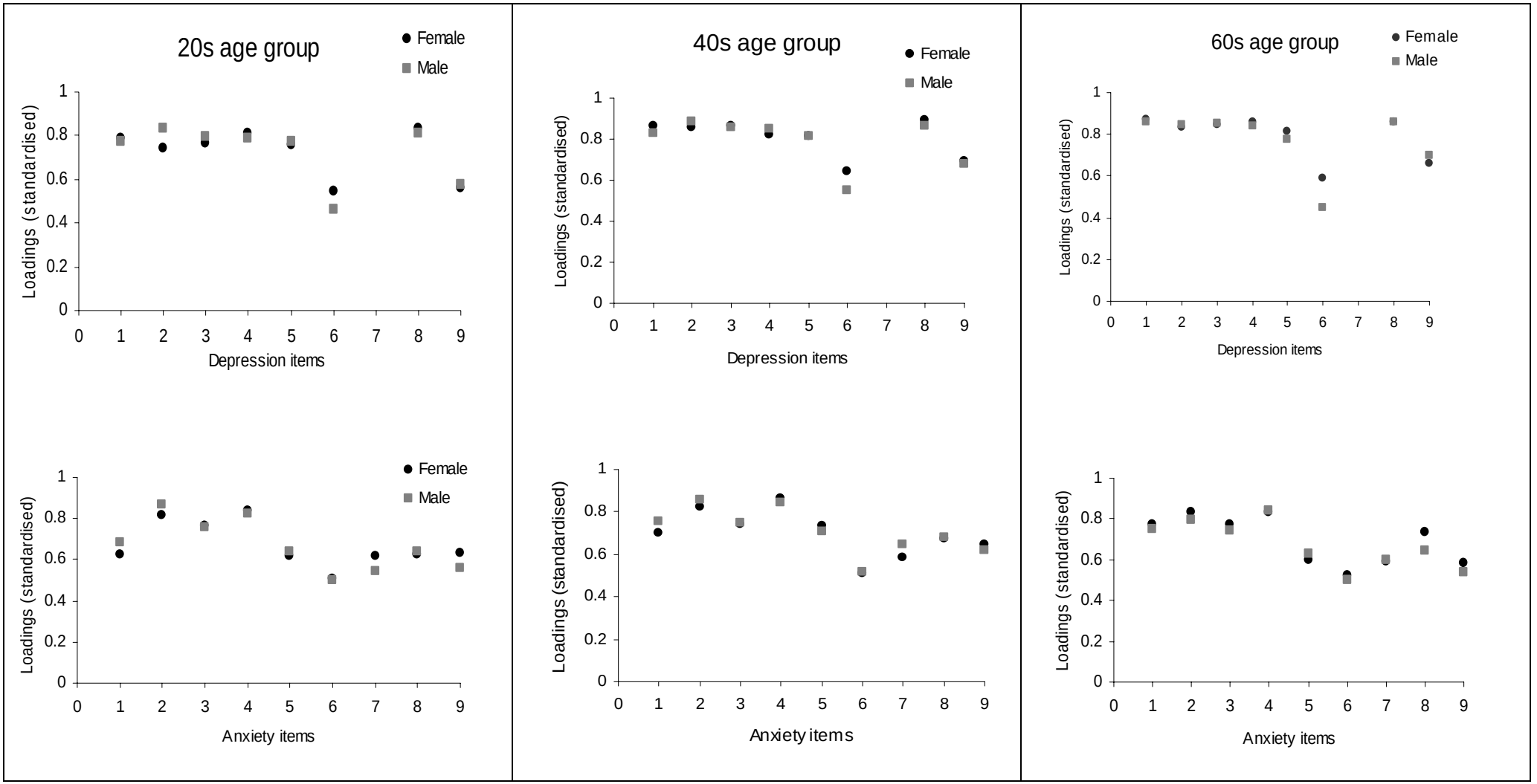


Table 6-4 shows the thresholds for males and females at each age group in the unconstrained models. In the great majority of cases, the thresholds for males were lower than those for females. This was thought to be a function of constraining the factor means, as is necessary for model identification in Mplus. To test this hypothesis an alternate parameterisation method was applied (Millsap & Yun-Tein, 2004). In this case thresholds remained fixed across both groups, factor loadings and means were permitted to vary, and the residual variance for items could be estimated (Muthen & Muthen, 2006). The results confirmed that the lower thresholds for males were accounted for by higher anxiety and depression factor means for females than for males.

Table 6-4. Thresholds in the unconstrained models for each gender by age group, at Wave 1.

	20s Female (n=1156)	20s Male (n=1231)	40s Female (n=1184)	40s Male (n=1331)	60s Female (n=1316)	60s Male (n=1225)
Thresholds for anxiety items						
Keyed up	.323	.054	.110	.001	.732	.497
Worrying	.156	-.302	.300	.154	.842	.602
Irritable	.196	-.286	.241	-.042	.712	.730
Difficulty relaxing	.375	-.064	.285	.181	.853	.683
Sleeping poorly	.377	.121	.266	.225	.620	.488
Head/neckaches	.253	-.350	.174	-.185	.575	.224
Trembling, etc.	.685	.305	.782	.676	.895	.765
Health worries	.447	.394	.449	.487	.708	.754
Difficulty falling asleep	.579	.290	.564	.556	1.012	.635
Thresholds for depression items						
Lacking energy	.276	-.007	.310	.099	.655	.445
Lost interest	.591	.568	.709	.769	1.210	1.327
Lost confidence	.924	.580	1.024	.782	1.433	1.275
Felt hopeless	.915	.614	1.167	.914	1.581	1.405
Difficulty concentrating	.261	.048	.437	.418	.947	.923
Lost weight	1.203	1.170	1.828	1.664	2.109	1.998
Felt slowed up	.518	.210	.428	.260	.618	.484
Feel worse in morning	.456	.290	.748	.609	1.122	.883

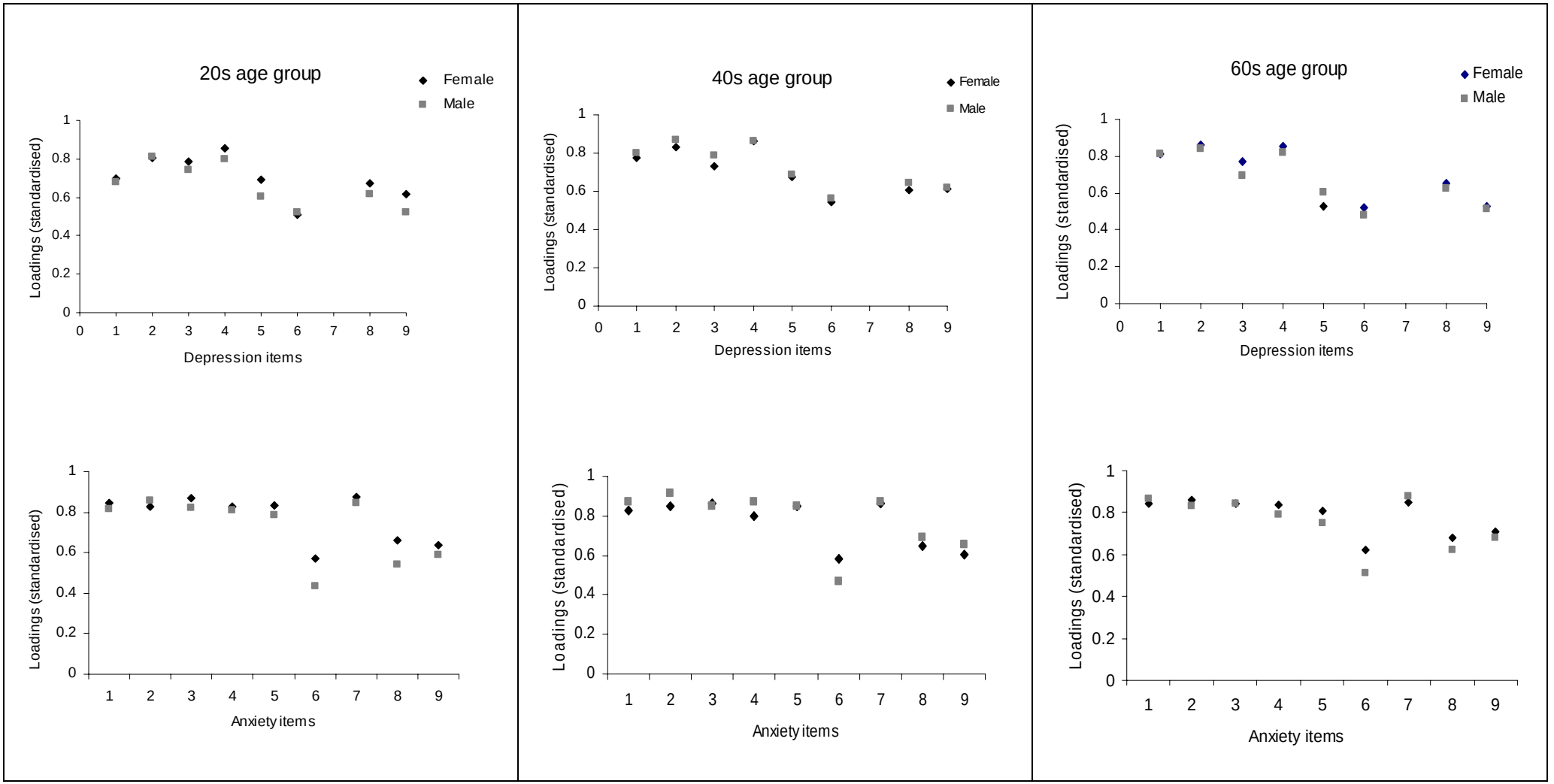
6.5.2. Replication of Analyses at Wave 2

The analyses were repeated using the second wave of the PATH dataset. The results were very similar to those found using Wave 1 data. Item responses at Wave 2 for both Goldberg Scales are shown by gender and age group in Table 6-1. In all cases where there was a significant gender difference in item responses, females were more likely to endorse the item than males. Once again fit statistics for the CFA improved dramatically for all three age samples when anxiety items 5 and 9 were correlated and depression item 7 was removed. Details for the adjusted CFA models at Wave 2 are shown in Table 6-2. Results from the MGAs showed that for each of the three age groups while the DIFFTEST was significantly different between constrained and unconstrained models, other fit statistics indicated very little change (see Table 6-3). The thresholds for males and females in the MGA were again higher for males than females, as a function of constraining the factor means within the model (see Table 6-5). When plotted, the standardised factor loadings for the unconstrained model were yet again similar for males and females in each age group, as shown in Figure 6-3.

Table 6-5. Thresholds in the unconstrained models for each gender by age group, at Wave 2.

	20s Female (n=1121)	20s Male (n=1010)	40s Female (n=1248)	40s Male (n=1097)	60s Female (n=1137)	60s Male (n=1062)
Thresholds for anxiety items						
Keyed up	.298	.145	.301	.125	.727	.515
Worrying	.319	-.137	.474	.239	.989	.689
Irritable	.231	-.109	.383	.153	.720	.724
Difficulty relaxing	.372	.060	.514	.379	.890	.734
Sleeping poorly	.380	.137	.396	.288	.633	.430
Head/neckaches	.270	-.302	.296	-.091	.787	.366
Trembling, etc.	.750	.365	.946	.750	1.15	.857
Health worries	.369	.294	.420	.438	.683	.686
Difficulty falling asleep	.423	.227	.587	.457	.877	.487
Thresholds for depression items						
Lacking energy	.206	-.262	.335	.119	.615	.356
Lost interest	.553	.611	.793	.799	1.305	1.400
Lost confidence	.852	.581	1.100	.756	1.410	1.256
Felt hopeless	.857	.767	1.178	.950	1.643	1.514
Difficulty concentrating	.398	.241	.636	.592	.958	.957
Lost weight	1.519	1.297	1.907	1.722	1.997	1.826
Felt slowed up	.517	.216	.549	.415	.577	.361
Feel worse in morning	.395	.311	.897	.759	1.212	.961

Figure 6-3. MGA Factor loadings for males and females on the Goldberg Anxiety and Depression Scales for each age group, at time 2.



6.6. Discussion

The current examination of the Goldberg Anxiety and Depression scales produced two main findings. First, a factor structure for the scales with two separate factors for depression and anxiety was found to fit appropriately. The model fit improved when two anxiety items (5 and 9) about sleep were correlated and one depression item (7) about waking early was removed. Second, the same factor structure was found to fit equally across both males and females. Both of these findings were shown for three separate age groups (20s, 40s and 60s) and at two different time points (Waves 1 and 2). Overall, the results suggest that the scales do not contain items that are biased towards either males or females. Therefore, the Goldberg Anxiety and Depression Scales can be considered appropriate for investigating gender differences in depression and anxiety across the adult lifespan.

The two-factor model tested and verified in this chapter suggests that the Goldberg Scales each tap into a separate construct for depression and anxiety. The factor loadings for each item were shown to load onto the appropriate scale, with only one exception (depression item 7 waking early). These findings add confidence when using the Goldberg Scales to measure depression and anxiety distinctly, and compare findings for the two outcomes, as this thesis does at times. There are few other scales designed to measure depression and anxiety in a distinct but complimentary way. The Hospital Anxiety and Depression Scales (HADS) are one such example (Zigmond & Snaith, 1983). The HADS contain two sets of 7 items each measuring anxiety and depression. Factor analysis conducted by Spinhoven et al. (1997) similarly found evidence for a two-factor solution

for the HADS, although these two factors were found to be highly correlated.

Several minor changes were made in the analyses to improve the factor structure of the Goldberg Scales. However, these changes were analogous to those made in previous research. Studies conducted by Christensen et al. (1999) and Jorm et al. (2005) examined the factor structure of the Goldberg Scales using conventional factor analytic techniques in Amos (structural equation modelling software) and in both cases found that the model improved when anxiety items 5 (sleeping poorly) and 9 (difficulty falling asleep) were correlated. The current findings are also in accordance with another study which suggested that the high correlation between Goldberg sleep items might indicate a third factor related to sleep disturbance (Mackinnon et al., 1994). The analyses conducted by Jorm et al. also included the removal of depression item 7 (waking early). Given the high levels of endorsement for this item (40-50% for each age group), perhaps respondents are interpreting 'waking early' as getting up early or waking at dawn, instead of the insomnia often associated with depression (Fava, 2004). This might explain the low correlations between 'waking early' and the other depression items. Although these minor changes improved the factor structure of the scales in the current analyses, their impact was not considered great enough to remove any of the offending items from subsequent analyses in this thesis. Instead, it was decided to keep the scales in their original form. This had the advantage that findings from other studies using the Goldberg Scales would be comparable.

Although gender-biased items have been found within depression scales, the absence of such a finding in the current analyses does not necessarily conflict with prior research. Items previously highlighted as possible sources of bias include questions about

crying, loss of interest in sex, and talking less (Cole et al., 2000; Salokangas et al., 2002; Stommel et al., 1993). Crying has particularly been characterised as a gendered activity, and as such, there have been calls to remove it from diagnostic criteria and scales assessing depression (Romans & Clarkson, 2008). The Goldberg Depression Scale does not contain items addressing these behaviours. The items it does contain were not found to be problematic in the current investigation, nor have similar items in studies of alternate depression scales. However, the current results are different to those suggesting that somatic symptoms such as changes in appetite, weight, fatigue and sleep are biased in the direction of women (Carter et al., 2000; Wenzel et al., 2005). This may be due to a difference in sample types, as studies with positive findings predominantly used clinically depressed populations whereas the current study used a representative sample of the general population. The current results are contradictory to those of Christensen et al. (1999), who identified the Goldberg depression items 'losing interest', 'having difficulty concentrating' and 'waking early', as being biased in the direction of males. The variation in results is partly due to the different methods used to test for item bias. As previously mentioned, the analysis techniques used in the current chapter are appropriate for analysing binary data, whereas the MIMIC model adopted by Christensen et al. (1999) assumes that the outcome data being factorised is continuous. The current results could therefore be considered an update to those of Christensen et al. based on the adoption of improved methodology.

The current analyses suggest that males and females will score questions such as those in the Goldberg Anxiety Scale similarly, after controlling for levels of the underlying anxiety construct being measured. Little research has investigated the possibility of gender-

biased items in anxiety measures. The study mentioned above by Christensen et al. (1999) did however find that that Goldberg Anxiety items 'worry a lot', 'having head and neck aches', and 'trembling etc' were biased towards women. Alternate studies exploring gender differences in somatic symptoms also suggest that items about aches and trembling might be gender biased (Barsky et al., 2001; Piccinelli & Simon, 1997). The current analyses contradict these prior suggestions of item bias, and instead find that the somatic items within the Goldberg Anxiety Scale are not biased towards women. Once again, the variation in findings can partially be accounted for by the statistical methods adopted. As there is a lack of research in this area, the conflicting results also demonstrate that more investigation is necessary to determine whether somatic items in anxiety scales are gender-biased.

The Goldberg Anxiety and Depression Scales do not appear to contain items that provide a gender-biased result when measuring and comparing the depression and anxiety levels of men and women. The current findings indicate that the scales are appropriate for exploring those factors that might explain the gender disparity in both outcomes. This information adds validity to epidemiological findings about gender differences in depression and anxiety, which are based on data from the Goldberg Anxiety and Depression Scales. While the impact of measurement bias could predominantly be seen as either a theoretical or methodological concern, and therefore possibly neglected by epidemiological or applied researchers exploring the gender disparity in depression and anxiety, this information is a valuable tool for the validation and interpretation of results. In this case, it can be more confidently reported that the significant gender difference in both depression and anxiety across the three separate age groups in PATH is a true

difference, rather than an artefact resulting from item bias.

6.6.1. Limitations

There are some potential limitations specific to the present chapter that should be considered. Firstly, the analyses conducted do not test whether the Goldberg Anxiety and Depression Scales in their entirety are gender-biased. Instead, it is the individual items that are evaluated. It is possible that while the items themselves are not biased, there might be total scale properties that artificially inflate women's levels of depression. Secondly, it is important to recognise that different methods of testing for measurement bias can provide different results. A recent review of methods used to investigate measurement bias in a cognition scale found that the identification of biased items varied depending on whether observed score, item-response or factor analytic methods were adopted (Millsap, 2006). The methods adopted in the present chapter are somewhat based on judgement regarding goodness-of-fit indices and statistical tests of model fit, and it is possible that alternate methods of investigating item bias may provide a different set of result. On the other hand, this study is strengthened and improves on previous investigations, by adopting statistical techniques that are considered appropriate for factorising binary outcome data. Positive elements of the study also include a large epidemiological sample and the replication of results at two different time points.

6.7. Chapter conclusions

This chapter shows that the greater endorsement of symptoms from the Goldberg Anxiety and Depression Scales by women across the three age groups in the PATH dataset cannot be explained by gender-biased items. No gender-biased items were identified.

These findings point to alternate psychological and social explanations for why the gender difference in depression and anxiety occurs. A two-factor solution was found to fit appropriately, suggesting that each scale taps a separate depression and anxiety construct. The current study also highlights the importance of choosing appropriate statistical methods when examining item bias. It suggests that previous investigations should be interpreted in light of the analysis techniques used. Future research could repeat previous studies using more sophisticated statistical methods in order to tease out the impact of analysis choice.

7. STUDY 3: GENDER DIFFERENCES IN LEVELS OF DEPRESSION AND ANXIETY ACROSS THE ADULT LIFESPAN: THE ROLE OF PSYCHOSOCIAL MEDIATORS

7.1. Summary

A wide range of psychosocial factors have been proffered to explain the gender difference in depression and anxiety. This chapter investigates these factors as potential mediators of the gender difference in both outcomes. The two primary research questions are: *What are the potential psychosocial mediators that might explain the preponderance of depression and anxiety for women?; and To what extent do they vary across the adult lifespan?* Based on the research reviewed, it was hypothesised that the majority of factors assessed would act as potential mediators, and that variation in these findings across age would be evident. Using Wave 1 of the PATH dataset, cross-sectional analyses were undertaken separately for three cohorts (20-24, 40-44, 60-64). Several shared potential mediators for depression and anxiety across the three age groups were identified including: childhood adversity, mastery, behavioural inhibition, ruminative style, neuroticism, physical health, and perceived interpersonal and employment problems. Age comparisons showed that some mediating effects were specific to particular age groups. Multivariate models accounted for gender differences in both outcomes in all age groups, except for anxiety in the 20-24 year olds, suggesting further important unmeasured factors specific to this age group.

7.2. Background

Research from this thesis reported to date has confirmed that women experience higher levels of depression and anxiety than men at young, middle and older stages of the lifespan. The magnitude of these gender gaps was found to vary across age, such that the greatest difference for both outcomes occurred during early adulthood. Gender difference in levels of depression and anxiety were not explained by gender-biased items within the Goldberg Anxiety and Depression Scales. The following two chapters focus on investigating the psychosocial basis for gender differences in levels of depression and anxiety. The current chapter aims to identify potential psychosocial mediators for the gender difference in both outcomes, for each cohort in the PATH dataset.

As outlined in Chapter 3, mediation is one process by which gender (A) and a psychosocial factor (B) might work together to influence depression (C). Mediation occurs when an "independent variable causes an intervening variable (mediator) which in turn causes the dependent variable" (p. 83, MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). In order for a variable to be considered a possible mediator of the association between gender and depression two criteria need to be met: a) there must be a gender difference in the mediator and b) the mediator must be related to depression. In the context of the gender difference in depression, mediation has predominantly been characterised in terms of 'exposure'. The exposure hypothesis for the gender difference in depression suggests that females are more exposed to (or possess higher levels of) a set of factors that are also associated with higher levels of depression (Turner & Avison, 1998). This hypothesis proposes a mediation process, where being female leads to greater exposure to

particular factors, which in turn leads to depression. This hypothesis is equally applicable to the gender difference in anxiety.

7.2.1. The gender difference in depression – mediating relationships

As introduced in Chapter 2, a wide range of socio-demographic, social and psychological factors have been proffered to explain the gender difference in depression. In addition to these factors, there are several health and lifestyle factors available in the PATH dataset, which might also be relevant. The evidence supporting each of these factors as potential mediators of the association between gender and depression is provided below. This evidence is framed in terms of the two criteria required for mediation: a) that the factor is associated with gender and b) that the factor is associated with depression.

7.2.1.1. Socio-demographic factors

Socio-economic factors are predictors of depression, and women are likely to be over-represented in lower socio-economic categories. For example, women generally earn less than men, are less likely to be employed and are less well educated (Reskin & Padavic, 1994). Low income, unemployment and poor education are associated with depression. The Belgian Households Panel Survey found that an increase in financial strain resulted in an increase in depressive symptoms (as measured by the Health and Daily Living Form) (Lorant et al., 2007). The Australian National Survey of Mental Health and Well-being (NSMHWB) also found that being unemployed was correlated with a DSM-IV diagnosis of Major Depression (Wilhelm, Mitchell, Slade, Brownhill, & Andrews, 2003). Indirect support for the role of socio-economic factors is found in populations where minimal gender differences in depression have been observed, such as college students

(Strangler & Pintz, 1980) and the Yoruba culture, where women have economic independence (Murphy, 1973). Representation in these socio-economic categories may vary as a function of the age of women, and hence there may be differences in mediation effects across the lifespan.

Relationship status and responsibility for children are also important demographic factors. Research in this area has previously examined complex interactions based on theory suggesting that women are more vulnerable to depression during marriage and child-rearing due to time pressure (Roxburgh, 2004). In the mediation or exposure context, there may be important gender differences in relationship and family status across the adult lifespan that help to explain why the gender difference in depression varies with age. For example, there are more young divorced women than young divorced men, as women tend to marry earlier. As divorce has been associated with Major Depression (Bruce & Kim, 1992) this might be a more relevant mediator during young adulthood as opposed to middle adulthood, where the number of divorced men and women is more equal.

7.2.1.2. Health and lifestyle status factors

Health and lifestyle factors did not feature heavily in the review of the literature conducted in Chapter 2. However, there are some indications that factors such as substance use, physical activity and physical health, may aid in explaining the gender difference in depression, and in determining its ratio over the lifespan. On the one hand, there is evidence to suggest that men may be more at risk for depression because of their greater engagement in substance abuse, a known risk factor for depression. The regular use of substances such as tobacco, alcohol and cannabis is more common among men,

particularly young men (Jha, Ranson, Nguyen, & Yach, 2002; Warner, Kessler, Hughes, Anthony, & Nelson, 1995), and high use of these substances has been associated with depression. The NSMHWB found that smoking was associated with Major Depression (Wilhelm et al., 2003) and that cannabis use was higher in those with an affective disorder (Degenhardt, Hall, & Lynskey, 2001b). The same survey found that alcohol use disorders were highly comorbid with affective disorders (Degenhardt, Hall, & Lynskey, 2001a). Thus, it is possible that when substance use is taken in to account the gender difference in depression may narrow in young adulthood, if all other factors are held constant. On the other hand, there is evidence that women may be more at risk for depression because they more commonly abstain from alcohol. Abstinence has been associated with higher mean levels of distress (as measured by the K-10) (Rodgers et al., 2000).

Physical activity might also be an important explanatory factor. Although evidence is scant, some research indicates that men exercise more than women (Armstrong & Welsman, 2006). As clinical interventions have shown that exercise reduces levels of mild to moderate depression (Dunn, Trivedi, Kampert, Clark, & Chambliss, 2005), this might be one mechanism through which men lower their risk for depression. Physical health is another factor to consider. Women have been found to report greater physical morbidity than men (Gove & Hughes, 1979), and it is well known that poor physical health is highly comorbid with depression (Gagnon & Patten, 2002). Population studies such as the NSMHWB have shown that having a physical illness is associated with Major Depression (Wilhelm et al., 2003).

7.2.1.3. Psychological factors

Chapter 2 surmised that coping styles are likely to affect the gender difference in depression. Ruminative style has been associated with the gender difference in depression. Nolen-Hoeksema has theorised that women are more likely than men to ruminate about negative experiences or thought processes, resulting in higher levels and lengthier episodes of depression (Nolen-Hoeksema, 1987). In one study of college students, women were found to ruminate on an existing sad mood more often than men, and having a ruminative response style predicted higher scores on the Beck Depression Inventory (Butler & Nolen-Hoeksema, 1994). Chapter 2 also indicated that gender differences in personality might also be relevant. Power inequity and helplessness models have hypothesised that the path to depression and helplessness is through the socialisation of passive characteristics (Nolen-Hoeksema, 1987; Weissman & Klerman, 1977). There is some limited support for this idea in the literature on personality and individual differences. A meta-analysis (Feingold, 1994) found that females were less assertive, had lower self-esteem, and higher levels of anxiety than males, and a review of personality and mood disorders found strong evidence that neuroticism and mood disorders are closely associated (Clark et al., 1994). Finally, cognitive function might also be linked to the gender difference in depression. Lower levels of cognition function (e.g. working memory and processing speed) have been associated with higher rates of depression in older individuals (Henderson, 1990). However, gender differences in cognitive function are difficult to measure accurately and have not been consistently observed (Feingold, 1994).

7.2.1.4. Social and relational factors

Social or relational factors, including role strain, interpersonal events, childhood sexual abuse and social support, were identified in Chapter 2 as key explanations for why women are more depressed than men. Traditionally, there is an uneven distribution of household tasks in families with women doing most of the domestic and child-rearing tasks. The US National Survey of Functional Health Status found that this inequity was associated with higher levels of depression in women (as measured by the Centre for Epidemiologic Studies Depression Scale) (Bird, 1999). Recent negative or stressful experiences involving interpersonal relationships are likely to mediate the gender difference in depression. Meta-analyses have shown that women report greater levels of stress in interpersonal relationships than men (Davis, Matthews, & Twamley, 1999), and there is strong evidence that stressful life events are associated with Major Depression (Kendler et al., 1999; Kessler, 1997).

Childhood sexual abuse (CSA) is also a probable explanatory factor. Reports of CSA prevalence vary wildly, with figures ranging from 2-62% of women and 3-16% of men depending on the sample studied and the definition used (Johnson, 2004). Accurate prevalence rates are difficult to pin down, particularly for men, as many cases of abuse go unrecognised and/or unreported (Holmes, Offen, & Waller, 1997). However, overall, it is agreed that women are exposed to greater CSA than men, and there is strong evidence from community, clinical and college studies that CSA is linked to depression (Andrews, Gould & Corry, 2002; Weiss et al., 1999). A final important interpersonal factor to consider is social support. Women appear to have more social support than do men (Vaux,

1985) and social support has been found to be associated with lower levels of depression (Paykel, 1994), suggesting it is a protective factor for women. However, having greater social support or social networks also provides greater opportunity for negative interpersonal experiences (e.g. death of someone close), which may in fact lead to higher rates of depression.

7.2.2. The gender difference in anxiety – mediating relationships

There is a paucity of evidence about mediators for the gender difference in anxiety. While a few studies have explored possible explanations for gender differences in specific anxiety disorders such as post-traumatic stress disorder (Gavranidou & Rosner, 2003) and panic disorder (Foot & Koszycki, 2004), little research has examined the aetiology of gender differences for general anxiety levels in the general community. The research that exists focuses on biological hypotheses, such as neurotransmitter systems, hormonal influences and reproductive factors, while psychosocial explanations remain largely unexplored (Allen, Barrett, Sheeber, & Davis, 2006; Pigott, 1999). Given these limitations and the evidence from Chapter 2 which concluded psychosocial factors associated with the gender difference in depression are also likely to be relevant to anxiety, the approach taken in the current chapter was to investigate the same set of psychosocial factors (those identified in the depression literature) for both outcomes.

7.3. Aims

The current study had two main aims. The first was to identify the socio-demographic, health and lifestyle, psychological and social factors that potentially mediate the association between gender and depression, and investigate whether these same factors

might mediate the relationship between gender and anxiety. The second was to examine differences in these potential mediators across three separate age groups (20-24, 40-44 and 60-64). Most previous studies have investigated the roles played by risk factors individually. The current investigation sought to improve on such piecemeal approaches, by evaluating a broad range of psychosocial factors concurrently within multivariate mediation models. Given the evidence-based selection of the variables under investigation, it was hypothesised that the majority of psychosocial factors assessed would be identified as potential mediators. Based on prior research reviewed in Chapters 2 and 5, indicating that the gender differences in depression and anxiety vary across age, it was also hypothesised that the potential mediators identified would vary between the three age groups.

7.4. Methodology

Data from Wave 1 of the PATH study were analysed in the current chapter. Data from Wave 2 were briefly used to assess the possibility of conducting longitudinal analyses; however these results showed a longitudinal approach was not feasible (see Appendix 6). The psychosocial measures under investigation were: a) socio-demographic measures: gender, age, relationship and employment status, number of children and education level, (b) health and lifestyle measures: cannabis and alcohol use, physical activity and physical health, (c) psychological measures: mastery, extraversion, psychoticism, behavioural activation, behavioural inhibition, two cognitive tests (assessing verbal intelligence and working memory), ruminative style and neuroticism, and (d) social

measures: role strain, recent negative life events, social support and childhood adversities. Descriptions for each of these measures, and the outcome measures for levels of depression and anxiety, were provided in Chapter 4.

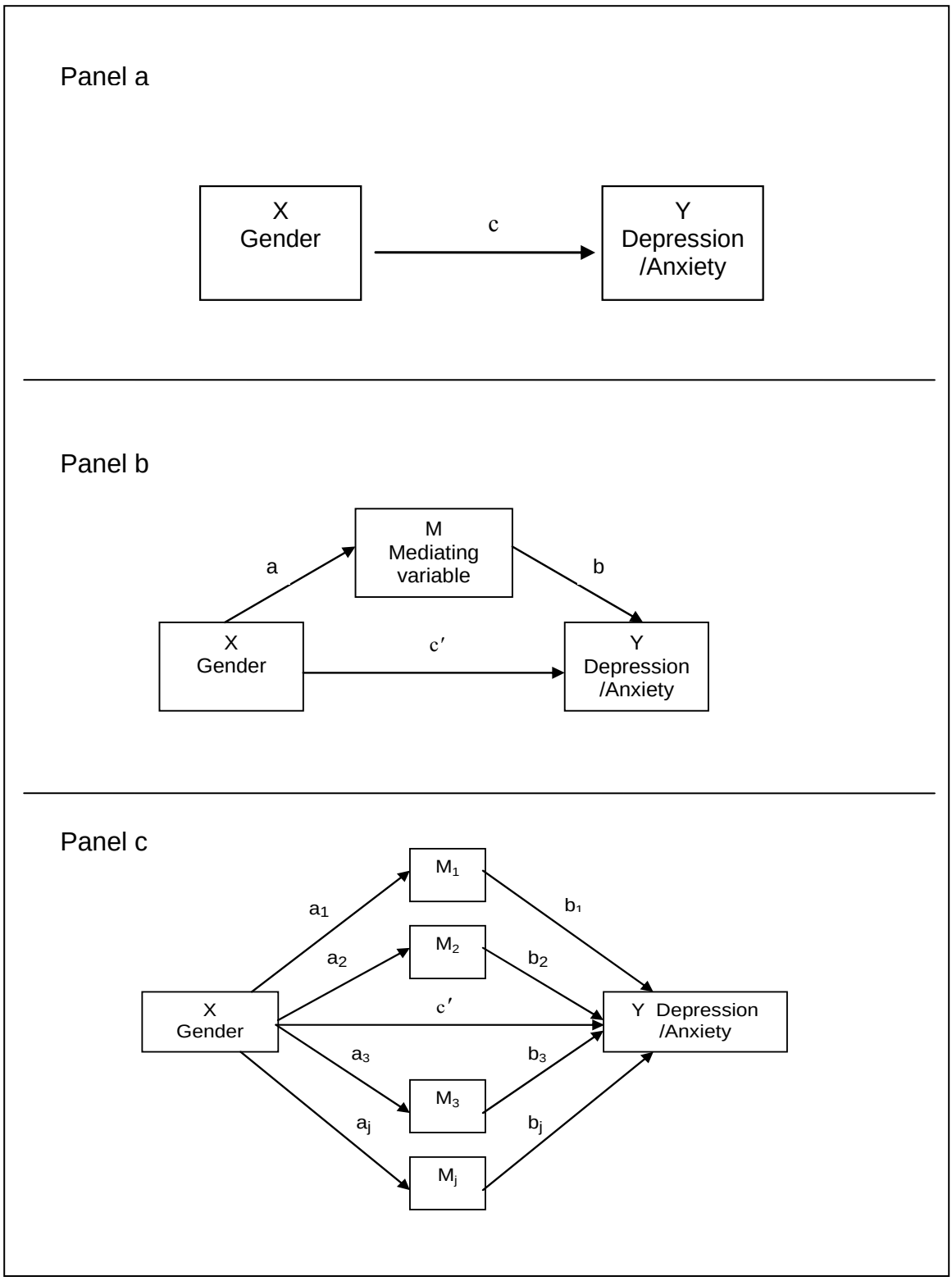
7.4.1. Statistical analyses

Missing data: the majority of participants (n=7108, 95%) had complete data for Wave 1 of the survey. Of those who did not, forty-six were omitted due to missing data on more than 25% of the variables included in the analyses. The full set of variables was used to impute missing data for a further 331 cases, with 90% of these cases requiring imputation of two or fewer variables. Missing data were imputed using the expectation-maximization algorithm in SPSS MVA (Multivariate Analyses) procedure in version 15.0, as described by Enders (2001). The key assumption in this approach is that the missingness is either completely at random or can be predicted from observed values (missing at random; MAR). MAR is an untestable assumption but is reasonable in the present circumstances given the wide range of variables collected. Given the very small proportion of data imputed, the effect of any violation of the MAR assumption would be negligible. Final samples included were: 2384 in the 20-24 age group (48.4% male), 2516 in the 40-44 age group (47.1% male) and 2539 in the 60-64 (51.7% male) age group.

Figure 7-1 illustrates the basic or univariate mediation model applied to the relationships tested in the current study. In this application X is gender, Y is the outcome variable (depression/anxiety) and c is the effect of gender on the outcome variable. Once a mediating variable (M) is added into the model c becomes c′ or the effect of gender on the outcome variable after adjusting for the potential mediator. If the gender effect were fully

mediated c′ would become zero. The present study also explored multivariate models for mediation. This elaboration of the model is illustrated in panel 'c'. Testing all possible mediators concurrently provides information about the effect of a specific mediator in the presence of other mediators, the relative strengths of the mediators, and allows for testing the incremental effects of adding additional mediators (Preacher & Hayes, in press). Inclusion for a large number of possible mediators might also reduce bias in estimating the true direct effect of gender on depression/anxiety, as estimating this effect accurately requires there to be no unmeasured confounders for the effect of both gender and the potential mediators on the outcome (Cole & Hernan, 2002). As outlined in Chapter 2, the cross-sectional analyses conducted in this thesis cannot resolve the causal direction between associations, a criterion that is required to comprehensively establish mediation. To remind the reader of this point of clarification, the significant mediators identified in subsequent cross-sectional analyses are either termed 'significant *potential* mediators' or are noted with the subscript 'p' to denote their true status.

Figure 7-1. Mediation model with no mediators, one mediator and multiple mediators.



Note: Panel a) the direct effect between gender and an outcome variable. Panel b) the univariate mediation model. Panel c) the multivariate mediation model.

The analyses proceeded in three stages. First, a series of t-tests and chi-square tests (two-tailed) identified significant gender differences in each factor under investigation for each age group. Effect sizes were also calculated: Cohen's *'h'* for differences in frequency and Cohen's *'d'* for differences in means (Cohen, 1988). Second, Preacher and Hayes' test of mediation (Preacher & Hayes, 2004, in press) was applied to each factor individually, with separate analyses conducted for depression and anxiety and each age group. This recently developed mediation test utilises bootstrapping to "generate a reference distribution, which is then used for confidence interval estimation and significance testing" (MacKinnon, Fairchild, & Fritz, 2007). Bootstrapping overcomes the normality assumptions necessary in other tests of mediation, such as the Sobel test (Sobel, 1982). This method also improves on Baron and Kenny's approach, which although commonly used, has been found to have low statistical power (MacKinnon et al., 2002). Following the univariate mediation tests, those variables that were not significant potential mediators were removed from further analyses.

Third, Preacher and Haye's test was used to identify significant potential mediators within multivariate models. In this third stage, factors were grouped into categories and added to models sequentially: model 1) gender, model 2) socio-demographic factors, model 3) health and lifestyle factors, model 4) psychological factors, and model 5) social factors. This sequence was based on the general concept that factors with higher stability, such as socio-demographic, health and personality variables are likely to causally precede more variable influences such as social relationships in the chain of events leading to depression or anxiety. Given conceptual similarities between ruminative style, neuroticism, anxiety and depression, and the high correlations between these factors (r=.56 to .71), the

multivariate mediation effects of ruminative style and neuroticism were tested separately.

7.5. Results

7.5.1. Gender differences in psychosocial factors

As previously identified, there were significant gender differences in depression and anxiety across all three age groups as shown in Table 7-1. There were also significant gender differences in many of the psychosocial factors under investigation. This section focuses on those differences that had at least a 'small' effect size (i.e. $h \geq 0.2$ or $d \geq 0.2$) (Cohen, 1988). For the socio-demographic variables, in the 20s age group fewer men were married or had children and more women were divorced or separated. In both the 40s and 60s more men than women were employed. In the 60s age group men had more years of education and were more often married than women. For the health variables, in all age groups men did more physical activity and in the 20s and 40s more men were likely to report regular cannabis use. In all age groups a greater number of men drank alcohol moderately and in the 40s and 60s more women were low consumers or abstinent. For the psychological variables, in all age groups women had higher levels of rumination, neuroticism, behavioural reward-responsiveness and behavioural inhibition and less behavioural drive. In the 20s men scored higher for fun seeking, in both the 20s and 40s men scored higher for psychoticism, and in the 60s they scored higher for mastery. For the social variables, the responsibility of household tasks lay with women across all three age groups. Men were more responsible for providing money in the two older age groups and for financial planning in the 60s. At all ages women experienced greater positive support from friends. Women also reported more childhood adversities in the 20s age group.

Table 7-1. Gender differences in psychosocial factors.

	20-24			40-44			60-64		
Variables	Men % *or* mean (sd)	Women % *or* mean (sd)	P value (effect size)	Men % *or* mean (sd)	Women % *or* mean (sd)	P value (effect size)	Men % *or* mean (sd)	Women % *or* mean (sd)	P value (effect size)
Depression	2.59 (2.28)	3.18 (2.44)	.000 (.25)	2.28 (2.30)	2.56 (2.43)	.003 (.12)	1.58 (1.83)	1.77 (1.92)	.009 (.10)
Anxiety	3.20 (2.60)	4.44 (2.67)	.000 (.47)	3.29 (2.67)	3.72 (2.72)	.000 (.16)	1.99 (2.25)	2.50 (2.39)	.000 (.22)
Socio-demographic factors									
Married or de facto (0, 1)	18.6 %	27.9%	.000 (.21)	81.5%	77.4%	.006 (.12)	86.7%	68.9%	.000 (.44)
Separated or divorced (0, 1)	.3 %	1.6%	.001 (.28)	8.9%	14.8%	.000 (.19)	9.3%	15.4%	.000 (.19)
Employed (0, 1)	85.8 %	84.4%	.358 (.06)	94.8%	85.7%	.000 (.32)	49.2%	32.0%	.000 (.35)
Number of children (0+)	.09 (.39)	.21 (.59)	.000 (.24)	2.05 (1.33)	2.24 (1.34)	.000 (.14)	2.85 (1.51)	2.83 (1.60)	.688 (.01)
Years of education (0+)	14.67 (1.59)	14.89 (1.65)	.001 (.14)	14.87 (2.32)	14.47 (2.33)	.000 (.17)	14.29 (2.74)	13.38 (2.68)	.000 (.34)
Health and lifestyle factors									
Tobacco use (0, 1)	31.9%	31.1%	.691 (.02)	20.3%	17.9%	.127 (.05)	9.8%	11.8%	.110 (.06)
Regular cannabis use (0, 1)	18.4%	8.8%	.000 (.27)	6.9%	1.9%	.000 (.27)	0.2%	0.0%	.500 (.00)
Alcohol: Abstainer/occasional (0,1)	27.7%	36.8%	.000 (.19)	19.5%	35.1%	.000 (.34)	21.0%	40.3%	.000 (.41)
Alcohol: Moderate use (0,1)	66.1%	56.2%	.000 (.21)	74.2%	57.9%	.000 (.34)	72.4%	54.3%	.000 (.38)
Alcohol: Heavy use (0,1)	6.1%	7.0%	.410 (.04)	6.3%	7.1%	.474 (.04)	6.6%	5.4%	.211 (.09)
Vigorous/moderate activity (0, 1)	87.4%	73.1%	.000 (.36)	73.2%	60.8%	.000 (.26)	74.5%	59.7%	.000 (.32)
SF12 Physical health (0+)	53.39 (6.42)	52.67 (7.19)	.010 (.11)	52.09 (7.39)	51.27 (8.52)	.011 (.10)	48.89 (9.64)	47.33 (10.53)	.000 (.15)
Psychological factors									
Mastery (7-28)	23.11 (3.41)	22.53 (3.47)	.000 (.17)	22.23 (3.58)	21.83 (3.58)	.006 (.11)	22.23 (3.64)	21.50 (3.46)	.000 (.21)
EPQ extraversion (0-12)	8.18 (3.38)	8.40 (3.37)	.109 (.07)	6.73 (3.65)	7.26 (3.53)	.000 (.15)	6.55 (3.47)	6.81 (3.43)	.059 (.08)
EPQ psychoticism (0-12)	3.13 (1.80)	2.35 (1.65)	.000 (.45)	2.43 (1.63)	1.85 (1.51)	.000 (.37)	1.86 (1.43)	1.59 (1.35)	.000 (.19)

Behavioral A. (drive) (4-16)	11.40 (2.31)	10.93 (2.29)	.000 (.20)	10.35 (2.38)	9.75 (2.45)	.000 (.25)	10.04 (2.39)	9.19 (2.61)	.000 (.34)
Behavioral A. (fun) (4-16)	12.60 (2.10)	12.11 (1.98)	.000 (.24)	11.04 (2.11)	10.79 (2.10)	.003 (.12)	10.26 (2.30)	10.40 (2.27)	.137 (.06)
Behavioral A. (reward) (5-20)	17.12 (1.98)	17.47 (1.14)	.000 (.22)	16.20 (2.09)	16.71 (1.95)	.000 (.25)	16.00 (2.10)	16.57 (2.15)	.000 (.27)
Behavioral inhibition (7-28)	19.14 (3.53)	21.70 (3.27)	.000 (.75)	19.78 (3.32)	22.50 (3.13)	.000 (.84)	17.50 (3.17)	20.90 (3.02)	.000 (1.10)
Spot-the-Word (0-60)	47.78 (5.56)	47.43 (5.11)	.102 (.07)	50.76 (5.80)	50.22 (5.57)	.016 (.09)	51.93 (5.89)	51.54 (5.73)	.091 (.07)
Digit Symbol Backwards (0-10)	5.47 (2.32)	5.23 (2.27)	.012 (.10)	5.36 (2.36)	5.10 (2.24)	.005 (.11)	4.76 (2.22)	5.01 (2.26)	.005 (.11)
Ruminative style (0-30)	8.70 (5.07)	10.81 (5.34)	.000 (.41)	8.04 (4.46)	9.21 (4.52)	.000 (.26)	6.33 (3.85)	7.68 (3.76)	.000 (.35)
EPQ neuroticism (0-12)	4.02 (3.28)	5.58 (3.33)	.000 (.47)	3.53 (3.15)	4.53 (3.27)	.000 (.31)	2.92 (2.98)	3.73 (3.02)	.000 (.27)
Social factors									
Household tasks (> 50%) (0, 1)	19.3%	39.2%	.000 (.45)	22.9%	79.3%	.000 (1.19)	24.4%	80.8%	.000 (1.22)
Financial planning (> 50%) (0, 1)	26.8%	33.3%	.001 (.13)	56.1%	55.6%	.809 (.00)	63.0%	51.6%	.000 (.22)
Providing money (> 50%) (0, 1)	19.8%	18.9%	.568 (.03)	67.8%	28.0%	.000 (.82)	65.2%	35.5%	.000 (.59)
Recent illness/injury (0, 1)	10.9%	7.4%	.003 (.14)	7.8%	6.5%	.215 (.04)	8.8%	8.1%	.618 (.04)
Recent family illness/injury (0, 1)	19.2%	23.5%	.011 (.12)	21.5%	22.3%	.664 (.00)	14.6%	17.2%	.073 (.06)
Recent close family death (0, 1)	1.0%	1.1%	.846 (.00)	2.6%	3.2%	.409 (.00)	3.0%	3.5%	.501 (.04)
Recent other close death (0, 1)	20.6%	20.2%	.799 (.03)	14.9%	19.4%	.004 (.11)	18.8%	20.3%	.367 (.03)
Recent relationship ended (0, 1)	16.6%	20.0%	.034 (.08)	3.4%	3.5%	.913 (.06)	1.1%	.9%	.561 (.00)
Recent problem with someone (0, 1)	16.9%	23.7%	.000 (.17)	11.2%	16.2%	.000 (.15)	6.0%	11.0%	.000 (.18)
Recent work crisis (0, 1)	19.8%	22.0%	.208 (.05)	21.7%	18.3%	.036 (.10)	6.5%	2.5%	.000 (.19)
Recent threat to job (0, 1)	15.3%	11.6%	.010 (.09)	13.4%	8.6%	.000 (.13)	3.0%	1.2%	.002 (.15)
Positive support from friends (0-6)	4.84 (1.33)	5.26 (1.08)	.000 (.35)	4.46 (1.34)	5.09 (1.16)	.000 (.50)	4.96 (1.31)	5.40 (1.04)	.000 (.37)
Negative events with friends (0-9)	3.47 (1.81)	3.23 (1.68)	.001 (.14)	2.99 (1.60)	2.78 (1.68)	.001 (.13)	2.54 (1.64)	2.30 (1.68)	.000 (.14)
Positive support from family (0-6)	5.32 (1.12)	5.43 (1.00)	.011 (.10)	5.21 (1.18)	5.16 (1.25)	.343 (.04)	5.43 (1.06)	5.46 (1.07)	.438 (.03)
Negative events with family (0-9)	3.97 (2.04)	4.23 (2.21)	.003 (.12)	4.24 (2.00)	4.62 (2.13)	.000 (.18)	3.34 (1.87)	3.37 (1.93)	.711 (.02)
No. of childhood adversities (0-17)	1.35 (1.94)	1.79 (2.39)	.000 (.20)	1.74 (2.32)	2.14 (2.59)	.000 (.16)	1.40 (1.87)	1.66 (2.16)	.001 (.13)

7.5.2. Mediation analyses

Table 7-2 shows the results for the univariate mediation analyses. Tables 7-3 and 7-4 show the results for the multivariate mediation analyses. In each of the tables, the coefficients shown correspond to Ordinary Least Squares (OLS) regressions conducted as part of the analyses. They demonstrate the association between each psychosocial factor and outcome variable, after adjusting for the effect of gender (and other potential mediators in the case of the multivariate analyses). Bold text indicates a significant gender effect after the psychosocial factor was added. The asterisks indicate significant potential mediators identified using the Preacher and Hayes test for mediation. The following section describes the results in Tables 7-2, 7-3 and 7-4, categorising them in terms of their status as positive and negative potential mediators. Positive mediators[p] mediate or explain the gender difference in depression/anxiety and are associated both with being female and higher levels of depression/anxiety. Although less common, several negative mediators[p] were also found. Negative mediators[p] exacerbate the gender difference and are associated with being male and higher depression/anxiety. While it was not an explicit aim of this study to identify negative mediators, their identification is noted, as they provide useful information about the potential risk factors for men's levels of depression and anxiety.

7.5.2.1. Potential univariate mediators for the gender difference in depression

Table 7-2 shows that several of the significant univariate mediators[p] for the gender difference in depression were consistently identified across all three age groups. For demographic factors, greater separation/divorce was a consistent positive mediator[p] (i.e. was associated with both being female and greater symptoms). Consistent positive

health and lifestyle mediators[p] were alcohol abstinence, less frequent moderate drinking, less vigorous exercise and poorer physical health. Positive psychological mediators[p] across all three age groups were lower levels of mastery, behavioural drive and the Digit Symbol scores, as well as higher levels of behavioural inhibition, rumination and neuroticism. Positive social mediators[p] maintained across the age groups were a greater responsibility for household tasks, a recent problem with someone, more negative events with friends, and more childhood adversities. Consistent negative social mediators[p] (i.e. associated with both being male and greater symptoms) were less positive support from friends, and a recent job threat.

In addition to those mediators[p] consistent across age groups, several additional mediators[p] relevant to the gender difference in depression were identified for each age group. For the 20-24 year olds having more children, more responsibility for financial planning, experiencing a recent family illness/injury, having a recent relationship end, and more negative family events were additional positive mediators[p]. Further negative mediators[p] for this age group were poorer education, more frequent cannabis use, higher levels of psychoticism, lower levels of behavioural reward, greater personal injury, and less positive support from family. For the 40-44 year olds additional positive mediators[p] were being married/defacto relationship, poorer education, being unemployed, poorer Spot-the-Word scores, and experiencing a recent close personal death. Further negative mediators[p] for this age group were more frequent cannabis use, more frequent work crises and less extraversion. For the 60-64 year olds additional positive mediators[p] were being in a marriage/defacto relationship, not being employed, poorer education, and poorer Spot-the-Word scores. Additional negative mediators[p] were responsibility to plan and provide financially, and more frequent work crises.

Table 7-2. Univariate mediation[p] effects for gender differences in depression and anxiety.

	Depression 20s		Depression 40s		Depression 60s		Anxiety 20s		Anxiety 40s		Anxiety 60s	
	Gender (β)	Mediator (β)	Gender (β)	Mediator (β)	Gender (β)	Mediator (β)	Gender (β)	Mediator (β)	Gender (β)	Mediator (β)	Gender (β)	Mediator (β)
Direct gender effect (female)	**-.13**		**-.06**		**-.04**		**-.23**		**-.08**		**-.09**	
Socio-demographic factors												
Married or de facto (no)	**-.14**	-.05	**-.06**	-.13*	-.03	-.10*	**-.23**	-.02	**-.08**	.10*	**-.09**	-.03
Separated/divorced (no)	**-.12**	.30*	**-.05**	.09*	**-.04**	.05*	**-.23**	.20*	**-.07**	.07*	**-.09**	.03
Employed (no)	**-.13**	-.17	**-.04**	-.17*	-.03	-.09*	**-.23**	-.12	**-.07**	-.15*	**-.08**	-.08*
Number of children (0+)	**-.12**	.32*	**-.06**	.01	**-.04**	.01	**-.23**	.18*	**-.08**	.01	**-.09**	-.01
Years of education (0+)	**-.14**	-.21*	**-.05**	-.11*	-.02	-.10*	**-.24**	-.13*	**-.08**	-.03	**-.08**	-.07*
Health and lifestyle factors												
Heavy cannabis use (no)	**-.16**	.13*	**-.07**	.08*	**-.04**	.20	**-.25**	.10*	**-.08**	.03	**-.10**	.22
Alcohol: Abstain/occasional (no)	**-.13**	.04*	**-.05**	.07*	-.02	.11*	**-.23**	.01	**-.08**	.03	**-.08**	.08*
Moderate (no)	**-.12**	-.09*	**-.04**	-.10*	-.02	-.10*	**-.23**	-.05*	**-.07**	-.06*	**.08**	-.09*
Heavy (no)	**-.13**	.09	**-.06**	.06	**-.04**	.00	**-.23**	07	**-.08**	.07	**-.10**	.03
Vigorous/moderate activity (no)	**-.10**	-.20*	**-.05**	-.11*	-.02	-.15*	**-.21**	-.14*	**-.06**	-.11*	**-.07**	-.12*
SF12 Physical health (0+)	**-.12**	-.22*	**-.05**	-.31*	-.02	-.30*	**-.22**	-.21*	**-.07**	-.27*	**-.07**	-.26*
Psychological factors												
Mastery (7-28)	**-.09**	-.50*	-.04	-.47*	-.01	-.34*	**-.20**	-.39*	**-.06**	-.41*	**-.06**	-.33*
EPQ extraversion (0-12)	**-.14**	-.23	**-.08**	-.18*	**-05**	-.16	**-.24**	-.17	**-.09**	-.15*	**-.10**	-.13
EPQ psychoticism (0-12)	**-.15**	.06*	**-.06**	.03	**-05**	.04	**-.25**	..07*	**-.07**	-.06*	**-.10**	.01
Behavioural A. (drive) (4-16)	**-.12**	-.12*	**-.06**	-.05*	**-.04**	-.05*	**-.23**	-.07*	**-.08**	-.04	**-.09**	-.04*
Behavioural A. (fun) (4-16)	**-.13**	-.03	**-.06**	.02	**-.04**	-.01	**-.23**	-.03	**-.08**	-.03	**-.10**	-.02

Behavioural A. (reward) (5-20)	**-.14**	-.07*	**-.06**	.03	**-.05**	-.01	**-.24**	-.03*	**-.08**	.04	**-.10**	-.01
Behavioural inhibition (7-28)	.00	.34*	.02	.34*	-.01	.18*	**-.11**	.32*	.02	.38*	**-.05**	.23*
Spot-the-Word (0-60)	**-.13**	-.02	**-.06**	-.06*	**-.04**	-.05*	**-.23**	.05	**-.08**	.03	**-.09**	-.05
Digit Symbol Backwards (0-10)	**-.13**	-.07*	**-.06**	-.08*	**-.04**	-.08*	**-.23**	-.02	**-.08**	-.04	**-.09**	-.05*
Ruminative style (0-30)	.00	.58*	.02	.66*	**.04**	.60*	**-.12**	.49*	-.01	.54*	-.02	.56*
EPQ neuroticism (0-12)	.01	.61*	.03	.60*	.01	.46*	**-..10**	.56*	.01	.59*	**-.03**	.51*
Social factors												
Household tasks (> 50%)	**-.10**	.15*	.01	.12*	-.01	.05*	**-.20**	.14*	-.04	.07*	**-.09**	.02
Financial planning (> 50%)	**-.12**	.11*	**-.06**	.03	**-.05**	.04*	**-23**	.09*	**-.08**	.04	**-.10**	.02
Providing money (> 50%)	**-.13**	.11	-.08	.05	**-.06**	.06*	**-.23**	.14	**-.11**	.06*	**-.10**	.03
Recent illness/injury (no)	**-.14**	.14*	**-.07**	.20	**-.04**	.13	**-.24**	.15*	**-.08**	.19	**-.10**	.14
Recent family illness/injury (no)	**-.12**	.13*	**-.06**	.10	**-.04**	.04	**-.23**	.13*	**-.08**	.12	**-.09**	.06
Recent close family death (no)	**-.13**	.06	**-.06**	.07	**-.04**	.02	**-.23**	.06	**-.08**	-.05	**-.09**	.05
Recent other close death (no)	**-.13**	.08	**-.06**	.06*	**-.04**	.02	**-.23**	.09	**-.08**	.06*	**-.09**	.04
Recent relationship ended (no)	**-.13**	.07*	**-.06**	.11	**-.04**	.10	**-.23**	.09*	**-.08**	.11	**-.10**	.07
Recent problem with someone (no)	**-.11**	.20*	**-.05**	.18*	**-.03**	.15*	**-.21**	.20*	**-.07**	.18*	**-.08**	.17*
Recent work crisis (no)	**-.12**	.23	**-.07**	.21*	**-.05**	.16*	**-.23**	.24	**-.09**	.21*	**-.10**	.16*
Recent threat to job (no)	**-.14**	.16*	**-.07**	.14*	**-.05**	.09*	**-.24**	.16*	**-.09**	.12*	**-.10**	.03
Positive support from friends (0-6)	**-.18**	-.31*	**-.12**	-.22*	**-.07**	-.14*	**-.28**	-.25*	**-.13**	-.20*	**-.11**	-.10*
Negative events with friends (0-9)	**-.15**	.28*	**-.07**	.20*	**-.05**	.14*	**-.25**	.27*	**-.09**	.18*	**-.10**	.14*
Positive support from family (0-6)	**-.14**	-.23*	**-.06**	-.24	**-.05**	-.15	**-.24**	-.21*	**-.08**	-.20	**-.10**	-.12
Negative events with family (0-9)	**-.11**	.32*	**-.04**	.20*	**-.04**	.17	**-.21**	.32*	**-.06**	.23*	**-.09**	.22
No. of childhood adversities (0-17)	**-.10**	.29*	**-.04**	.22*	**-.03**	.18*	**-.21**	..27*	**-.06**	.22*	**-.08**	.19*

Note: Reference categories/scales (min-max) in brackets. 'Bold text' p<.05 for the gender coefficient. '*' p<.05 for test of mediation. 'β' standardised coefficients.

7.5.2.2. Potential univariate mediators for the gender difference in anxiety

Many of the variables found to mediate[p] the gender difference in depression also mediated[p] the association for anxiety. Table 7-2 shows that for the 20s no variables acted as unique mediators[p] for anxiety. The only disparity between the two outcomes was that alcohol abstinence and the Digit Symbol Backwards test acted as mediators[p] for depression only. Mediators[p] unique to anxiety in the 40s were psychoticism (positive) and providing money (negative). Variables identified as mediators[p] for depression but not anxiety were education, cannabis use, alcohol abstinence, behavioural drive, Spot-the-Word scores and Digit Symbol scores. For the 60s no variables acted as unique mediators[p] for anxiety. The variables married/de facto, separated/divorced, Spot-the-Word scores, household tasks, financial planning, providing money, and a recent job threat acted as mediators[p] for depression only.

7.5.2.3. Potential multivariate mediators for the gender difference in depression

Table 7-3 shows the results for the multivariate models for depression. Results for the 20-24 age group show that the direct effect of gender on depression remained significant until psychological factors were added in model 4. Model 2 presented two significant socio-demographic mediators[p]: separation/divorce (positive) and poorer education (negative). The addition of health and lifestyle variables in model 3 introduced three significant mediators[p]: less physical activity (positive), poorer physical health (positive) and regular cannabis use (negative). The addition of psychological factors in model 4 introduced lower levels of mastery and higher behavioural inhibition as positive mediators[p] and higher psychoticism as a negative mediator. In the final model (5), positive social mediators[p] were more family illness/injury, relationship

problems, negative family events and childhood adversities. Negative social mediators[p] were more personal illness or injury, less support from friends and more employment threats.

Results for the 40s and 60s age groups are also shown in Table 7-3. In both age groups the direct effect of gender on depression was removed in model 2, re-emerged in the reverse form in model 4 for the 60s, and was not significant in the final model. As in the univariate analyses, several mediators[p] were the same as those identified for the 20s. Specific to the 40s, positive mediators[p] were poorer education and employment, and negative mediators[p] were more work crises and lower extraversion. The two main additional mediators[p] for the 60s were lower scores on the Spot-the-Word test (positive) and a greater responsibility to provide financially (negative).

Table 7-3. Mediated[p] effects for gender differences in depression.

Variables	20-24					40-44					60-64				
	Model 1 (β)	Model 2 (β)	Model 3 (β)	Model 4 (β)	Model 5 (β)	Model 1 (β)	Model 2 (β)	Model 3 (β)	Model 4 (β)	Model 5 (β)	Model 1 (β)	Model 2 (β)	Model 3 (β)	Model 4 (β)	Model 5 (β)
Direct gender effect (female)	**-.13**	**-.13**	**-.11**	-.01	-.02	**-.06**	-.03	-.02	.03	.03	**-.04**	.00	.03	**.06**	.04
Socio-demographic factors															
Married or de facto (no)		-	-	-	-		-.09*	-.06*	-.03	-.02		-.08*	-.06*	-.07*	-.04
Separated/divorced (no)		.24*	.22*	.16*	12*		.04	.05*	.05*	.04		.01	.01	.00	-.02
Employed (no)		-	-	-	-		-.15*	-.08*	-.07*	-.06*		-.08*	-.02	-.01	-.02
Number of children (0+)		.14	.15*	.11*	.00		-	-	-	-		-	-	-	-
Years of education (0+)		-.19*	-.09*	-.07*	-.07*		-.09*	-.06*	-.05*	-.06*		-.08*	-.04*	-.03*	-.03*
Health and lifestyle factors															
Regular cannabis use (no)			.11*	.07*	.05*			.04*	.03	.01			-	-	-
Alcohol: Abstain/occ. (moderate)			.04*	.03	.03			.02	.01	.01			.05*	.05*	.04*
Moderate/vigorous activity (no)			-.16*	-.09*	-.09*			-.05*	-.02	-.02			-.06*	-.04*	-.04*
SF12 Physical health (0+)			-.16*	-.13*	-.11*			-.27*	-.20*	-.18*			-.27*	-.24*	-.23*
Psychological factors															
Mastery (7-28)				-.35*	-.24*				-.36*	-.29*				-.26*	-.22*
EPQ extraversion (0-12)				-	-				-.04*	-.05*				-	-
EPQ psychoticism (0-12)				.09*	.05*				-	-				-	-
Behavioral A. (drive) (4-16)				.03	.00				.06*	.02				.00	-.01
Behavioral A. (fun) (4-16)				-	-				-	-				-	-
Behavioral A. (reward) (5-20)				-.02	-.02				-	-				-	-

Behavioral inhibition (7-28)	.26*	.22*	.20*	.18*	.11*	.10*
Spot-the-Word (0-60)	-	-	-.02	.02	.05*	.04*
Digit Symbol Backwards (0-10)	-.03	-.02	.01	.00	-.03	-.02
Social factors						
Household tasks (> 50%)		.03		.02		.01
Financial planning (> 50%)		.02		-		.01
Providing money (> 50%)		-		-		.05*
Recent illness/injury (no)		.02*		-		-
Recent family illness/injury (no)		.07*		-		-
Recent close family death (no)		-		-		-
Recent other close death (no)		-		.01		-
Recent relationship ended (no)		.03*		-		-
Recent problem with someone (no)		.05*		.07*		.08*
Recent work crisis (no)		-		.12*		.10*
Recent threat to job (no)		.04*		.02		.05*
Positive support from friends (0-6)		-.12*		-.06*		-.04*
Negative events with friends (0-9)		.08*		.06*		.08*
Positive support from family (0-6)		.02		-		-
Negative events with family (0-9)		.10*		.03		-
No. of childhood adversities (0-17)		.09*		.09*		.09*

Note: Reference categories/scales (min-max) in brackets. ‘Bold text’ p<.05 for gender coefficient. ‘*’ p<.05 for test of mediation. ‘-’ indicates the variable was excluded (not a univariate mediator). ‘β' standardised coefficients.

7.5.2.4. Potential multivariate mediators for the gender difference in anxiety

The multivariate models for anxiety are shown in Table 7-4. In the 20s age group the direct effect of gender on anxiety remained significant in the final model. In model 2, greater separation/divorce (positive) and poorer education (negative) were significant mediators[p], however these effects were removed in subsequent models. The addition of health and lifestyle variables in model 3 introduced two enduring positive mediators[p]; less physical activity and poorer physical health. In model 4 the positive psychological mediators[p] included greater behavioural inhibition and less mastery, and the negative mediators[p] were greater psychoticism and behavioural drive. However, behavioural drive was no longer significant in the final model. Positive social mediators[p] introduced in model 5 were; greater responsibility for household tasks and more family illness/injury, relationship breakdowns, interpersonal problems, negative family events, and childhood adversities. Negative mediators[p] were more personal illness/injury and threats to employment, and less support from friends.

Table 7-4 also shows the results for the 40s and 60s age groups. For both ages the direct effect of gender was removed with the addition of psychological variables in model 4. Once again, a number of the significant mediating[p] factors were the same as those for the 20s age group. For the 40s less frequent employment was an additional positive mediator[p]. An additional negative mediator[p] for the 40s and 60s was more perceived work crises. In the 60s there were fewer significant mediating[p] effects and alcohol abstinence was the only new mediator[p] (positive) introduced

Table 7-4. Mediated[p] effects for gender differences in anxiety.

Variables	20-24					40-44					60-64				
	Model 1 (β)	Model 2 (β)	Model 3 (β)	Model 4 (β)	Model 5 (β)	Model 1 (β)	Model 2 (β)	Model 3 (β)	Model 4 (β)	Model 5 (β)	Model 1 (β)	Model 2 (β)	Model 3 (β)	Model 4 (β)	Model 5 (β)
Direct gender effect (female)	**-.23**	**-.23**	**-22**	**-.13**	**-.13**	**-.08**	**-.06**	**-.05**	.02	.00	**-.09**	**-.07**	**-.05**	-.03	-.04
Socio-demographic factors															
Married or de facto (no)		-	-	-	-		-.05	-.03	-.02	-.00		-	-	-	-
Separated/divorced (no)		.17*	.15*	.09	.05		.04	.05	.05*	.03		-	-	-	-
Employed (no)		-	-	-	-		-.14*	-.08*	-.06*	-.07*		-.07*	-.02	-.01	-.02
Number of children (0+)		.06	.07	.05	-.06		-	-	-	-		-	-	-	-
Years of education (0+)		-.12*	-.05	-.04	-.04		-	-	-	-		-.06*	-.02	.00	-.01
Health and lifestyle factors															
Regular cannabis use (no)			.08*	.04*	.02			-	-	-			-	-	-
Alcohol: Abstain/occ. (moderate)			.01	.01	.00			-.01	.01	-.01			.04*	.04*	.04*
Moderate/vigorous activity (no)			-.11*	-.05*	-.06*			-.06*	-.03	-.03			-.05*	-.02	-.03
SF12 Physical health (0+)			-.18*	-.15*	-.13*			-.25*	-.18*	-.16*			-.26*	-.20*	-.19*
Psychological factors															
Mastery (7-28)				-.27*	-.15*				-.28*	-.21*				-.24*	-.21*
EPQ extraversion (0-12)				-	-				.00	-.02				-	-
EPQ psychoticism (0-12)				.11*	.06*				.04*	.01				-	-
Behavioral A. (drive) (4-16)				.06*	.03				-	-				-.01	-.02
Behavioral A. (fun) (4-16)				-	-				-	-				-	-
Behavioral A. (reward) (5-20)				-.02	-.02				-	-				-	-

Behavioral inhibition (7-28)	.28*	.24*	.27*	.24*	.16*	.15*
Spot-the-Word (0-60)	-	-	-	-	-	-
Digit Symbol Backwards (0-10)	-	-	-	-	.00	.00
Social factors						
Household tasks (> 50%)		.05*		.00		-
Financial planning (> 50%)		.00		-		-
Providing money (> 50%)		-		.03		-
Recent illness/injury (no)		.05*		-		-
Recent family illness/injury (no)		.08*		-		-
Recent close family death (no)		-		-		-
Recent other close death (no)		-		.02		-
Recent relationship ended (no)		.05*		-		-
Recent problem with someone (no)		.06*		.08*		.09*
Recent work crisis (no)		-		.12*		.11*
Recent threat to job (no)		.06*		.00		-
Positive support from friends (0-6)		-.09*		-.06*		-.01
Negative events with friends (0-9)		.08*		.04*		.09*
Positive support from family (0-6)		.01		-		-
Negative events with family (0-9)		.12*		.08*		-
No. of childhood adversities (0-17)		.08*		.10*		.11*

Note: Reference categories/scales (min-max) in brackets. ‘Bold text’ p<.05 for gender coefficient. ‘*’ p<.05 for test of mediation. ‘-’ indicates the variable was excluded (not a univariate mediator). ‘β' standardised coefficients.

7.5.3. Supplementary analyses

Multivariate models that added ruminative style and neuroticism in addition to the other psychosocial factors assessed showed that these factors were strong, significant positive mediators[p] of the gender difference in both depression and anxiety. In each model the addition of ruminative style and neuroticism was accompanied by large reductions in the direct effect of gender upon depression/anxiety. After adjusting for other factors in the model, ruminative style mediated[p] depression across the 20s, 40s and 60s (β *(standardised coefficient)* =.32, .37, .35, all p<.05) as well as anxiety (β =.23, .19, .24, all p<.05). Neuroticism also mediated[p] depression across all three age groups (β =.24, .31, .20, all p<.05) as well as anxiety (β =.29, .36, .32, all p<.05).

7.6. Discussion

The current study identified the status of a wide range of psychosocial variables as potential mediators of the gender difference in depression, investigated whether a similar set of factors applied to the gender difference in anxiety, and examined the variation in findings across three separate age groups. While previous studies have predominantly adopted a piecemeal approach to investigating mediators in this context, the current study utilised multivariate models to examine the effects of numerous psychosocial factors concurrently. Thus, the discussion below focuses on those variables identified as significant potential mediators within the final, adjusted multivariate models (Model 5) adopted.

Several shared mediators for depression and anxiety across the three PATH age groups were identified. Factors more common for women than men in all age groups,

which were also associated with greater symptomology included poorer physical health, lower levels of mastery, higher levels of behavioural inhibition, rumination and neuroticism, and more perceived interpersonal problems. Problems related to employment were more common for men than women in all age groups, and were associated with higher levels of depression and anxiety. Adjusting for these potential mediators accounted for the gender difference in levels of anxiety and depression in the majority of multivariate models (except for anxiety in the 20s). Several additional interesting age differences involving specific mediators were also observed. Overall, in comparing the findings for depression and anxiety there were few discrepancies.

7.6.1. Consistent potential mediators

Many of the potential mediators identified were found to be significant for both depression and anxiety, across all three age groups. None of these pervasive effects were within the category of socio-demographic factors. One health and lifestyle factor – poor physical health – was found to be a consistent potential positive mediator. Thus, women of all age groups were more likely to report physical health problems, which contributed towards their higher levels of depression and anxiety. This finding reflects previous research indicating that women report higher rates of morbidity (Gove & Hughes, 1979) and that physical health status is correlated with mental health (Gagnon & Patten, 2002), but goes a step further in demonstrating that women's higher rates of morbidity are correlated with their poorer mental health across the adult lifespan. Stress theory has commonly been proposed as an explanatory model for these associations (Baum & Grunberg, 1991), with female excesses in poor physical and mental health being attributed to strain involving work and family roles. However, results from the current analyses

suggest that even after controlling for gender differences in employment and role strain, physical health remains an independent potential mediator across the adult lifespan.

Four psychological variables were found to consistently act as potential positive mediators for or as contributors towards women's preponderance of depressive and anxiety symptoms; lower levels of mastery, and higher levels of behavioural inhibition, negative ruminative style and neuroticism. These factors have previously been highlighted in theories examining the gender difference in depression (Nolen-Hoeksema et al., 1994; Weiss et al., 1999; Weissman & Klerman, 1977; Wilhelm et al., 1997). However, their role in explaining gender differences in anxiety has not been explored previously. The consistency of these factors across age groups indicates a pervasive relationship with depression and anxiety at a variety of life stages. An alternate interpretation is the possibility that these mediators might simply be proxy variables for depression or anxiety or consequences, thus explaining their consistency (Bebbington, 1996). This may particularly be the case for ruminative style and neuroticism, which overlap conceptually with both depression and anxiety and are highly associated with these conditions (Jorm et al., 2000; Nolen-Hoeksema, 2000). Although, both ruminative style and neuroticism were found to contribute both independently and substantially when included simultaneously in multivariate models, suggesting they have some degree of independence.

Interpersonal problems were consistently identified as potential positive social mediators. Interpersonal problems, particularly involving family, were more common in women and also were associated with levels of depression and anxiety, even when other variables were considered simultaneously. The current study also found that women of all age groups reported more support from friends than men did, a factor which was associated

with decreased depression and anxiety. In combination, these results are consistent with previous suggestions that women's focus on interpersonal relationships is bittersweet, with opportunities for both positive and negative effects (Kessler & McLeod, 1984; Wolk & Weissman, 1995). The current findings also imply that the majority of interpersonal problems leading to women's mental health issues involve family members rather than friends. For men, negative employment experiences were more common in all age cohorts, with work problems and employment insecurity found to be associated with greater depression and anxiety. Overall, these data suggest that the types of negative events experienced by men and women differ, creating different paths to the development and experience of mental health problems.

A final consistent potential social mediator associated both with being female and higher levels of depression and anxiety in all age groups, was childhood adversity. This result is analogous to previous research indicating that childhood sexual abuse is more common for girls than boys and is associated with pathology (Weiss et al., 1999). Reviews aimed at summarising the possible explanations for the gender difference in depression have also identified childhood sexual abuse as an important factor (e.g. Bebbington, 1996). The measure of childhood adversity adopted in the current study, was a summary measure of items including not only childhood sexual abuse but other adverse experiences, such as witnessing household conflict and parental affection. Therefore, it is not possible to conclude exactly which events were predominantly related to women's greater anxiety and depression, only that in total, women experienced a higher mean number of adversities. However, the findings do uniquely show that the impact of experiencing a greater number

of adversities is independent of other psychosocial influences, and remains across the adult lifespan.

7.6.2. Age differences and trends

There were several interesting trends across age. Overall, as age increased, there were fewer significant potential mediators for gender differences in both anxiety and depression. The category of that reduced the most was the social/relational group. For example, experiencing a recent romantic relationship end, was associated both with being female and greater anxiety and depression in the 20s age group, but neither of the two older age groups, as was having a close family member experience a recent illness or injury. It appears that less relationship stability and a higher frequency of negative interpersonal events contributes particularly to the poor mental health of young women. This finding is consistent with the kindling hypothesis, which posits that the first episode of Major Depression is more likely to be preceded by negative life events or major stressors than subsequent episodes (Post, 1992). More specifically, as the reduction across age relates to positive potential mediators, rather than just risk factors applicable to both genders, the findings suggest the kindling hypothesis is more pertinent to women than men. No prior studies have directly tested gender differences in the kindling hypothesis. A study of twin females in the general population found that the relationship between stressful life events and major depression decreased with successive episodes, indicating that the kindling hypothesis is relevant for women (Kendler, Thornton, & Gardner, 2000). However, a recent meta-analysis (Stroud, Davila, & Moyer, 2008) found that as the percentage of women in the sample increased, the kindling hypothesis was less likely to be supported, contradicting the current findings. Although a direct test of gender differences

in the kindling hypothesis was not possible in the current study (as several waves of longitudinal data would be required), the findings provoke additional interest in this area.

The role played by education also differed across age. Women in the 20s age group were more highly educated than men, and education was associated with lower levels of depression. This reversed in the two older age groups where men had greater levels of education. Similarly in the 40s age group women had higher levels of unemployment than men, a factor associated with greater depression and anxiety, whereas unemployment was not a mediator in the 20s. These results reflect a shift in the traditional gender divide of socio-economic resources and responsibilities towards one that favours young women (Inglehart & Norris, 2003). Despite this development, the 20s age group still showed the greatest gender gap in levels of anxiety and depression, once again highlighting the negative impact of interpersonal problems on young women's mental health.

There are a number of other findings which might also reflect changes in societal expectations for men and women across time. For example, alcohol abstinence was associated with being female and lower depression and anxiety, in the 60s age group only. Similarly, cannabis use was associated both with being male and depression in the 20s age group only, which may reflect the rise of substance use in young men. Also, having the majority responsibility for household tasks was a potential positive mediator for anxiety in the 20s, and having the majority responsibility for monetary provision was a potential positive mediator for depression in the 60s. These last two findings suggest there are different role strain stressors for women across the adult lifespan. A further age difference was that psychoticism was identified as a negative mediator in the 20s age group only, such that this factor was associated with being male and both depression and anxiety. This

finding is mainly a reflection of the stronger gender gap in psychoticism levels in the youngest age group, in comparison to the two older groups. Experiencing a recent illness or injury was also associated with being male as well as depression and anxiety in the 20s age group only.

The current study builds on suggestions made by Jorm (2000) that some risk factors for depression and anxiety are age specific, and additionally finds that some gender differences in potential risk factors might also be age specific. However, it is important to remember that the three age groups analysed can also be viewed as three separate cohorts. If this is the case, the differences found between each cohort might reflect the different environments and social contexts in which they have lived rather than age-specific effects. For example, cannabis use was found to be a potential negative mediator for the gender difference in depression in the 20s age group, such that men were more likely to use cannabis regularly than women, and this use was associated with greater depression. This was not the case in the 40s and 60s. As a study by Degenhardt, Lynskey and Hall (2000) found that recent birth cohorts are more likely to use illicit drugs at some point in their lifetime than older cohorts, it is possible that the relationship between being male, cannabis use and depression in the 20s is the result of societal trends or is a cohort effect, rather than an age-specific effect. In order to disentangle age effects from cohort effects longitudinal data is required. Prospective longitudinal studies are of most benefit, as problems such as 'telescoping' and memory effects, make retrospective studies a less valid approach.

7.6.3. Differences in depression and anxiety

Overall, the mediation models for anxiety and for depression were consistent, although there were a few differences. The clearest difference was for education, which

was a potential mediator for the gender difference in depression for the 20s, 40s and 60s but not for anxiety. Reflecting this finding, low education and other socio-economic indicators have been suggested to be greater risk factors for depression than for anxiety (Samuelsson, McCamish-Svensson, Hagberg, Sundstrom, & Dehin, 2005).

The enduring effect between gender and anxiety for the 20s suggests that there are other important unmeasured factors that would further explain this association. Possible stressors specific to this life stage might include relationship formation, career choice, tertiary study, leaving home and financial adjustments (de Goede, Spruijt, Iedema, & Meeus, 1999). Each of these factors might vary by gender and also be associated with levels of anxiety. Further investigation is needed to clarify the impact of these factors, particularly given that anxiety in this age group showed the greatest gender disparity.

The large number of shared potential mediators identified for gender differences in depression and anxiety again raises the issue of similarity between the two constructs. Attempts to differentiate anxiety and depression are ongoing, with the two constructs being viewed alternately as separate phenomenon, different manifestations of the same underlying diathesis, separate syndromes with common subtypes or different points along a continuum (Clark & Watson, 1991). The commonalities in the current study support findings that anxiety and depression share a component of general negative affect (Clark & Watson, 1991). Our analyses suggest that mediation may occur in this shared component, rather than the distinguishing features of each psychological outcome. While this could be considered to be a validity issue related specifically to the Goldberg Scales, this general component of negative affect has been readily observed in a number of different measures (see Clark & Watson, 1991). Furthermore, the consistency of neuroticism as a potential

mediator across age and psychological outcome reflects Andrews et al.'s (1990) proposal of 'a general neurotic syndrome', which may or may not precede the onset of mood and/or anxiety illness. However, it is also possible that neuroticism is simply a proxy for anxiety and depression, rather than a separate but related factor. The interaction between depression, anxiety and neuroticism remains unclear, highlighting the need for continued research examining etiological similarities and differences.

7.6.4. Subsidiary factors

The multivariate models showed a number of additional disparate potential mediators that have not previously been discussed, as they were neither consistent across all age groups nor both anxiety and depression, that should be noted. Physical activity was found to be a potential positive mediator for both depression and anxiety in the 20s age group, as well as depression in the 60s age group. This is consistent with previous studies showing that exercise is an effective intervention for anxiety and depression (Dunn et al., 2005). Adult women undertook less moderate-to-vigorous exercise than adult men in the present sample. Previous research has focused on this gender difference in exercise in children and adolescents only (Armstrong & Welsman, 2006). This finding suggests there may be benefit in instituting and evaluating interventions for exercise in adult women, with the aim of reducing levels of depression and anxiety. Separation or divorce was found to be a potential positive mediator for the gender gap in depression, for 20s age group only. This finding reflects not only the greater gender disparity in divorce/separation in this age group in comparison to the two older groups, but also suggests a stronger association with depression for young women. Finally, poor Spot-the-Word scores were found to be a potential mediator for the gender difference in depression in the 60s age group only,

suggesting this explanatory factor is specific to the gender gap in depression within older age groups. There may be a decline in verbal skills women entering older age that is not as apparent for men.

7.6.5. Limitations

There are some caveats on the interpretation of the current analyses that should be considered. First, as already outlined, it is not possible to definitively resolve the causal direction of associations within the current study. Although the analyses undertaken cast the variables studied along a causal path responsible for gender differences in psychological distress, firm conclusions about causal precedence cannot be drawn using cross-sectional data sets. For example, although the analyses prescribe that unemployment causes increases in anxiety, it is also possible that increases in anxiety cause unemployment in which case anxiety might play a mediating role. Other causal patterns may also be plausible and could describe the pattern of associations found in our cross-sectional data. These include each variable being causally linked to gender through unrelated pathways. Nevertheless, these analyses are informative in that they rule out variables that are not potential causal agents. Regardless of causal ambiguity regarding potential mediators in the models presented, a non-significant variable can be eliminated from further consideration. Moreover, external information about plausible causal relationships may be used in interpretation when mediation effects are found.

Second, as mentioned, some of the psychological variables may be considered as alternate measures or manifestations of the outcome variable and as being highly proximal to them rather than a being a distinct mediating variable. This limitation applies particularly to ruminative style and neuroticism.

7.7. Chapter conclusions

The research undertaken in the present chapter is novel in three major respects. First, it represents one of the few studies to have examined a full range of possible mediators for the gender difference in anxiety and depression within comprehensive, multivariate models. Second, it examines differences across three age groups to explore age variation. Third it is one of the first studies to identify potential mediators for the gender difference in anxiety, where mediators have previously not been studied either individually or concurrently.

The findings identify a set of variables that are potential causes of higher rates of depression in women than in men. Women of all ages were found to have poorer physical health, to have lower levels of mastery, and to have higher levels of behavioural inhibition, ruminative style and neuroticism, than were men. They also had more interpersonal problems and had experienced more childhood adversity. These factors were found to be associated with depression and anxiety, controlling for other concurrent influences. As such these findings offer support for the 'exposure hypothesis'. This hypothesis states that there are a set of factors that women are more exposed to (or possess more of) than men, and that these factors are related to their higher levels of depression and anxiety. With regard to age differences, the number of social mediators was found to decrease as age increased, suggesting that interpersonal problems were particularly associated with psychological distress in young women. The gender difference in anxiety remained for young people after adjusting for the potential mediators under investigation, signifying further important, unidentified explanatory factors. Finally, the findings from this study

showed that anxiety and depression have a strong set of shared potential mediators, indicating potential overlap in the aetiology of gender differences in both outcomes.

8. STUDY 4: GENDER DIFFERENCES IN LEVELS OF DEPRESSION AND ANXIETY ACROSS THE ADULT LIFESPAN: THE ROLE OF PSYCHOSOCIAL MODERATORS

8.1. Summary

Women's greater exposure to psychosocial factors associated with depression and anxiety is only one pathway to gender differences in these outcomes. A second possibility is that in the presence of certain psychosocial factors women are more vulnerable towards developing depression and anxiety, than are men. This possibility is investigated in the current chapter, where a wide range of psychosocial factors are examined as potential moderators of the association between gender and depression, and gender and anxiety. The two primary research questions are: *What are the potential psychosocial moderators that might explain the preponderance of depression and anxiety for women?; and To what extent do they vary across the adult lifespan?* Based on the research reviewed, it was hypothesised that several potential moderators would be identified, and that variation in these findings across age would be evident. The same set of socio-demographic, health and lifestyle, psychological and social factors examined as potential mediators in the previous chapter, were investigated in the present study. Cross-sectional analyses were conducted using Wave 1 of the PATH dataset. Longitudinal analyses were also conducted using Waves 1 and 2. The findings showed that women were more vulnerable to negative events involving social networks, poorer cognition and mastery, and recent marriage. For men the predominant vulnerabilities included alcohol abstinence, aggressive personality characteristics and problems at work. Several interesting age group differences were also identified, and are discussed.

8.2. Background

Chapter 3 outlined moderation as a second mechanism for investigating gender differences in symptom levels. In the current context, moderators are those variables that interact statistically with gender to predict depression/anxiety. Moderators have also been described as circumstances in which men and women are differentially vulnerable or susceptible towards the development of psychological distress. In the gender differences literature, moderation has been characterised in terms of 'vulnerability'. The vulnerability hypothesis proposes that women are more vulnerable than men to certain life circumstances or events, resulting in their higher levels of depression and anxiety (Turner & Avison, 1998). A large body of research has investigated the vulnerability hypothesis, particularly in relation to depression. However, this research has predominantly focused on a few possible moderating factors, such as marital status and interpersonal life events, and has largely ignored other possible influences including health and lifestyle, and psychological factors. The following section examines the evidence surrounding the psychosocial factors under investigation in this thesis as potential moderators of the association between gender and depression.

8.2.1. The gender difference in depression – evidence for moderators

8.2.1.1. Socio-demographic factors

Women have not been found to be more vulnerable to depression than men in the context of unemployment. Leana and Feldman (1991) and Ensminger and Celentano (1990) reported no gender difference in the psychological impact of unemployment. Another study has shown that unemployment has a greater negative impact on men's

mental health than women's (Artazcoz, Benach, Borrell, & Cortes, 2004). Women have also not consistently been shown to be more vulnerable to depression than men in the context of socio-economic disadvantage. Alvarado, Zunzunegui, Béland, Sicotte and Tellechea (2007) found that while Latin American women were more exposed to socio-economically disadvantaged situations than men, they were not more vulnerable to developing depression in these circumstances. Evidence surrounding a gender difference in the impact of education levels on depression is scant. One study conducted by Ross and Mirowsky (2006) found that depression as measured by the Centre for Epidemiological Studies Depression Scale (CES-D) decreased more steeply for women than men as education increased, suggesting poorly educated women are more vulnerable than poorly educated men.

Relationship status and family structure have been proposed as important components of the vulnerability hypothesis. Marriage has consistently been shown as less protective against mental health problems for women compared to men. The differential effect of marital status was initially examined by Gove (1972). He found that married women experienced greater psychological distress than married men whereas no gender differences were observed in alternate categories of marital status such as being single, divorced or widowed. Kessler (1984) critiqued the early work in this area, suggesting that gross comparisons between demographic factors and mental health did little to identify the role-specific stressors involved in triggering depression. Following this, women's marital role was linked with childrearing and to household responsibilities, tasks which have been established to have a negative psychological impact (Bird, 1999). Likewise, having more

children is thought to impact more negatively on women compared to men, as it is women who are predominantly responsible for child care.

8.2.1.2. Health and lifestyle status factors

There is little evidence to suggest the effect of cannabis use on depression levels is different for women and men. A study conducted by Rey, Sawyer, Raphael, Patton and Lynskey (2002) found that cannabis use was associated with higher depression scores (as measured by the CES-D); however there were no gender differences in this effect. A study conducted by Poulin et al. (2005) of adolescents similarly found that cannabis was a risk factor for depression (CES-D scores) in both males and females. There are some studies that suggest women are more vulnerable to the effects of alcohol use and tobacco smoking than men. Poulin et al. (2005) found that alcohol use and tobacco smoking were risk factors for depression in females only. Alcohol and tobacco use were also found to be risk factors for women's depression (subscale of the Symptom Checklist-90) in a study conducted by Milani, Parrott, Turner & Fox (2004). At least two studies have found that there may be a u-shaped association between alcohol and depression for men, with both abstinence and heavy drinking causing depression in comparison to light/moderate drinking (Alati et al., 2004; Caldwell et al., 2002). In both studies no such association was apparent for women.

It is unclear whether the association between lack of physical activity and depression is different for males and females. While some studies suggest that the relationship between lack of exercise and greater depression levels is stronger for women than it is for men (Farmer et al., 1988; Stephens, 1988), others have found a similar effect across both genders (Dunn, Trivedi, & O'Neal, 2001; Guszkowska, 2004). It is also not

clear whether there are gender differences in vulnerability towards depression as a result of poor physical health. While there have been some indications that this relationship is stronger for men than women (Beekman, Kriegsman, Deeg, & van Tilburg, 1995; Kiviruusu, Huurre, & Aro, 2007), alternate studies have found no interaction between gender and physical health when predicting depression (Patten, 2001) or that stressors involving ill health have a greater impact on women (Kessler & McLeod, 1984; Sandanger et al., 2004).

8.2.1.3. Psychological factors

Differential vulnerabilities between men and women towards depression in the presence of psychological factors such as rumination, personality characteristics and cognitive functioning, have been largely unexplored. There is very little research examining gender differences in the effects of rumination, personality characteristics such as neuroticism, and mastery upon depression. Although it is known that these risk factors are more prevalent amongst women, as explored in Chapter 7, it is not known whether women are more vulnerable to higher levels of these factors than men are (that is whether they operate as moderators). It may be that greater levels of factors such as rumination and inhibition actually have a stronger impact on depression for men than women, given that they are stereotypically considered to be feminine characteristics and may be more unusual in men. In relation to cognitive functioning, it has been suggested that women with poor cognition (eg. poor working memory and processing speed) are more vulnerable to depression than men are with poor cognition. A study conducted by Fuhrer, Antonucci and Dartigues (1992) found that the co-occurrence of cognitive impairment and depression was higher for women than it was for men in older adults (aged ≥ 65).

8.2.1.4. Social and relational factors

Gender differences in the effect of social and relational factors in the development of depression have largely been the focus of studies investigating the vulnerability hypothesis. Stressful life events involving social networks have been shown to have a stronger association with depression for women than men. Early research suggested that, in general, the emotional impact of negative life events was significantly greater for women than men (Dohrenwend, 1973; Kessler, 1979; Radloff & Rae, 1979). However, this research combined items about a variety of life events into a single aggregate score, providing no detail on the types of events important to each gender. A study conducted by Kessler and McLeod (1984) hypothesised that a disaggregated analysis of life-event effects would find women specifically vulnerable to network or social life events. This was found to be the case, with female vulnerability being confined to network life crises, such as the death of a loved one. The only event that affected men's distress more than women's was income loss (Kessler & McLeod, 1984). These findings led to suggestions that men and women find different types of events stressful based on their differing traditional social roles; specifically, that men find negative events involving employment or career stressful, whereas women find negative events involving social relationships or networks stressful. A study conducted by Kendler, Thornton and Prescott (2001) confirmed this theory. Men were more sensitive to the effects of work problems in the development of depression and women were more sensitive to problems in their social networks. However, these differential effects were not found to fully account for the gender difference in depression. Conversely, a meta-analysis of 119 studies conducted by Davis, Mathews and Twamley (1999) showed that although women found problems associated with interpersonal

relationships more stressful than those associated with work, they reported more distress in both domains than did men.

Based on the above findings, it has been suggested that social support is more important to the well-being of women than men. A study conducted by Kendler, Myers and Prescott (2005) found that socially supportive relationships were more protective against Major Depression for women than they were for men. A further study conducted by Dalgard et al. (2006) also found that women without social support were more vulnerable to higher levels of depression (using the Beck Depression Inventory) than men without social support. However, both of these studies also concluded that these gender differences in vulnerability were not great enough to fully explain the gender differences in depression. The relationship between childhood sexual abuse (CSA) and depression is another association than might vary in strength for men and women, contributing the gender difference in depression. However, the majority of research suggests that the victim's gender does not influence the development of depression. A university study of 406 undergraduates found no interaction between gender and CSA in the prediction of poor mental health (using the Brief Symptom Inventory) (Young, Harford, Kinder, & Savell, 2007). Alternate studies have similarly concluded that there is no gender difference in the development of mental health problems following childhood sexual abuse (e.g. Dube et al., 2005; Gover, 2004).

8.2.1.5. The benefits of a longitudinal approach

Previous investigations examining gender differences in the contribution of psychosocial factors towards depression have been limited by the use of cross-sectional data. Cross-sectional analyses explore the associations between explanatory factors and

outcome factors at one point in time. Longitudinal data are necessary to answer more complex questions, such as whether changes in psychosocial factors are associated with changes in outcomes, if psychosocial factors have temporal associations, (i.e. if one explanatory factor predates another) and if psychosocial factors have temporary or permanent effects on psychological symptoms. The distinction between short term and stable psychosocial influences is important in the context of a lifespan approach to examining gender differences in depression. Whereas some explanatory factors might be relevant across the lifespan, others may be specific to particular life stages. Failing to consider that an effect might be temporary can lead to overstating the role it plays in accounting for the gender difference in levels of depression (Marks & Lambert, 1998).

8.2.2. The gender difference in anxiety – evidence for moderators

Research reviewing potential moderators of the gender difference in anxiety is scarce (see Craske, 2003 for a general overview). Few studies have explored gender differences in vulnerability to anxiety in the context of particular psychosocial factors. Given the similarities between anxiety and depression, as outlined in previous chapters, it is reasonable to expect that the same factors identified as plausible moderators for depression might also moderate the association between gender and anxiety. The current chapter investigates this assumption, by examining the same set of psychosocial risk factors as moderators for the gender difference in both depression and anxiety.

8.3. Aims

The current study aimed to identify socio-demographic, health and lifestyle, psychological and social circumstances in which men and women are differentially

susceptible towards higher levels of depression and anxiety. It also aimed to investigate any age variation in these effects across three life stages. After reviewing the research evidence outlined above, it was hypothesised that several potential mediators would be identified, most likely in the areas of marital status and interpersonal life events. Based on prior research reviewed in Chapters 2 and 5, indicating that the gender differences in depression and anxiety vary across age, it was also hypothesised that the potential moderators identified would vary between the three PATH age groups. Both cross-sectional (one time point) and longitudinal (two time points) analyses were conducted to achieve these aims.

8.4. Methodology

Data from Waves 1 and 2 of the PATH study were analysed in the current chapter. The outcome measures used were the Goldberg Anxiety and Depression Scales (Goldberg et al., 1988). The psychosocial factors assessed as potential moderators were the same as those previously described in Chapters 4 and 7.

8.4.1. Statistical analyses

Participants who completed both Waves 1 and 2 of the PATH survey were included in the current analyses. A comparison between those participants who only completed Wave 1 (excluded n = 770) and those who remained in the survey for both waves (n = 6715) can be found in Chapter 4. A further 29 cases were omitted due to missing data on more than 25% of the variables included in the analyses. The full set of Wave 1 and Wave 2 variables was used to impute missing data for a further 1,138 cases, with 85% of these cases requiring imputation for four or fewer variables. Missing data were imputed using

the expectation-maximization algorithm in SPSS MVA procedure in version 15.0 (Enders, 2001). The final samples included were: 2119 in the 20s age group (47.5% male), 2349 in the 40s age group (46.8% male) and 2218 in the 60s (51.6% male) age group.

The analyses in this study were conducted using the Stata software (version 8). Ordinary Least Squares regression (OLS) was used to assess whether each factor moderated the association between gender and levels of depression/anxiety, and to examine if any moderating associations differed across the age groups. Each factor was modelled separately using a three stage process. First, the main effects of the factor and gender were examined (model 1). Second, a two-way interaction was added to examine the interaction between the factor and gender (model 2). In the case where a factor is found to significantly interact with gender it can be considered a moderating variable. Third, a three-way interaction between the factor, gender and age group was added to examine whether any moderating variables differed according to age group (model 3). The reference category used for age group was the 40s age group. It was decided to model each factor univariately, as multivariate analyses were considered too convoluted for interpretation given large number of predictors and two and three-way interactions under investigation. Analyses were repeated separately for both depression and anxiety.

The analyses were initially conducted cross-sectionally (using Wave 1 data) to examine whether men and women were vulnerable to different risk factors at one time point. They were then repeated using data from Wave 2, controlling for depression/anxiety and the predictor variables status at Wave 1, effectively predicting change in depression/anxiety at Wave 2 from change in the predictor variable. For example, the effects of gender and marital status on depression at Wave 2 were examined, taking into

account marital status and depression levels at Wave 1. Controlling for the effect of both marital status and depression at Wave 1 allowed us to explore whether *changes* in marital status were associated with *changes* in depression. Appropriate statistical control for the effect of prior mental health status has been acknowledged as an important component of investigating gender differences in the association between risk factors and psychological outcomes (Bird, 1999; Kessler & McLeod, 1984).

Chapter 4 demonstrated that the distributions of the Goldberg Anxiety and Depression Scales were positively skewed for each gender and age group. Therefore robust standard errors (Stata version 8) were used as a conservative measure to minimise the impact of violating the normality assumptions required for OLS regression. The use of negative binomial regression, which effectively treats the Goldberg Scales as symptom counts, was also investigated to accommodate the non-normal distributions of the dependent variables. However, preliminary analyses using this method did not significantly improve the distribution of residuals. As outlined in Chapter 3, neither the cross-sectional or longitudinal analyses conducted in this chapter can resolve the causal direction between the psychosocial factors examined and depression/anxiety. Therefore, as in the prior chapter, the significant moderators identified in subsequent analyses are termed 'significant *potential* moderators' or are noted with the subscript 'p' to denote their potential status as moderators.

8.5. Results

8.5.1. Socio-demographic factors

8.5.1.1. Cross-sectional analyses identifying potential moderating factors

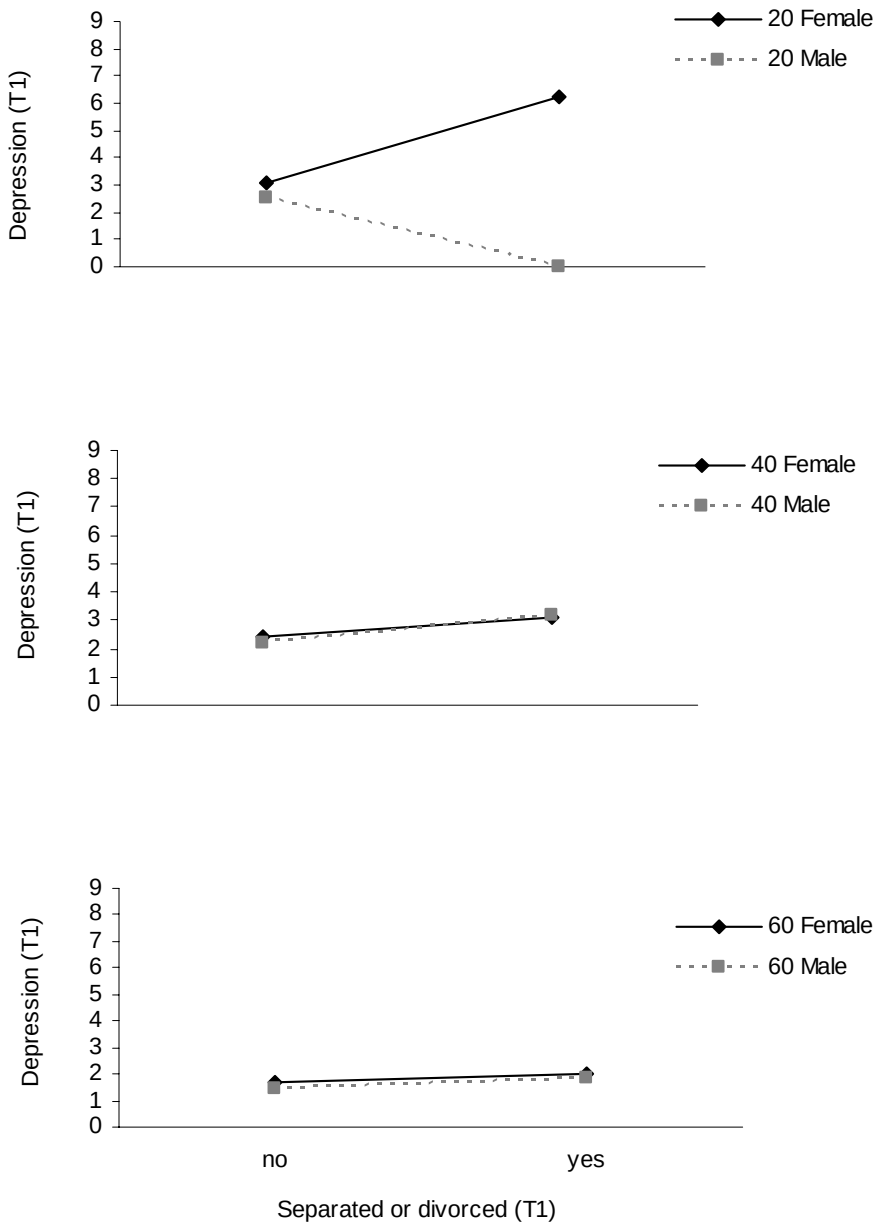
The results from the cross-sectional analyses examining socio-demographic factors as potential moderators can be seen in Table 8-1. Model 1 shows that after adjusting for gender, employment was the only variable unrelated to depression and separation/divorce was the only variable unrelated to anxiety. Model 2 shows that there were no significant moderating[p] associations (i.e. two-way interactions) between the socio-demographic factors under investigation and gender for either depression or anxiety. However, when differences between age groups were assessed (i.e. three-way interactions in model 3), there were three significant moderating[p] relationships specific to age group. Separation/divorce was found to moderate[p] the relationship between gender and depression, and gender and anxiety, in the 20s age group but not the 40s age group. Figure 8-1 explains this three-way interaction further: while there was little gender difference in the way separation/divorce affected depression in the 40s and 60s age group, in the 20s separation/divorce was associated with a clear increase in depression for women. Figure 8-2 displays a similar finding for anxiety. However, it is important to note that the validity of these findings are uncertain as there were only 3 men and 20 women who were divorced or separated in the 20s age group. Number of children was also found to moderate[p] the relationship between gender and depression in the 20s, but not the 40s age group. Figure 8-3 shows there was little gender difference in the way number of children affected depression in the 40s and 60s in comparison to the 20s, where having more children was associated with higher depression in women only.

Table 8-1. Associations between socio-demographic factors, gender, age-group and outcome variables at time 1.

	Depression Wave 1			Anxiety Wave 1		
	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*
Married or de facto (no)	-.15 (.06)**	-.13 (.08)**		-.11 (.07)**	-.12 (.09)**	
Gender (male)	-.08 (.05)**	-.06 (.09)*		-.14 (.06)**	-.15 (.11)**	
Gender X Married/de facto	-	-.03 (.11)		-	.02 (.13)	
G X A (20s) X Married/de facto	-	-	.00 (.35)	-	-	.03 (.39)
G X A (60s) X Married/de facto	-	-	.04 (.33)	-	-	.03 (.39)
Separated/divorced (no)	.04 (.11)*	.04 (.14)*		.02 (.13)	.01 (.16)	
Gender (male)	-.09 (.06)**	-.09 (.06)*		-.15 (.06)**	-.15 (.07)*	
Gender X Separated/divorced	-	.01 (.22)		-	.02 (.26)	
G X A (20s) X Separated/div.	-	-	-.06 (.32)**	-	-	-.03 (.99)**
G X A (60s) X Separated/div.	-	-	-.02 (.43)	-	-	.00 (.50)
Employed (0, 1)	.02 (.06)	-.03 (.09)**		.06 (.07)**	-.08 (.10)**	
Gender (male)	-.09 (.06)**	-.38 (.11)**		-.15 (.06)**	-.12 (.12)**	
Gender X Employed	-	-.01 (.13)		-	-.04 (.15)	
G X A (20s) X Employed	-	-	.09 (.56)	-	-	.00 (.59)
G X A (60s) X Employed	-	-	.08 (.49)	-	-	.05 (.53)
Number of children (0+)	-.12 (.02)**	-.11 (.02)**		-.14 (.02)**	-.16 (.03)**	
Gender (male)	-.09 (.05)**	-.09 (.08)**		-.15 (.06)**	-.17 (.09)**	
Gender X No. Children	-	-.01 (.03)		-	.04 (.04)	
G X A (20s) X No. Children	-	-	-.03 (.23)*	-	-	.01 (.26)
G X A (60s) X No. Children	-	-	.03 (.09)	-	-	.03 (.11)
Years of education (0+)	-.07 (.01)**	-.06 (.02)*		-.01 (.01)	.01 (.02)	
Gender (male)	-.08 (.05)**	-.03 (.36)		-.15 (.06)**	-.03 (.42)	
Gender X Education	-	-.06 (.02)		-	-.12 (.03)	
G X A (20s) X Education	-	-	.22 (.09)	-	-	.11 (.09)
G X A (60s) X Education	-	-	.01 (.05)	-	-	.20 (.06)

Note: * p<.05, ** p<.001. G–gender, A–age. Standardised coefficients reported. Additional results were provided in model 3, including the main effects and necessary two-way interactions between age and risk factors, however as these results are not central to the hypotheses examined in this chapter for parsimony they are not shown.

Figure 8-1. Moderating[p] association between gender and separation/divorce by age group, for depression at time 1.



Note: All graphs plot predicted values for depression and anxiety.

Figure 8-2. Moderating[p] association between gender and separation/divorce by age group, for anxiety at time 1.

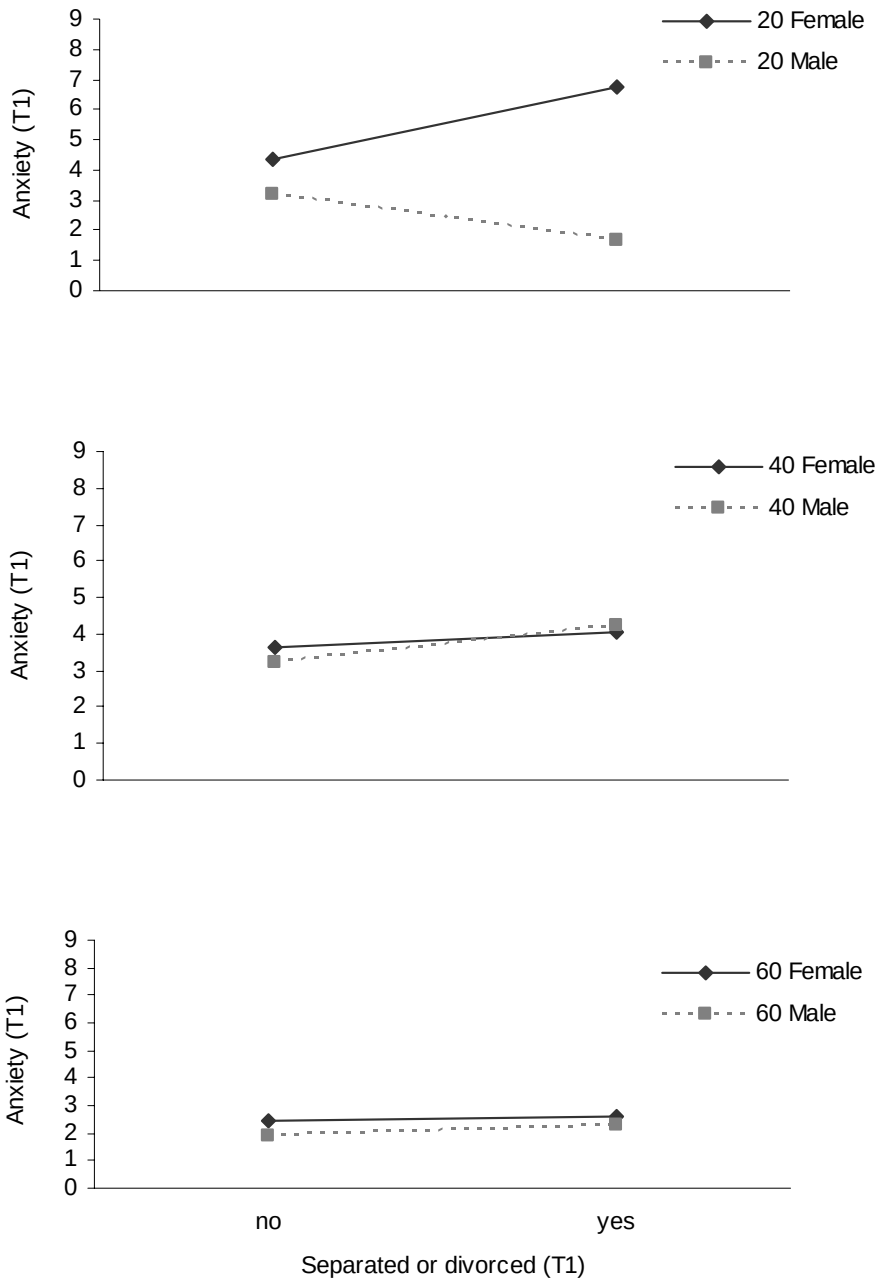
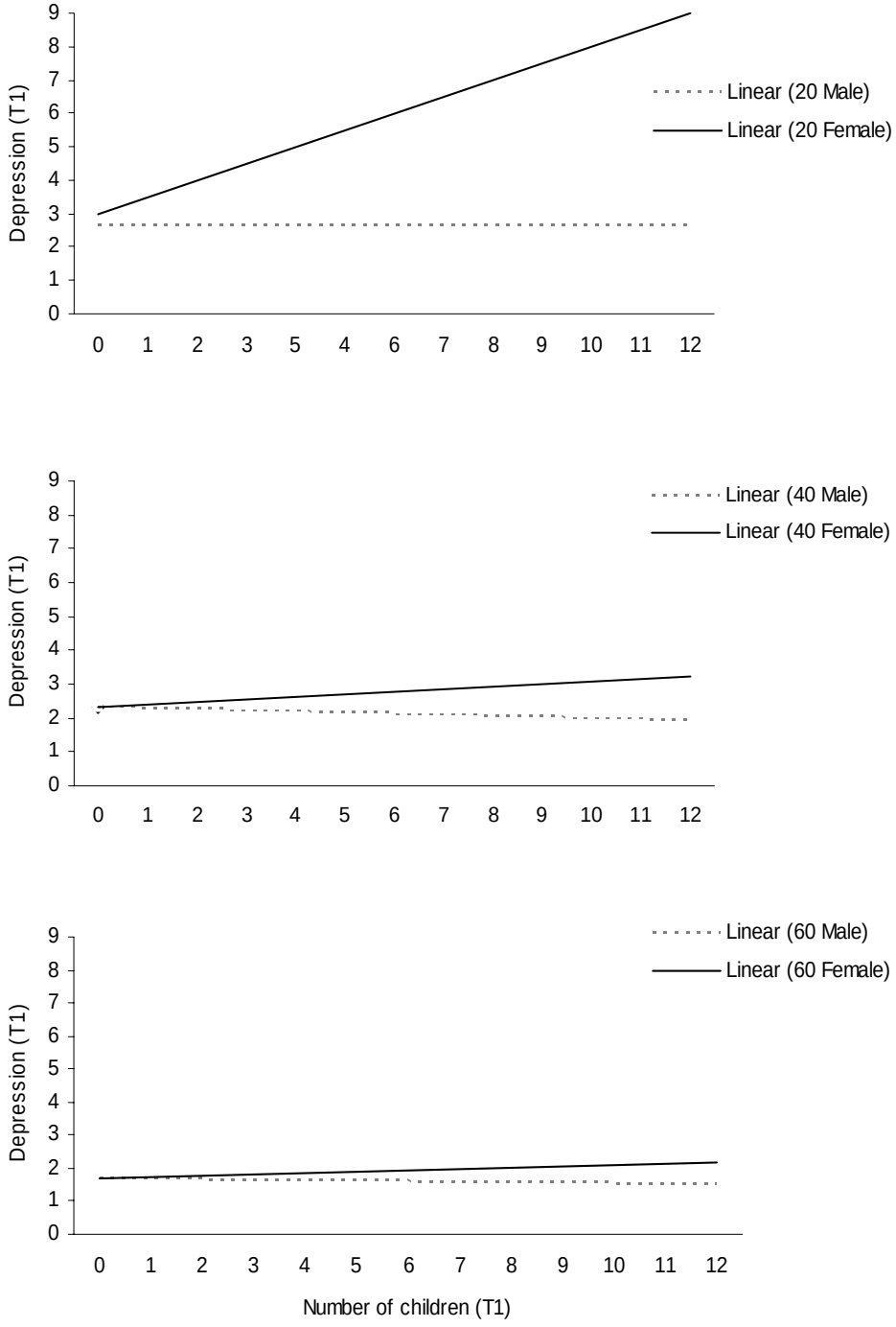


Figure 8-3. Moderating[p] association between gender and no. of children by age group, for depression at time 1.



8.5.1.2. Longitudinal analyses identifying potential moderating factors

The results from the longitudinal analyses examining potential socio-demographic moderators of the gender difference in depression and anxiety at time 2 whilst controlling for differences at time 1, are shown in Table 8-2. Controlling for time 1 effects allowed us to examine associations between changes in the predictors and changes in the outcomes. Model 1 shows that changes in separation/divorce, employment and years of education did not significantly predict changes in depression. Change in anxiety was not significantly predicted by Wave 2 status in any of the socio-demographic factors, with Wave 1 status also in the equation. Model 2 identifies significant socio-demographic moderators[p] of the association between gender and change in depression/anxiety. Marital status was found to moderate[p] the relationship between gender and depression change, such that the association between becoming married/defacto and decreased depression was stronger for men than women (β=-.08, p<.05). This was also found to be the case for anxiety (β=-.09, p<.05). Model 3 shows there were three significant differences in moderating[p] associations between the age groups. First, change in number of children was found to moderate[p] the relationship between gender and change in depression for the 20s, but not the 40s. Figure 8-4 shows that in the 40s and 60s there were minimal gender differences in the way changes in numbers of children affected depression, however in the 20s age group, an increase in children was clearly associated with an increase in depression specific to women. Secondly, Figure 8-5 shows the effect of number of children was also similar for anxiety. Lastly, change in employment was found to moderate[p] the relationship between gender and change in anxiety for the 20s, but not the 40s. Figure 8-6 shows that males who

became employed in their 20s had lower anxiety in contrast to their female counterparts, whereas no gender difference was observed in the 40s.

Table 8-2. Associations between socio-demographic factors, gender, age-group and outcome variables at time 2.

	Depression Wave 2			Anxiety Wave 2		
	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*
Married or de facto (no)	-.05 (.07)*	-.02 (.09)		-.01 (.08)	.02 (.10)	
Gender (male)	-.04 (.05)**	.02 (.10)		-.06 (.05)**	.00 (.10)	
Gender X Married/defacato	-	-.08 (.11)*		-	-.09 (.12)**	
G X A (20s) X Married/defacato	-	-	-.05 (.28)	-	-	-.03 (.31)
G X A (60s) X Married/defacato	-	-	.00 (.27)	-	-	-.05 (.31)
Separated/divorced (no)	.01 (.12)	.01 (.14)		.02 (.13)	.02 (.15)	
Gender (male)	-.04 (.05)**	-.04 (.05)**		-.07 (.05)**	-.07 (.06)**	
Gender X Separated/divorced	-	.00 (.15)		-	.00 (.17)	
G X A (20s) X Separated/div.	-	-	-.02 (.70)	-	-	-.03 (.82)
G X A (60s) X Separated/div.	-	-	.02 (.31)	-	-	.00 (.36)
Employed (0, 1)	-.01 (.06)	-.02 (.08)		.02 (.07)	.02 (.09)	
Gender (male)	-.04 (.05)**	-.05 (.08)*		-.07 (.05)**	-.06 (.09)**	
Gender X Employed	-	.01 (.10)		-	-.01 (.11)	
G X A (20s) X Employed	-	-	-.07 (.44)	-	-	-.13 (.46)*
G X A (60s) X Employed	-	-	-.01 (.33)	-	-	-.01 (.37)
Number of children (0+)	.09 (.05)*	.09 (.06)*		.07 (.06)	.07 (.06)	
Gender (male)	-.04 (.05)**	-.04 (.07)*		-.07 (.05)**	-.07 (.08)**	
Gender X No. Children	-	-.01 (.03)		-	.00 (.03)	
G X A (20s) X No. Children	-	-	-.04 (.13)*	-	-	-.03 (.14)*
G X A (60s) X No. Children	-	-	.04 (.07)	-	-	.03 (.09)
Years of education (0+)	.02 (.02)	.02 (.02)		.04 (.03)	.04 (.03)	
Gender (male)	-.04 (.05)**	-.01 (.29)		-.07 (.05)**	-.07 (.33)	
Gender X Education	-	-.03 (.02)		-	.01 (.02)	
G X A (20s) X Education	-	-	-.20 (.07)	-	-	-.24 (.07)
G X A (60s) X Education	-	-	-.06 (.04)	-	-	-.09 (.05)

Note: * p<.05, ** p<.001. G–gender, A–Age. Standardised coefficients reported. Additional results were provided in model 3, including the main effects and necessary two-way interactions between age and risk factors, however as these results are not central to the hypotheses examined in this chapter for parsimony they are not shown.

Figure 8-4. Moderating[p] association between gender and number of children by age group, for depression, at time 2.

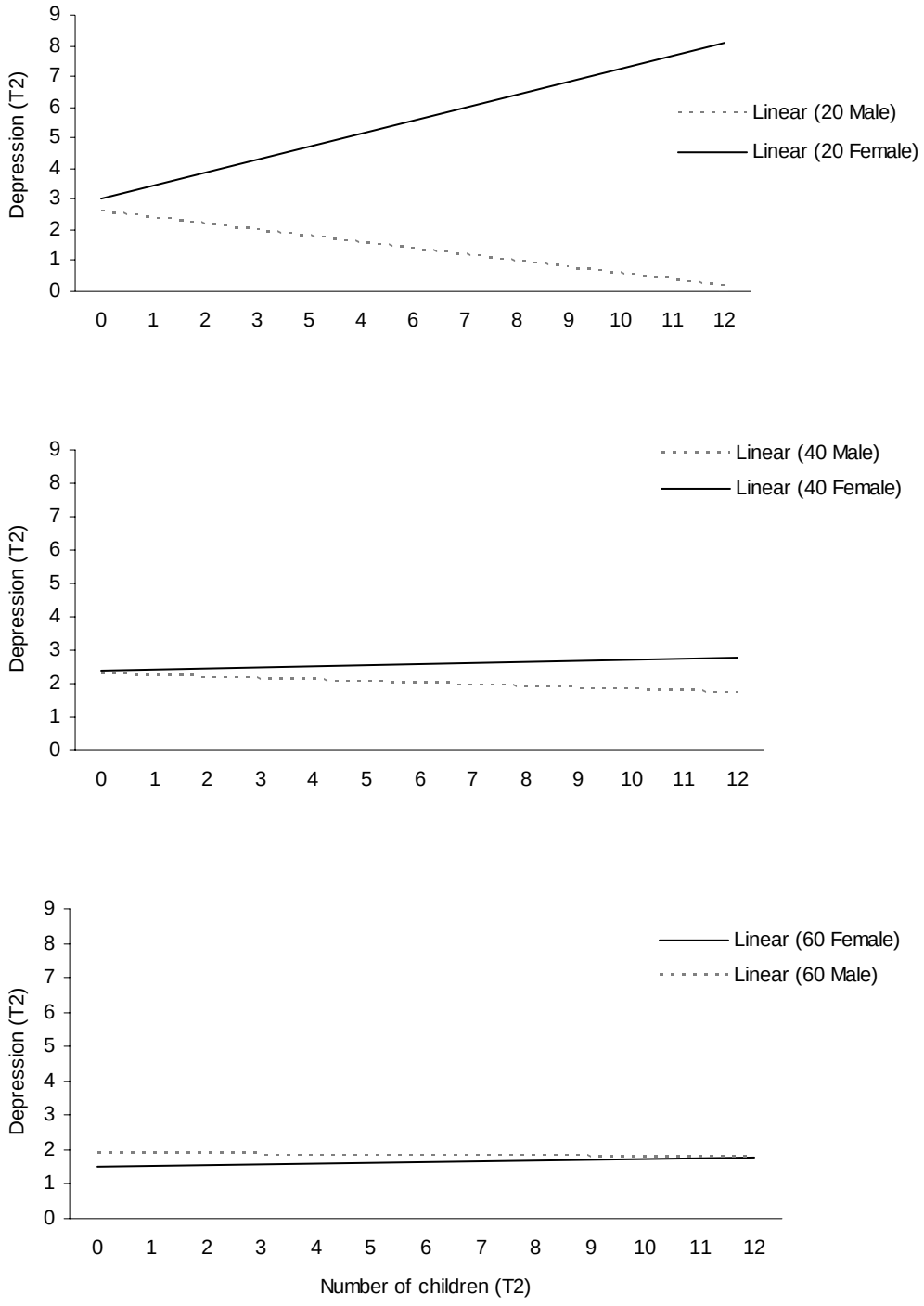


Figure 8-5. Moderating[p] association between gender and number of children by age group, for anxiety at time 2.

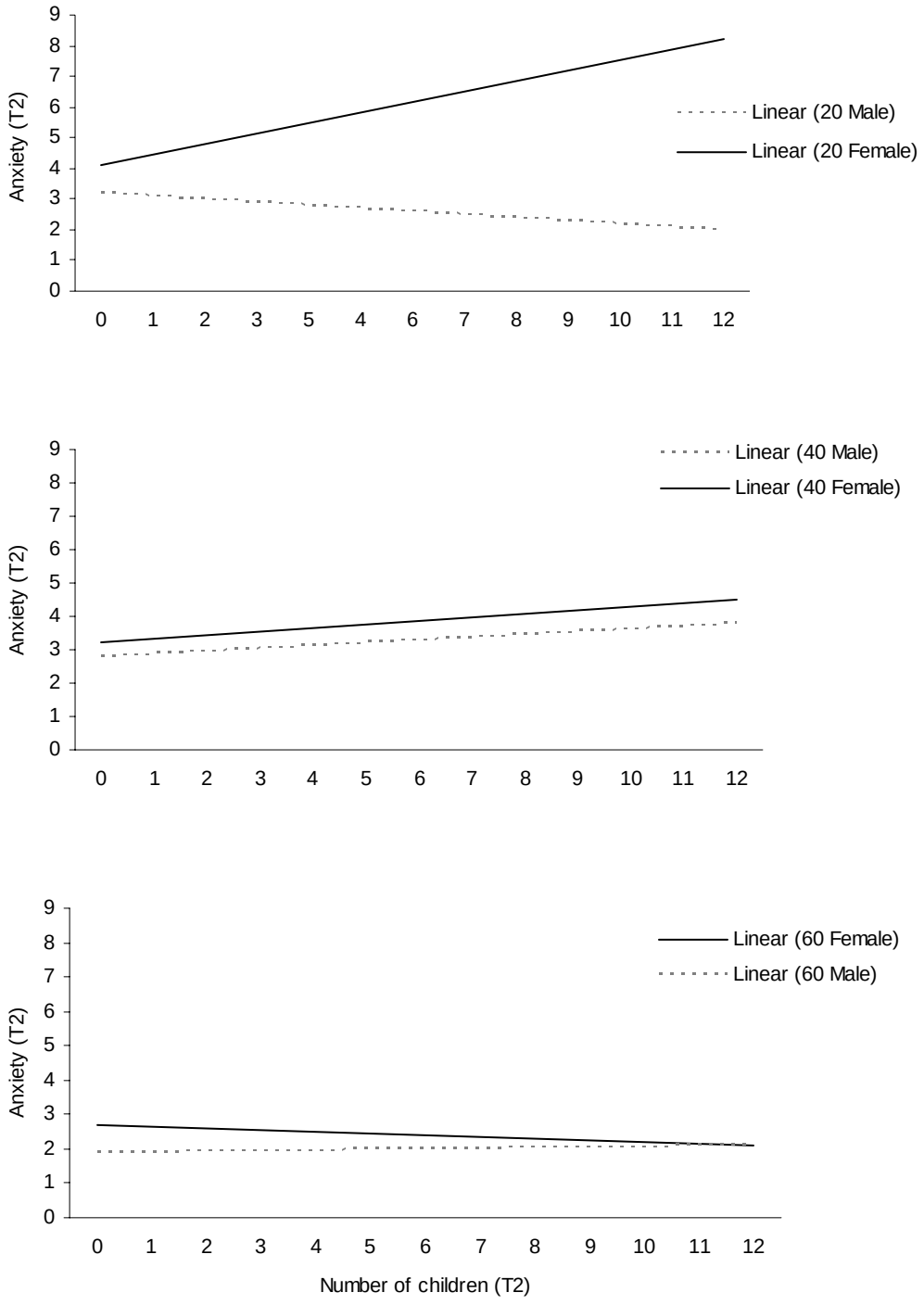
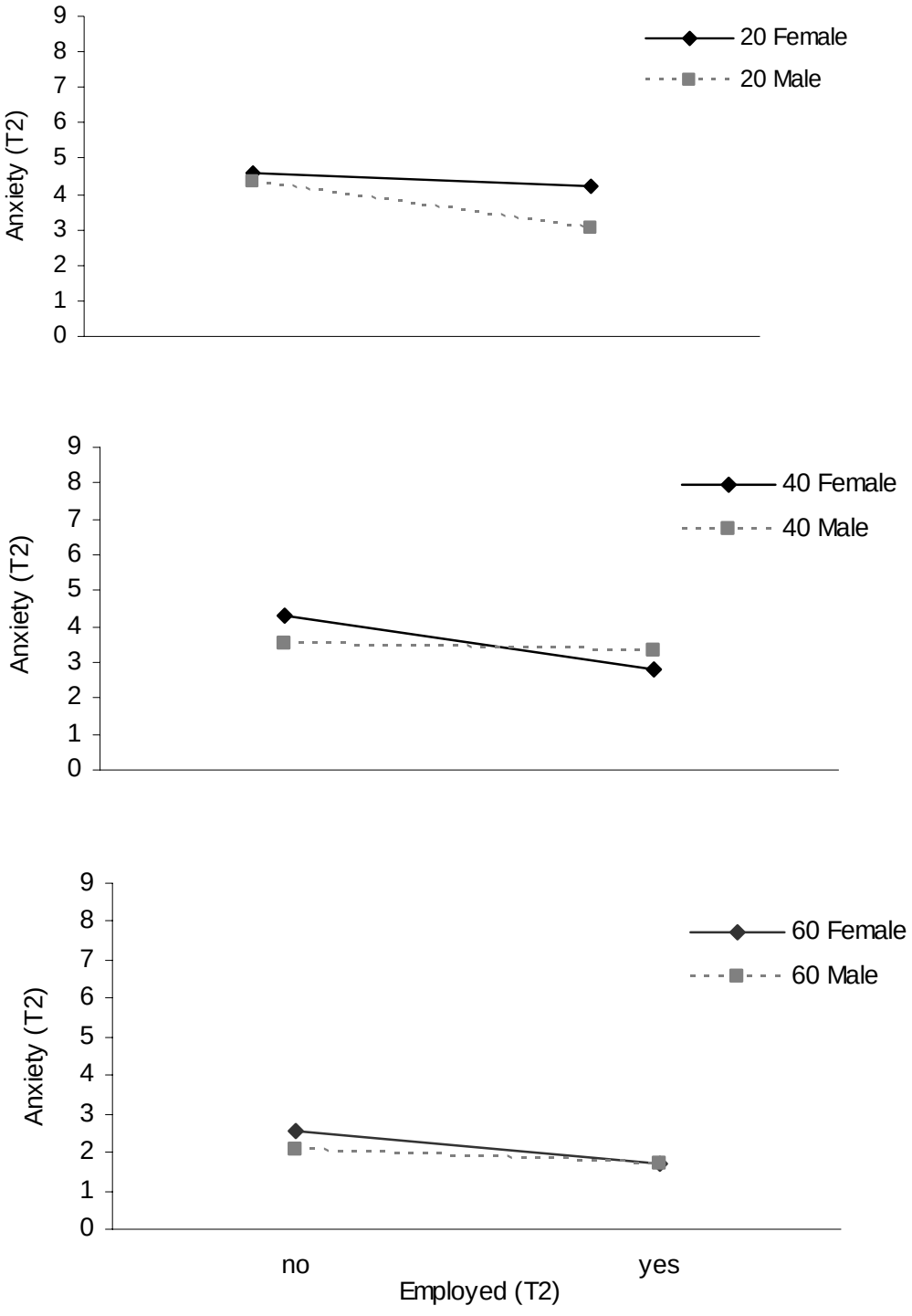


Figure 8-6. Moderating[p] association between gender and employment by age group, for anxiety at time 2.



8.5.2. Health and lifestyle factors

8.5.2.1. Cross-sectional analyses identifying potential moderating factors

The results from the cross-sectional analyses examining health and lifestyle factors as potential moderators can be seen in Table 8-3. Model 1 shows that each factor was found to significantly predict depression and anxiety. Model 2 shows that drinking alcohol either never or occasionally moderated[p] the relationship between gender and depression (β=.04, p<.05) and gender and anxiety (β=.06, p<.05), such that the association between abstaining and greater psychological distress was stronger for men than women. There was also a moderating[p] relationship between gender and drinking alcohol moderately, such that moderate drinking was more strongly associated with lower anxiety for men than for women (β=-.07, p<.05). Model 3 shows there were no significant differences in moderating[p] relationships across the three age groups.

Table 8-3. Associations between health and lifestyle factors, gender, age-group and outcome variables at time 1.

	Depression Wave 1			Anxiety Wave 1		
	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*
Tobacco use (no)	.18 (.07)**	.20 (.10)**		.15 (.03)**	.16 (.11)**	
Gender (male)	-.09 (.05)**	-.08 (.06)**		-.15 (.06)**	-.15 (.07)**	
Gender X Tobacco	-	-.03 (.14)		-	.00 (.16)	
G X A (20s) X Tobacco	-	-	.00 (.10)	-	-	.01 (.36)
G X A (60s) X Tobacco	-	-	.03 (.39)	-	-	.01 (.45)
Regular cannabis use (no)	.15 (.13)**	.17 (.25)**		.12 (.15)**	.14 (.27)**	
Gender (male)	-.10 (.05)**	-.10 (.06)**		-.16 (.06)**	-.15 (.07)**	
Gender X Cannabis	-	-.03 (.30)		-	-.02 (.32)	
G X A (20s) X Cannabis	-	-	.00 (.69)	-	-	-.03 (.80)
G X A (60s) X Cannabis	-	-	-	-	-	-
Alcohol abstain/occasional (no)	.07 (.06)**	.04 (.08)		.04 (.07)*	.00 (.10)	
Gender (male)	-.08 (.06)**	-.10 (.06)*		-.14 (.07)**	-.17 (.08)**	
Gender X Abstain/occ.	-	.04 (.13)*		-	.06 (.15)*	
G X A (20s) X Abstain/occ.	-	-	.02 (.33)	-	-	-.01 (.37)
G X A (60s) X Abstain/occ.	-	-	.02 (.31)	-	-	.00 (.36)
Alcohol moderate (no)	-.09 (.06)**	-.07 (.08)**		-.06 (.07)**	-.03 (.09)	
Gender (male)	-.08 (.06)**	-.04 (.10)		-.14 (.07)**	-.09 (.12)**	
Gender X Moderate	-	-.05 (.12)		-	-.07 (.13)*	
G X A (20s) X Moderate	-	-	-.06 (.31)	-	-	-.02 (.34)
G X A (60s) X Moderate	-	-	-.05 (.28)	-	-	-.03 (.33)
Alcohol heavy (no)	.05 (.12)**	.06 (.18)*		.05 (.14)**	.06 (.20)*	
Gender (male)	-.09 (.05)**	-.09 (.06)**		-.15 (.06)**	-.14 (.07)**	
Gender X Heavy	-	-.01 (.25)		-	-.01 (.28)	
G X A (20s) X Heavy	-	-	.03 (.61)	-	-	.04 (.65)
G X A (60s) X Heavy	-	-	.04 (.53)	-	-	.04 (.64)
Moderate physical activity (no)	-.12 (.06)**	-.13 (.08)**		-.10 (.07)**	-.09 (.09)**	
Gender (male)	-.07 (.06)**	-.09 (.11)**		-.13 (.06)**	-.11 (.13)**	
Gender X Activity	-	.03 (.13)		-	-.03 (.15)	
G X A (20s) X Activity	-	-	.05 (.35)	-	-	.00 (.39)
G X A (60s) X Activity	-	-	-.02 (.28)	-	-	-.01 (.33)
Physical health (0+)	-.20 (.00)**	-.19 (.00)**		-.17 (.00)**	-.15 (.01)**	
Gender (male)	-.08 (.05)**	-.01 (.37)		-.14 (.06)**	.01 (.42)	
Gender X Health	-	-.07 (.01)		-	-.15 (.01)	
G X A (20s) X Health	-	-	-.11 (.02)	-	-	.04 (.02)
G X A (60s) X Health	-	-	-.10 (.02)	-	-	-.06 (.02)

Note: * p<.05, ** p<.001. G–gender, A–Age. Standardised coefficients reported. Additional results were provided in model 3, including the main effects and necessary two-way interactions between age and risk factors, however as these results are not central to the hypotheses examined in this chapter for parsimony they are not shown.

8.5.2.2. Longitudinal analyses identifying potential moderating factors

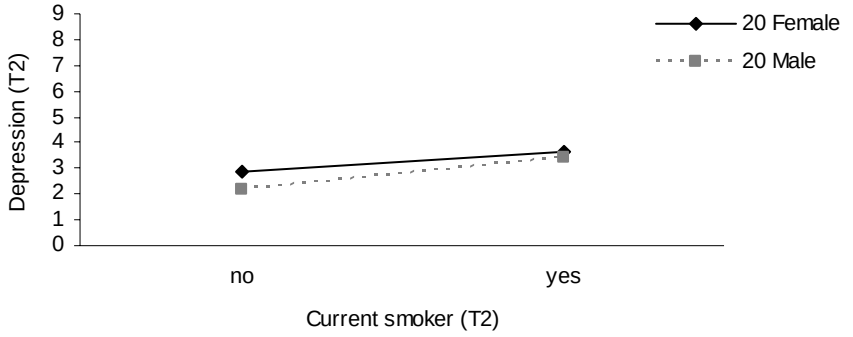
The results from the longitudinal analyses examining the potential moderating effects of change in health and lifestyle factors are shown in Table 8-4. Model 1 shows that change in alcohol abstinence did not significantly predict change depression or anxiety, and change in drinking alcohol moderately did not predict change in anxiety. Model 2 shows that none of the health and lifestyle factors were significant moderators[p] of the association between gender and change in depression or anxiety. Model 3 shows that the moderating effect of becoming a current smoker differed between the 20s and 40s age groups. This is shown in Figures 8-7 and 8-8, where in the 20s age group becoming a current smoker is more strongly associated with higher levels of depression and anxiety for men than women, whereas the 40s and 60s age groups these associations appear similar for both genders.

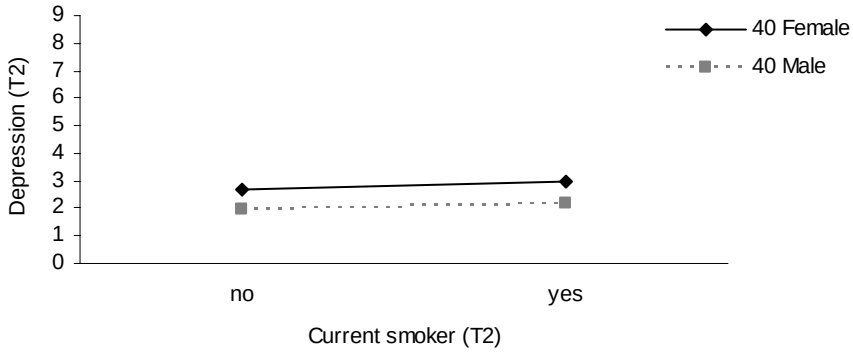
Table 8-4. Associations between health and lifestyle factors, gender, age-group and outcome variables at time 2.

	Depression Wave 2			Anxiety Wave 2		
	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*
Tobacco use (no)	.06 (.09)**	.05 (.11)*	-	.06 (.11)**	.06 (.13)*	-
Gender (male)	-.04 (.05)**	-.05 (.05)**	-	-.07 (.05)**	-.07 (.06)**	-
Gender X Tobacco	-	.02 (.12)	-		.01 (.14)	-
G X A (20s) X Tobacco	-	-	.07 (.28)*		-	.06 (.32)*
G X A (60s) X Tobacco	-	-	.01 (.37)		-	.02 (.42)
Regular cannabis use (no)	.09 (.19)**	.07 (.29)*		.06 (.20)**	.06 (.29)*	
Gender (male)	-.05 (.05)**	-.05 (.05)**		-.07 (.05)**	-.07 (.06)**	
Gender X Cannabis	-	.02 (.31)		-	.00 (.33)	
G X A (20s) X Cannabis	-	-	-.01 (.72)	-	-	-.01 (.76)
G X A (60s) X Cannabis	-	-	-	-	-	-
Alcohol abstain/occasional (no)	.02 (.07)	.01 (.09)		.00 (.08)	.00 (.10)	
Gender (male)	-.04 (.04)**	-.04 (.05)*		-.07 (.06)**	-.07 (.06)**	
Gender X Abstain/occ.	-	.00 (.11)		-	.00 (.12)	
G X A (20s) X Abstain/occ.	-	-	-.03 (.29)	-	-	.01 (.32)
G X A (60s) X Abstain/occ.	-	-	.00 (.24)	-	-	.02 (.29)
Alcohol moderate (no)	-.05 (.06)**	-.04 (.08)*		-.02 (.07)	-.02 (.09)	
Gender (male)	-.04 (.05)**	-.03 (.08)		-.07 (.05)**	-.07 (.09)**	
Gender X Moderate	-	-.01 (.10)		-	.01 (.11)	
G X A (20s) X Moderate	-	-	.04 (.26)	-	-	-.02 (.29)
G X A (60s) X Moderate	-	-	.01 (.22)	-	-	-.04 (.26)
Alcohol heavy (no)	.05 (.11)**	.05 (.16)*		.03 (.12)*	.04 (.17)*	
Gender (male)	-.04 (.05)**	-.04 (.05)**		-.07 (.05)**	-.06 (.06)**	
Gender X Heavy	-	.00 (.19)		-	-.02 (.21)	
G X A (20s) X Heavy	-	-	-.02 (.48)	-	-	-.01 (.50)
G X A (60s) X Heavy	-	-	-.02 (.44)	-	-	-.01 (.55)
Moderate physical activity (no)	-.08 (.06)**	-.07 (.08)**		-.07 (.06)**	-.07 (.08)**	
Gender (male)	-.03 (.05)*	-.03 (.09)		-.06 (.05)**	-.05 (.10)*	
Gender X Activity	-	-.01 (.10)		-	-.01 (.12)	
G X A (20s) X Activity	-	-	-.02 (.29)	-	-	-.06 (.32)
G X A (60s) X Activity	-	-	-.01 (.23)	-	-	-.02 (.27)
Physical health (0+)	-.14 (.00)**	-.15 (.00)**		-.13 (.00)**	-.13 (.00)**	
Gender (male)	-.03 (.05)*	-.08 (.31)		-.06 (.05)**	-.08 (.33)	
Gender X Health	-	.05 (.01)		-	.02 (.01)	
G X A (20s) X Health	-	-	-.12 (.02)	-	-	-.03 (.02)
G X A (60s) X Health	-	-	-.24 (.01)	-	-	-.12 (.01)

Note: * p<.05, ** p<.001. G–gender, A–Age. Standardised coefficients reported. Additional results were provided in model 3, including the main effects and necessary two-way interactions between age and risk factors, however as these results are not central to the hypotheses examined in this chapter for parsimony they are not shown.

Figure 8-7. Moderating[p] association between gender and smoking status by age group, for depression at time 2.





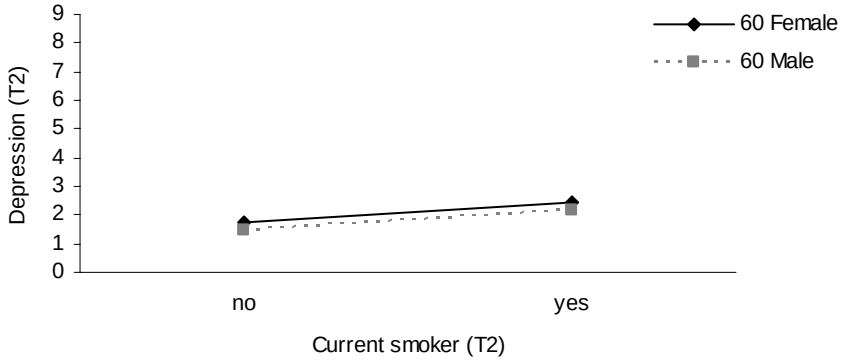
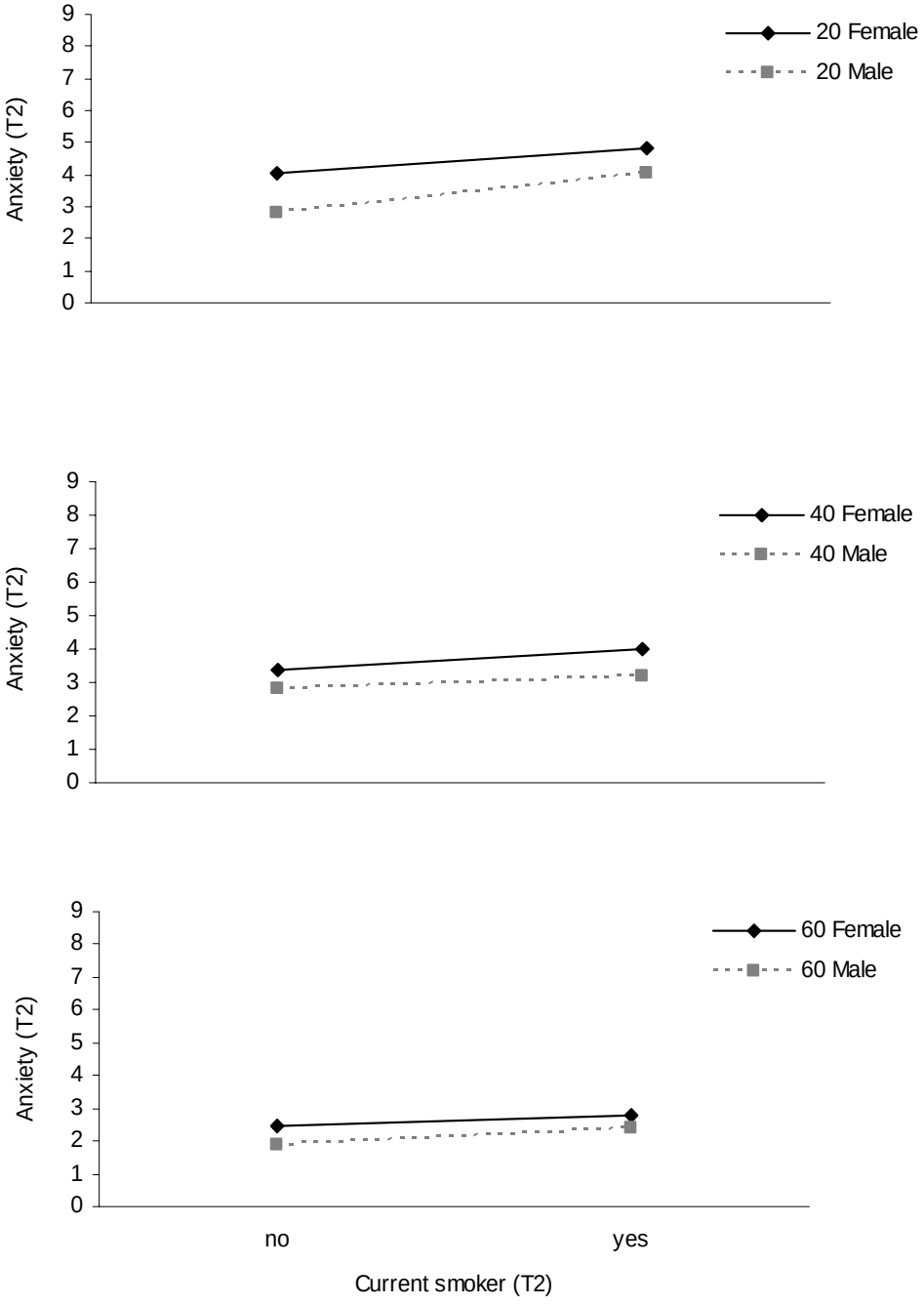


Figure 8-8. Moderating[p] association between gender and smoking status by age group, for anxiety at time 2.



8.5.3. Psychological factors

8.5.3.1. Cross-sectional analyses identifying potential moderating factors

The results from the cross-sectional analyses examining psychological factors are shown in Table 8-5. The only factors that were unrelated to depression (model 1) were behavioural drive and reward. The only factors unrelated to anxiety (model 1) were behavioural drive and Digit Symbol Backwards scores. Model 2 shows several significant moderating[p] associations. In predicting depression, gender was found to interact with mastery, behavioural fun, behavioural reward and Spot-the-Word scores. For both mastery and Spot-the-Word scores, the association between low scores and higher depression was stronger for women than men (β=.16, p<.05; β=.24, p<.05). For both behavioural fun and behavioural reward, the association between low scores and low depression was stronger for men than women (β=.13, p<.05; β=.21, p<.05). When predicting anxiety, there was a relationship between higher Digit Symbol Backwards scores and lower depression levels for men, while there was no association for women (β=-.06, p<.05). Model 3 shows there were no significant age differences across the moderating[p] factors.

Table 8-5. Associations between psychological factors, gender, age-group and outcome variables at time 1.

	Depression Wave 1			Anxiety Wave 1		
	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*
Mastery (7-28)	-.41 (.01)**	-.43 (.01)**		-.35 (.01)**	-.36 (.01)**	
Gender (male)	-.06 (.05)**	-.21 (.35)*		-.12 (.06)**	-.19 (.39)**	
Gender X Mastery	-	.16 (.01)*		-	.07 (.02)	
G X A (20s) X Mastery	-	-	.02 (.04)	-	-	-.15 (.04)
G X A (60s) X Mastery	-	-	-.11 (.03)	-	-	.00 (.04)
EPQ extraversion (0-12)	-.14 (.01)**	-.15 (.01)**		-.10 (.01)**	-.11 (.01)**	
Gender (male)	-.10 (.05)**	-.13 (.13)**		-.15 (.06)**	-.17 (.15)**	
Gender X Extraversion	-	.04 (.02)		-	.02 (.02)	
G X A (20s) X Extraversion	-	-	-.02 (.04)	-	-	.01 (.05)
G X A (60s) X Extraversion	-	-	-.07 (.04)	-	-	-.02 (.04)
EPQ psychoticism (0-12)	.08 (.02)**	.06 (.03)*		.06 (.02)**	-.05 (.03)*	
Gender (male)	-.10 (.06)**	-.13 (.09)*		-.16 (.06)**	-.18 (.11)**	
Gender X Psychoticism	-	.04 (.04)		-	.03 (.04)	
G X A (20s) X Psychoticism	-	-	.07 (.09)	-	-	.07 (.10)
G X A (60s) X Psychoticism	-	-	.05 (.08)	-	-	.03 (.10)
Behavioural drive (4-16)	-.08 (.01)	-.04 (.02)		.01 (.01)	.01 (.02)	
Gender (male)	-.09 (.06)**	-.16 (.24)*		-.15 (.06)**	-.16 (.28)*	
Gender X Drive	-	.08 (.02)		-	.01 (.03)	
G X A (20s) X Drive	-	-	.00 (.06)	-	-	-.05 (.07)
G X A (60s) X Drive	-	-	-.11 (.05)	-	-	.02 (.06)
Behavioural fun (4-16)	.07 (.01)**	-.04 (.02)*		.05 (.01)**	.03 (.02)	
Gender (male)	-.09 (.05)**	-.22 (.328)**		-.15 (.06)**	-.24 (.32)**	
Gender X Fun	-	.13 (.02)*		-	.10 (.03)	
G X A (20s) X Fun	-	-	-.06 (.07)	-	-	-.06 (.08)
G X A (60s) X Fun	-	-	-.17 (.06)	-	-	-.03 (.07)
Behavioural reward (5-20)	.02 (.01)	.00 (.02)		.04 (.02)*	.02 (.02)	
Gender (male)	-.09 (.06)**	-.30 (.46)*		-.14 (.06)**	-.27 (.52)*	
Gender X Reward	-	.21 (.03)*		-	.13 (.03)	
G X A (20s) X Reward	-	-	.01 (.07)	-	-	-.25 (.08)
G X A (60s) X Reward	-	-	-.06 (.06)	-	-	-.02 (.07)
Behavioural inhibition (7-28)	.30 (.01)**	.32 (.01)**		.32 (.01)**	.34 (.01)**	
Gender (male)	-.01 (.06)	.12 (.34)		-.06 (.06)**	.05 (.38)	
Gender X Inhibition	-	-.12 (.02)		-	-.10 (.02)	
G X A (20s) X Inhibition	-	-	-.06 (.04)	-	-	-.14 (.04)
G X A (60s) X Inhibition	-	-	-.01 (.04)	-	-	-.04 (.04)
Spot-the-Word (0-60)	-.10 (.00)**	-.12 (.01)*		-.06 (.01)**	-.07 (.01)**	
Gender (male)	-.09 (.05)**	-.32 (.51)*		-.14 (.06)**	-.22 (.57)*	
Gender X STW	-	.24 (.01)*		-	.08 (.01)	
G X A (20s) X STW	-	-	-.03 (.03)	-	-	.07 (.03)
G X A (60s) X STW	-	-	.03 (.02)	-	-	.12 (.03)
Digit span backwards (0-10)	-.05 (.01)**	-04 (.02)*		-.01 (.01)	.01 (.02)	
Gender (male)	-.09 (.05)**	-.06 (.14)		-.15 (.06)**	-.09 (.16)*	
Gender X DSB	-	-.04 (.02)		-	-.06 (.03)*	

G X A (20s) X DSB	-	-	-.04 (.06)	-	-	-.02 (.07)
G X A (60s) X DSB	-	-	.05 (.05)	-	-	.03 (.06)
Ruminative style (0-30)	.62 (.00)**	.64 (.01)**		.55 (.01)**	.55 (.01)**	
Gender (male)	.02 (.04)	.05 (.08)*		-.05 (.05)**	-.05 (.09)*	
Gender X Ruminative	-	-.04 (.01)		-	.00 (.01)	
G X A (20s) X Ruminative	-	-	.03 (.02)	-	-	.02 (.03)
G X A (60s) X Ruminative	-	-	.01 (.03)	-	-	-.05 (.03)
EPQ Neuroticism (0-12)	.58 (.01)**	.59 (.01)**		.58 (.01)**	.58 (.01)**	
Gender (male)	.02 (.05)	.03 (.06)*		-.04 (.05)**	-.03 (.07)*	
Gender X Neuroticism	-	-.02 (.02)		-	-.01 (.02)	
G X A (20s) X Neuroticism	-	-	.01 (.04)	-	-	.01 (.04)
G X A (60s) X Neuroticism	-	-	.00 (.04)	-	-	-.04 (.04)

Note. * p<.05, ** p<.001. G–gender, A–Age. Standardised coefficients reported. Additional results were provided in model 3, including the main effects and necessary two-way interactions between age and risk factors, however as these results are not central to the hypotheses examined in this chapter for parsimony they are not shown.

8.5.3.2. Longitudinal analyses identifying potential moderating factors

The results from the longitudinal analyses examining psychological factors are shown in Table 8-6. Model 1 shows that changes in several of the psychological factors (psychoticism, behavioural fun, behavioural reward, Spot-the-Word scores and Digit Symbol Backwards scores) did not predict of changes in depression or anxiety. Model 2 shows that changes in psychoticism, ruminative style, behavioural inhibition and Spot-the-Word moderated the association between gender and change in depression or anxiety. The association between increases in psychoticism and ruminative style and increases in depression, were stronger for men than women (β=.05, p<.05; β=.07, p<.001). There was an association between increased psychoticism and increased anxiety for men, but no association for women (β=.07, p<.05). The relationship between increased behavioural inhibition and increased anxiety was stronger for women than men (β=-.13, p<.05), as was the relationship between decreased Spot-the-Word scores and increased anxiety (β=.20, p<.05). Model 3 shows that moderating[p] relationships involving behavioural inhibition, behavioural drive, ruminative style, and neuroticism, differed across age groups. In the

40s, the association between increases in behavioural inhibition and increases in depression was slightly stronger for women than men, while there was little gender difference in the 20s (Figure 8-9). This was also the case for anxiety (Figure 8-10). Figure 8-11 shows that in the 20s and 40s, the association between higher behavioural drive and lower anxiety was stronger for women than men, whereas no association was found for either gender in the 60s. Figure 8-12 shows that the association between increased ruminative style and increased anxiety was stronger for men than women in the 20s, while there was no apparent gender difference in the 40s and 60s. Finally, increases in neuroticism were more strongly associated with increases in anxiety for men in the 20s, whereas in the 40s and 60s this association appeared stronger for women (see Figure 8-13).

Table 8-6. Associations between psychological factors, gender, age-group and outcome variables at time 2.

	Depression Wave 2			Anxiety Wave 2		
	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*
Mastery (7-28)	-.34 (.01)**	-.36 (.01)*		-.28 (.01)**	-.29 (.01)**	
Gender (male)	-.03 (.04)*	-.14 (.29)*		-.06 (.05)**	-.15 (.32)*	
Gender X Mastery	-	.12 (.01)		-	.10 (.01)	
G X A (20s) X Mastery	-	-	.00 (.03)	-	-	-.04 (.03)
G X A (60s) X Mastery	-	-	-.07 (.03)	-	-	-.02 (.03)
EPQ extraversion (0-12)	-.22 (.01)**	-.22 (.01)**		-.15 (.01)**	-.16 (.02)**	
Gender (male)	-.05 (.05)**	-.04 (.11)		-.07 (.05)**	-.08 (.12)**	
Gender X Extraversion	-	-.01 (.01)		-	.02 (.02)	
G X A (20s) X Extraversion	-	-	.01 (.04)	-	-	-.02 (.04)
G X A (60s) X Extraversion	-	-	-.02 (.03)	-	-	-.07 (.04)
EPQ psychoticism (0-12)	.01 (.02)	-.02 (.03)		-.02 (.02)	-.06 (.03)*	
Gender (male)	-.05 (.05)**	-.08 (.07)**		-.07 (.06)**	-.11 (.09)**	
Gender X Psychoticism	-	.05 (.03)*		-	.07 (.03)*	
G X A (20s) X Psychoticism	-	-	.08 (.08)	-	-	.02 (.08)
G X A (60s) X Psychoticism	-	-	-.01 (.07)	-	-	-.02 (.08)
Behavioural drive (4-16)	-.04 (.01)*	-.04 (.02)*		-.01 (.01)	-.03 (.02)	
Gender (male)	-.04 (.05)**	-.05 (.20)		-.07 (.05)**	-.13 (.23)*	
Gender X Drive	-	.01 (.02)		-	.07 (.02)	
G X A (20s) X Drive	-	-	.02 (.05)	-	-	-.04 (.06)

G X A (60s) X Drive	-	-	-.06 (.04)	-	-	-.18 (.05)*
Behavioural fun (4-16)	.00 (.02)	-.01 (.02)		-.01 (.02)	-.03 (.02)	
Gender (male)	-.04 (.05)**	-.08 (.23)		-.07 (.05)**	-.15 (.27)*	
Gender X Fun	-	.04 (.02)		-	.09 (.02)	
G X A (20s) X Fun	-	-	.22 (.06)	-	-	.08 (.06)
G X A (60s) X Fun	-	-	.10 (.05)	-	-	-.08 (.06)
Behavioural reward (5-20)	-.01 (.01)	-.02 (.02)		.02 (.02)	.01 (.02)	
Gender (male)	-.04 (.05)**	-.07 (.37)		-.06 (.05)**	-.13 (.42)	
Gender X Reward	-	.03 (.02)		-	.07 (.03)	
G X A (20s) X Reward	-	-	-.27 (.06)	-	-	-.09 (.07)
G X A (60s) X Reward	-	-	-.17 (.05)	-	-	-.13 (.06)
Behavioural inhibition (7-28)	.24 (.01)**	.26 (.01)**		.25 (.01)**	.27 (.01)**	
Gender (male)	.00 (.05)	.11 (.28)		-.02 (.05)*	.11 (.32)	
Gender X Inhibition	-	-.11 (.01)		-	-.13 (.02)*	
G X A (20s) X Inhibition	-	-	.09 (.03)	-	-	.22 (.04)*
G X A (60s) X Inhibition	-	-	.22 (.03)*	-	-	.29 (.04)**
Spot-the-Word (0-60)	.00 (.01)	-.01 (.01)		.00 (.01)	-.01 (.01)	
Gender (male)	-.04 (.05)**	-.10 (.45)		-.07 (.05)**	-.26 (.40)*	
Gender X STW	-	.06 (.01)		-	.20 (.01)*	
G X A (20s) X STW	-	-	-.12 (.02)	-	-	.02 (.03)
G X A (60s) X STW	-	-	-.04 (.02)	-	-	.12 (.02)
Digit span backwards (0-10)	.01 (.01)	.02 (.02)		.01 (.02)	.01 (.02)	
Gender (male)	-.04 (.05)**	-.02 (.12)		-.07 (.05)**	-.06 (.14)*	
Gender X DSB	-	-.03 (.02)		-	-.01 (.02)	
G X A (20s) X DSB	-	-	-.08 (.06)	-	-	-.08 (.06)
G X A (60s) X DSB	-	-	.02 (.05)	-	-	.03 (.05)
Ruminative style (0-30)	.53 (.01)**	.50 (.01)**		.43 (.01)**	.42 (.01)**	
Gender (male)	.01 (.04)	-.04 (.06)*		-.03 (.05)*	-.05 (.08)**	
Gender X Ruminative	-	.07 (.03)**		-	.03 (.01)	
G X A (20s) X Ruminative	-	-	.04 (.02)	-	-	.08 (.06)*
G X A (60s) X Ruminative	-	-	-.03 (.02)	-	-	.02 (.03)
EPQ Neuroticism (0-12)	.51 (.01)**	.50 (.01)**		.50 (.01)**	.51 (.01)**	
Gender (male)	.01 (.04)	.00 (.06)		-.02 (.05)*	-.01 (.07)	
Gender X Neuroticism	-	.02 (.01)		-	-.01 (.01)	
G X A (20s) X Neuroticism	-	-	.05 (.03)	-	-	.07 (.03)*
G X A (60s) X Neuroticism	-	-	.02 (.03)	-	-	.00 (.04)

Note. * p<.05, ** p<.001. G–gender, A–Age. Standardised coefficients reported. Additional results were provided in model 3, including the main effects and necessary two-way interactions between age and risk factors, however as these results are not central to the hypotheses examined in this chapter for parsimony they are not shown.

Figure 8-9. Moderating[p] association between gender and behavioural inhibition by age group, for depression at time 2.

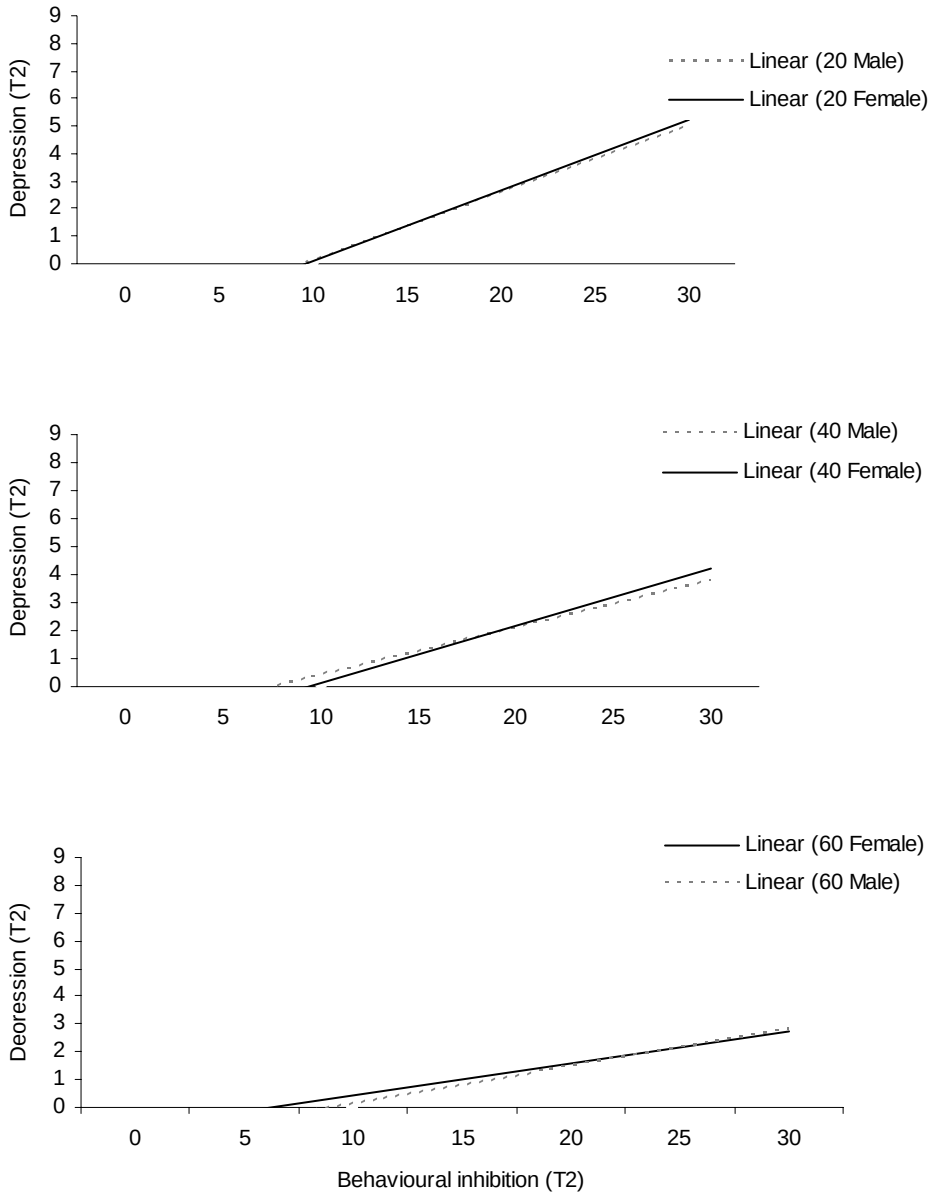


Figure 8-10. Moderating[p] association between gender and behavioural inhibition by age group, for anxiety at time 2.

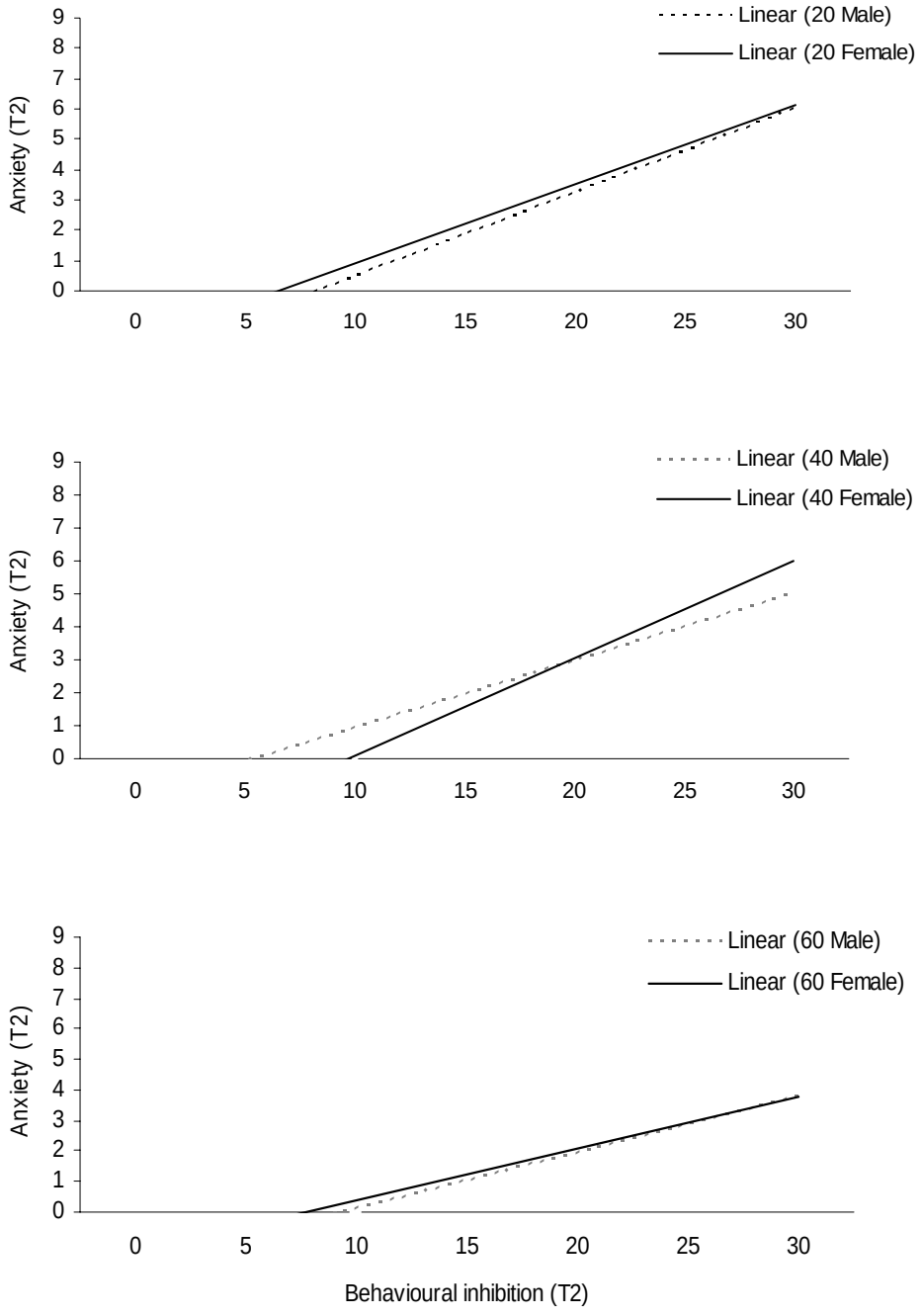


Figure 8-11. Moderating[p] association between gender and behavioural drive by age group, for anxiety at time 2.

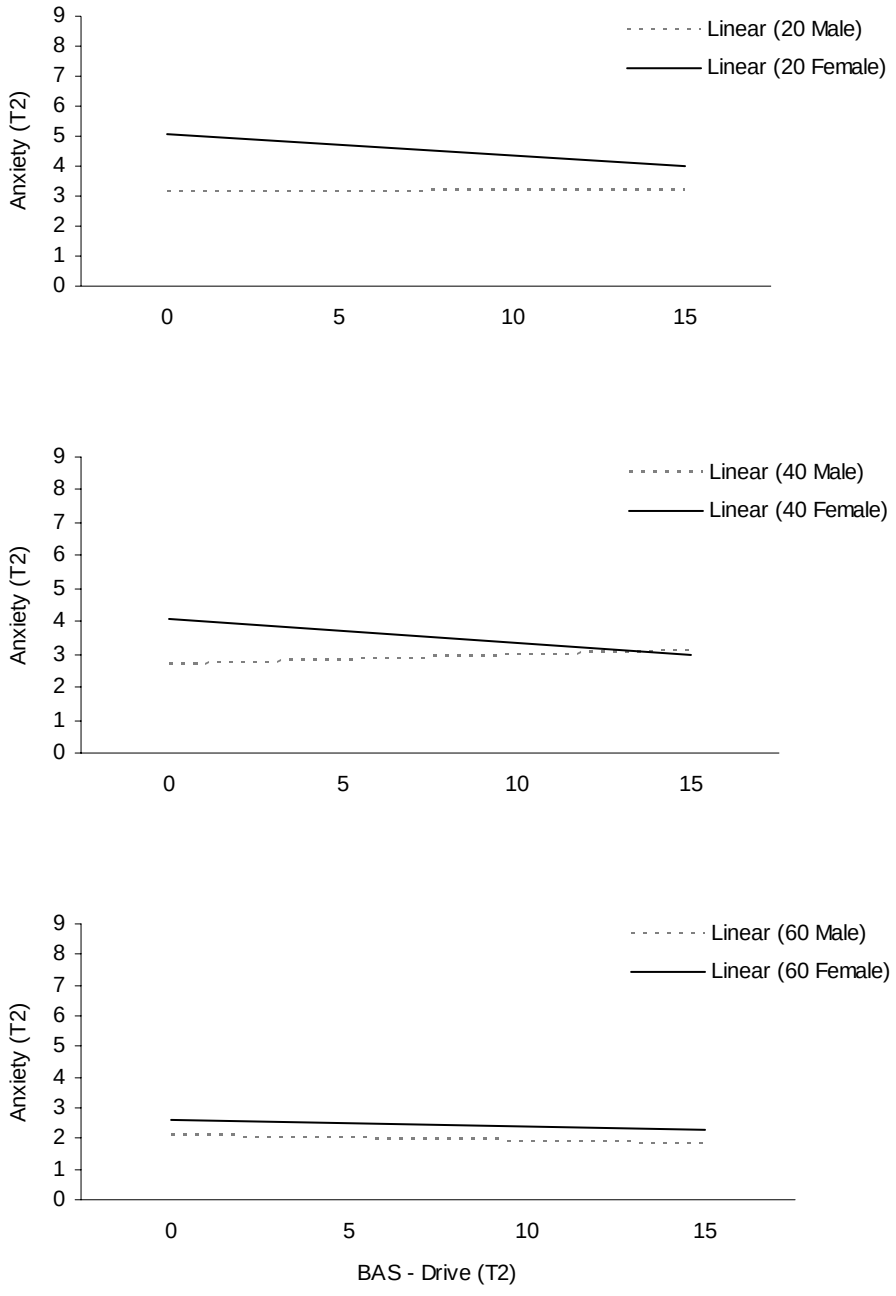


Figure 8-12. Moderating[p] association between gender and rumination by age group, for anxiety at time 2.

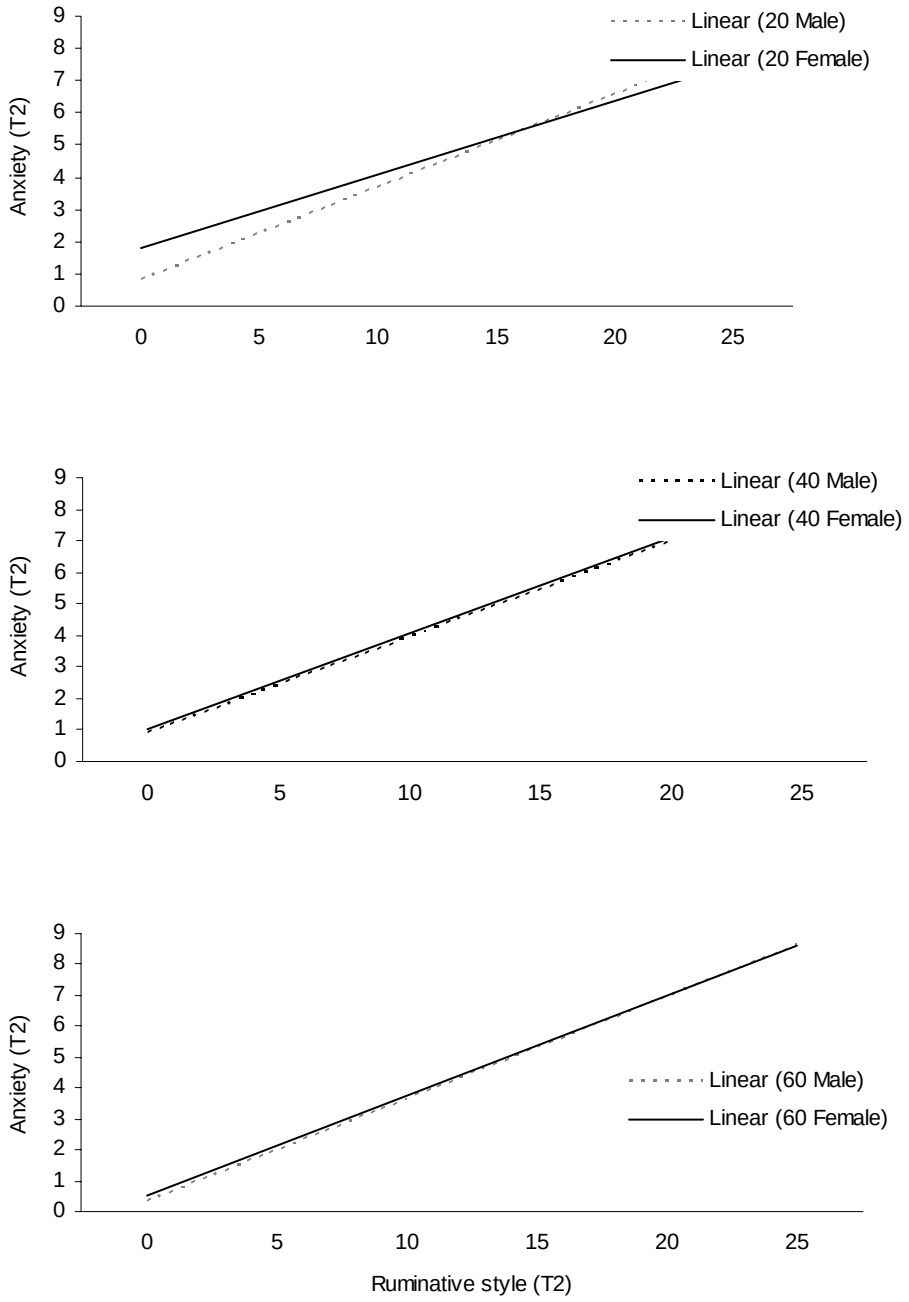
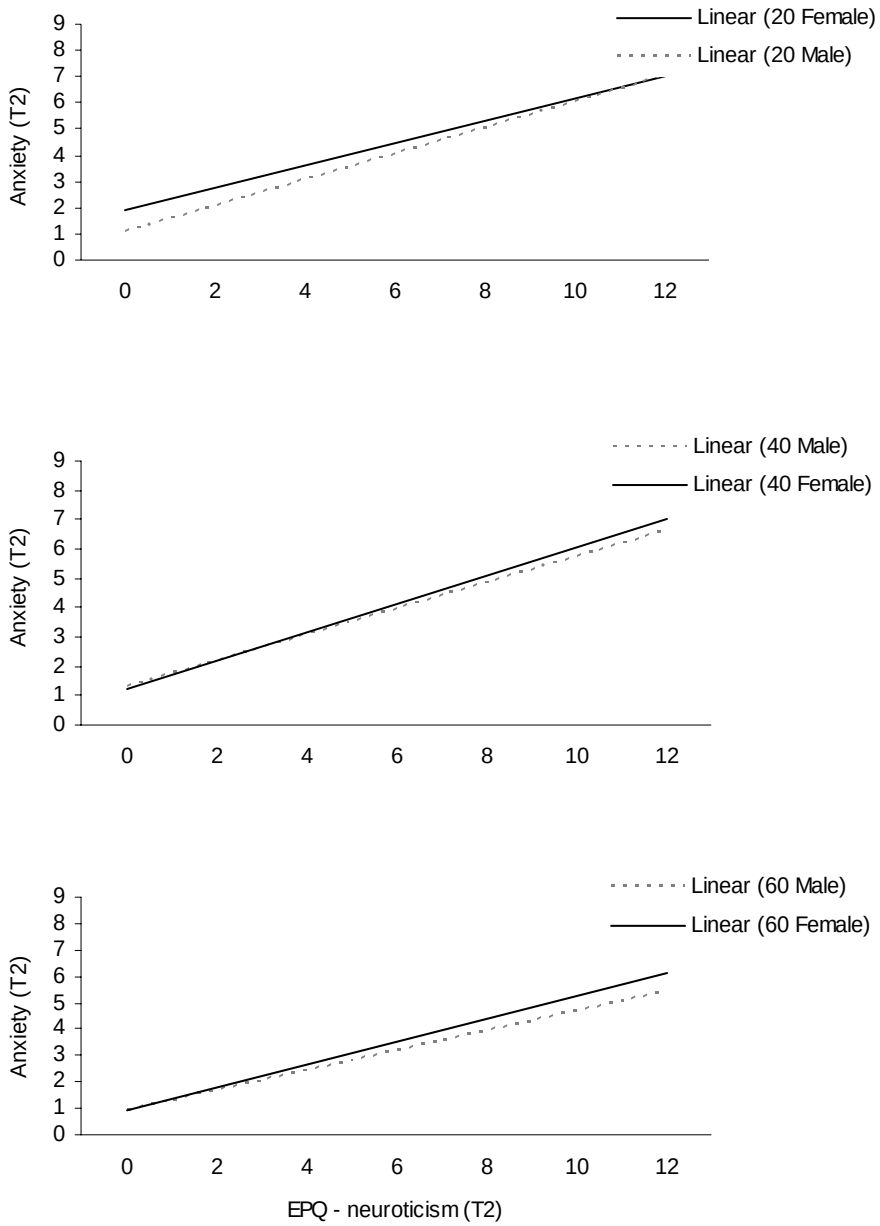


Figure 8-13. Moderating[p] association between gender and neuroticism by age group, for anxiety at time 2.



8.5.4. Social and relational factors

8.5.4.1. Cross-sectional analyses identifying potential moderating factors

The results from the cross-sectional analyses examining social and relational factors are shown in Table 8-7. Model 1 shows that the only variables that did not predict depression or anxiety were finance management and money provision. In addition, responsibility for household tasks did not predict anxiety. Model 2 shows four significant moderating[p] relationships predicting depression. For household tasks, there was an association between majority responsibility and greater depression for men, but not for women (β=.08, p<.05). Both financial management and money provision responsibilities were associated with a greater increase in depression for women, but not for men (β=-.05, p<.05; β=-.11, p<.001). Finally, the association between receiving more positive support from friends and lower levels of depression was stronger for women than men (β=.16, p<.05). There were three significant moderating[p] relationships predicting anxiety. While having the responsibility for household tasks was associated with low anxiety for women, for men this responsibility was associated with higher levels of anxiety (β=.07, p<.001). There was an association between responsibility for money provision and increased anxiety was for women, but not for men (β=-.05, p<.05). The association between experiencing a recent relationship end and increased anxiety was stronger for women than men (β=-.04, p<.05). Three differences in moderating relationships across the age groups were identified (model 3). The first is shown in Figure 8-14, where women in their 20s with household responsibilities were more depressed than their male counterparts, in comparison to the 40s where it was men with these responsibilities who appear more depressed. Figure 8-15 shows similar results for anxiety. The graph in Figure 8-16 shows

that while there was little change in the gender difference in anxiety when an injury/illness was experienced in the 20s and 40s, in the 60s age group this experience was more strongly associated with greater anxiety for men than it was for women.

Table 8-7. Associations between social factors, gender, age-group and outcome variables at time 1.

	Depression Wave 1			Anxiety Wave 1		
	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*
House tasks >50% (no)	.03 (.06)*	-.02 (.08)		.01 (.07)	-.04 (.10)*	
Gender (male)	-.07 (.06)**	-.13 (.08)**		-.14 (.07)**	-.19 (.09)**	
Gender X House	-	.08 (.13)**		-	.07 (.15)**	
G X A (20s) X House	-	-	-.06 (.35)*	-	-	-.05 (.39)*
G X A (60s) X House	-	-	-.02 (.32)	-	-	.00 (.36)
Finance tasks >50% (no)	.02 (.06)	.05 (.08)*		.01 (.06)	.02 (.09)	
Gender (male)	-.09 (.06)**	-.06 (.08)**		-.14 (.06)**	-.14 (.09)**	
Gender X Finance	-	-.05 (.11)*		-	-.01 (.13)	
G X A (20s) X Finance	-	-	.01 (.30)	-	-	.01 (.37)
G X A (60s) X Finance	-	-	-.03 (.25)	-	-	-.02 (.30)
Provide money >50% (no)	.01 (.06)	.08 (.09)**		.02 (.07)	.05 (.11)*	
Gender (male)	-.09 (.06)**	-.04 (.07)*		-.15 (.08)**	-.13 (.08)*	
Gender X Money	-	-.11 (.12)**		-	-.05 (.14)*	
G X A (20s) X Money	-	-	.03 (.35)	-	-	.00 (.38)
G X A (60s) X Money	-	-	.01 (.28)	-	-	-.01 (.32)
Illness/injury (no)	.15 (.11)**	.14 (.16)**		.14 (.12)**	.13 (.18)**	
Gender (male)	-.09 (.05)**	-.10 (.06)**		-.15 (.06)**	-.15 (.07)**	
Gender X Ill/injury	-	.02 (.23)		-	.02 (.25)	
G X A (20s) X Ill/injury	-	-	.05 (.58)	-	-	.00 (.61)
G X A (60s) X Ill/injury	-	-	.04 (.53)	-	-	.05 (.58)*
Family illness/injury (no)	.11 (.07)**	.10 (.10)**		.13 (.08)**	.13 (.11)**	
Gender (male)	-.09 (.05)**	-.09 (.06)*		-.14 (.06)**	-.14 (.07)**	
Gender X Fam. Ill/injury	-	.02 (.15)		-	.00 (.18)	
G X A (20s) X Fam. Ill/injury	-	-	.02 (.35)	-	-	.03 (.40)
G X A (60s) X Fam. Ill/injury	-	-	.04 (.33)	-	-	.01 (.39)
Close family death (no)	.03 (.19)*	.04 (.26)*		.03 (.21)*	.03 (.30)	
Gender (male)	-.09 (.05)**	-.09 (.06)*		-.15 (.06)**	-.15 (.06)**	
Gender X Fam. death	-	-.01 (.39)		-	-.00 (.43)	
G X A (20s) X Fam. death	-	-	-.02 (1.23)	-	-	.00 (1.26)
G X A (60s) X Fam. death	-	-	.01 (.78)	-	-	.01 (.89)
Other close death (no)	.06 (.07)**	.04 (.10)*		.07 (.08)**	.05 (.12)*	
Gender (male)	-.09 (.05)**	-.09 (.06)**		-.15 (.06)**	-.15 (.07)**	
Gender X Other death	-	.02 (.14)		-	.02 (.17)	
G X A (20s) X Other death	-	-	.00 (.38)	-	-	-.02 (.42)
G X A (60s) X Other death	-	-	.01 (.33)	-	-	-.01 (.39)

Relationship ended (no)	.13 (.12)**	.16 (.17)**		.14 (.13)**	.17 (.17)**	
Gender (male)	-.09 (.05)**	-.08 (.06)*		-.14 (.06)**	-.14 (.07)**	
Gender X Relationship end	-	-.03 (.24)		-	-.04 (.25)*	
G X A (20s) X Relationship end	-	-	.00 (.64)	-	-	.03 (.68)
G X A (60s) X Relationship end	-	-	.03 (1.26)	-	-	.03 (1.25)
Interpersonal problem (no)	.21 (.09)**	.20 (.11)**		.21 (.10)**	.21 (.12)**	
Gender (male)	-.07 (.05)**	-.08 (.06)**		-.12 (.06)**	-.13 (.07)*	
Gender X Interpersonal problem	-	.02 (.18)		-	.01 (.20)	
G X A (20s) X Interpersonal prob.	-	-	.01 (.42)	-	-	.04 (.45)
G X A (60s) X Interpersonal prob.	-	-	.01 (.48)	-	-	.01 (.53)
Work crisis (no)	.24 (.08)**	.26 (.12)**		.26 (.09)**	.26 (.12)**	
Gender (male)	-.09 (.05)**	-.09 (.06)**		-.15 (.06)**	-.15 (.07)**	
Gender X Work crisis	-	-.02 (.17)		-	.00 (.18)	
G X A (20s) X Work crisis	-	-	-.01 (.37)	-	-	.00 (.39)
G X A (60s) X Work crisis	-	-	-.03 (.58)	-	-	-.01 (.61)
Job threat (no)	.18 (.11)**	.17 (.16)**		.18 (.11)**	.16 (.16)**	
Gender (male)	-.10 (.05)**	-.10 (.06)**		-.16 (.06)**	-.16 (.06)**	
Gender X Job threat	-	.02 (.22)		-	.02 (.23)	
G X A (20s) X Job threat	-	-	.04 (.46)	-	-	.02 (.47)
G X A (60s) X Job threat	-	-	.01 (.84)	-	-	.03 (.77)
Positive friend support (0-6)	-.23 (.02)**	-.27 (.04)**		-.20 (.03)**	-.22 (.04)**	
Gender (male)	-.14 (.05)**	-.30 (.27)**		-.18 (.06)**	-.26 (.29)**	
Gender X Positive friend	-	.16 (.05)*		-	.07 (.05)	
G X A (20s) X Positive friend	-	-	.08 (.12)	-	-	.05 (.13)
G X A (60s) X Positive friend	-	-	-.04 (.11)	-	-	.14 (.13)
Negative friend support (0-9)	.24 (.02)**	.23 (.02)**		.25 (.02)**	.24 (.03)**	
Gender (male)	-.10 (.05)**	-.12 (.10)*		-.16 (.06)**	-.17 (.12)**	
Gender X Negative friend	-	.02 (.03)		-	.01 (.04)	
G X A (20s) X Negative friend	-	-	.02 (.09)	-	-	.01 (.09)
G X A (60s) X Negative friend	-	-	.03 (.08)	-	-	.00 (.09)
Positive family support (0-6)	-.22 (.03)**	-.22 (.04)**		.18 (.03)**	-.18 (.04)**	
Gender (male)	-.09 (.05)**	-.15 (.30)*		-.15 (.06)**	-.12 (.33)	
Gender X Positive family	-	.06 (.05)		-	-.02 (.06)	
G X A (20s) X Positive family	-	-	-.03 (.13)	-	-	.03 (.14)
G X A (60s) X Positive family	-	-	-.15 (.12)	-	-	.00 (.14)
Negative family support (0-9)	.26 (.01)**	.25 (.03)**		.30 (.01)**	.30 (.02)**	
Gender (male)	-.08 (.05)**	-.08 (.12)*		-.13 (.06)**	-.13 (.13)*	
Gender X Negative family	-	.01 (.03)		-	.00 (.03)	
G X A (20s) X Negative family	-	-	.09 (.07)	-	-	.06 (.07)
G X A (60s) Negative family	-	-	.04 (.07)	-	-	.02 (.07)
No. child adversities (0-17)	.22 (.01)**	.22 (.02)**		.23 (.02)**	.21 (.02)**	
Gender (male)	-.07 (.05)**	-.08 (.06)*		-.13 (.06)**	-.14 (.08)*	
Gender X Adversity	-	-.01 (.03)		-	.03 (.03)	
G X A (20s) X Adversity	-	-	.04 (.46)	-	-	.01 (.07)
G X A (60s) X Adversity	-	-	.01 (.84)	-	-	.02 (.07)

Notes. * p<.05, ** p<.001. G–gender, A–Age. Standardised coefficients reported. A number of additional results were provided in model 3, including the main effects and necessary two-way interactions between age and risk factors, however as these results are not central to the hypotheses examined in this chapter for parsimony they are not shown.

Figure 8-14. Moderating[p] association between gender and household tasks by age group, for depression at time 1.

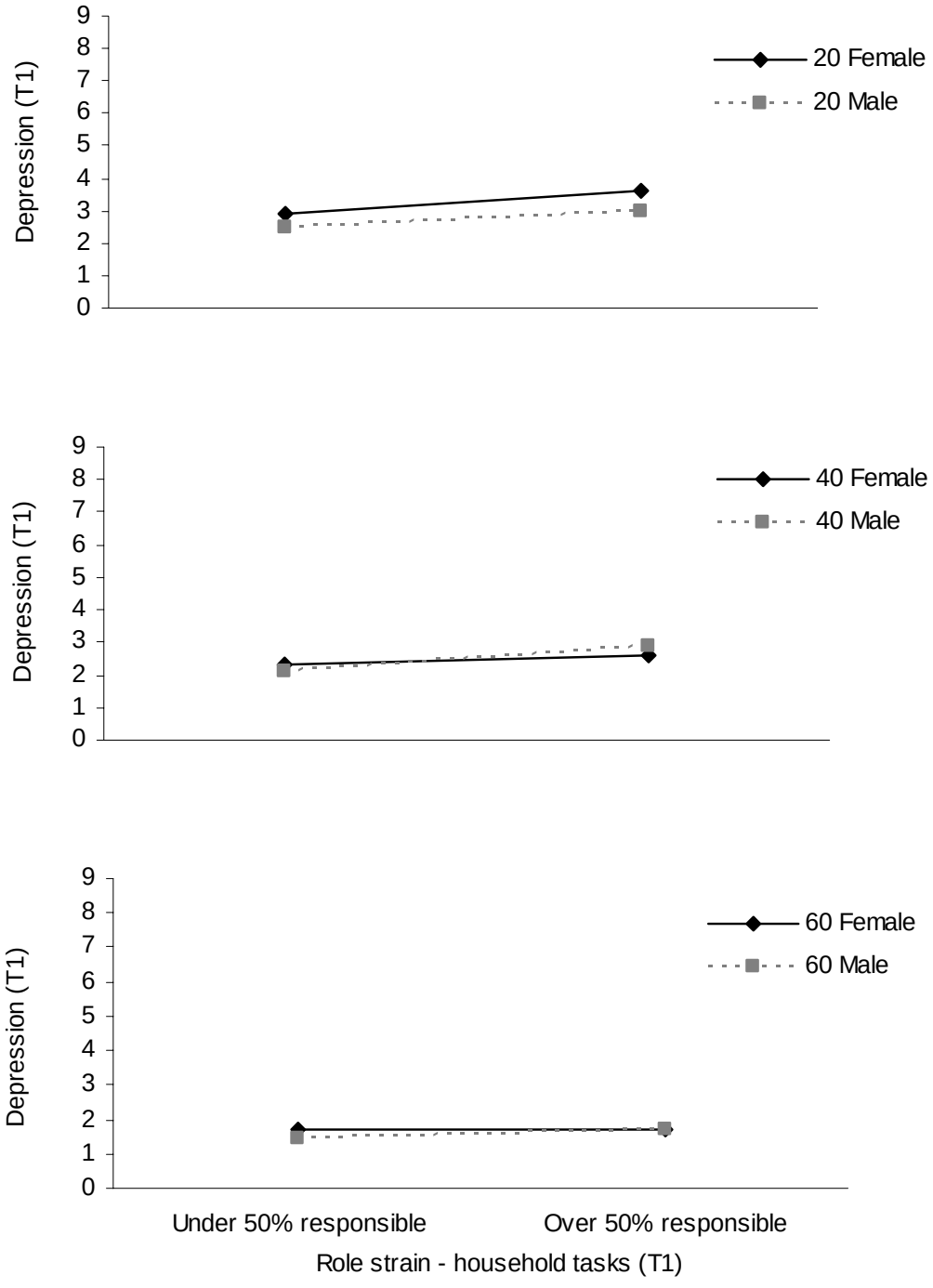


Figure 8-15. Moderating[p] association between gender and household tasks by age group, for anxiety at time 1.

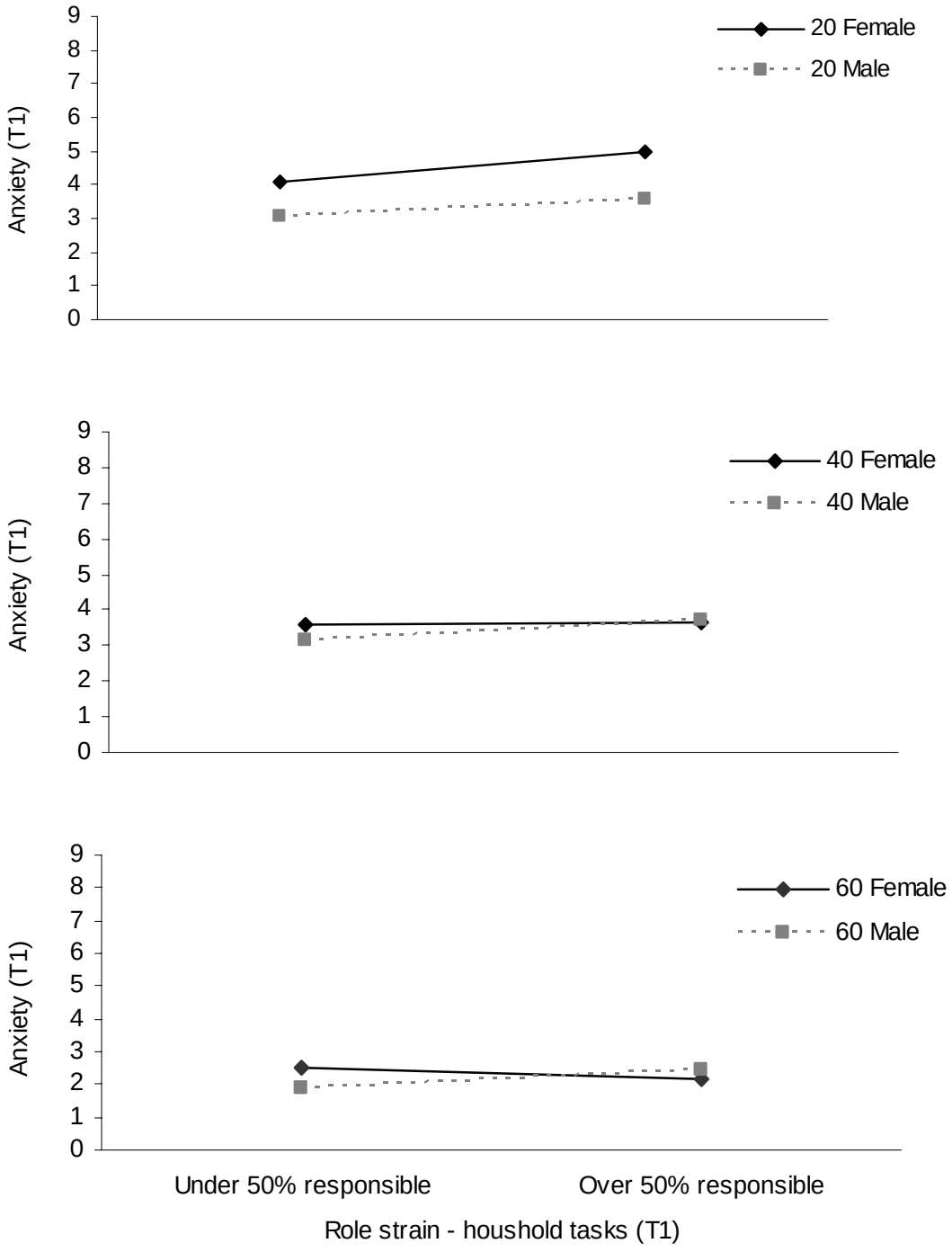
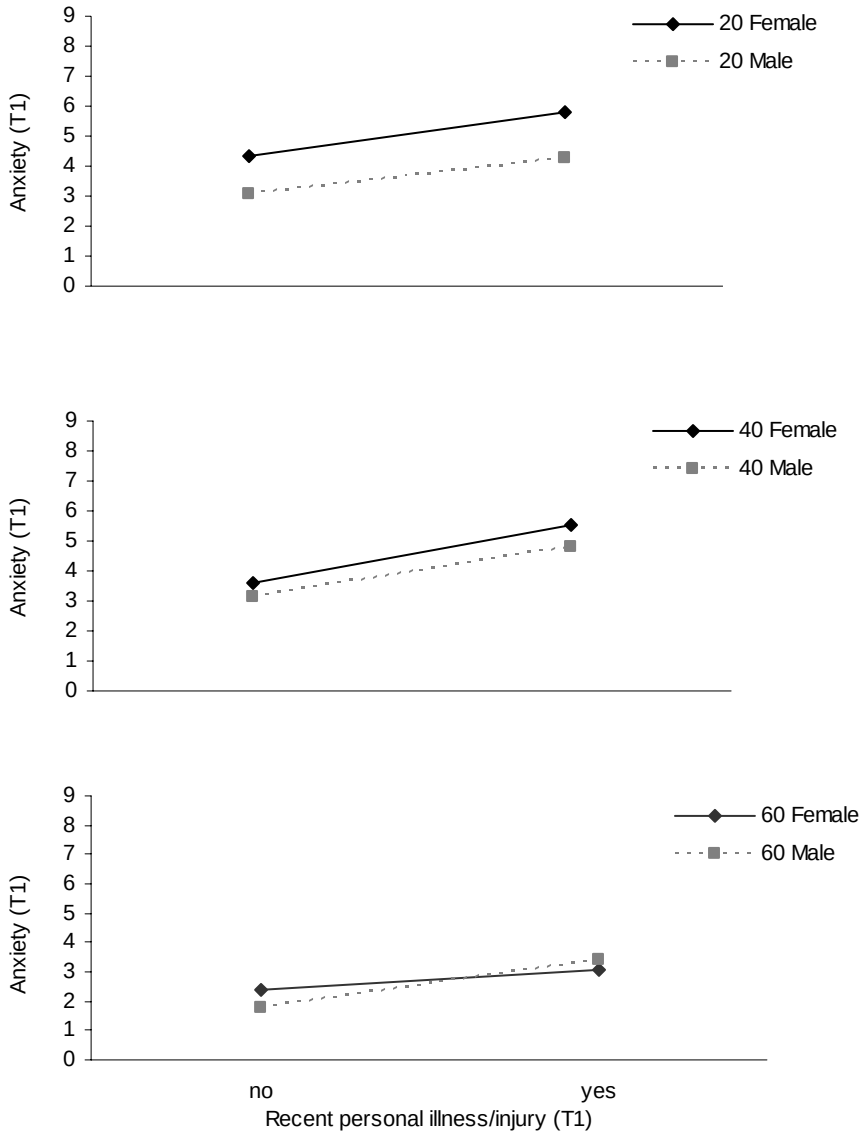


Figure 8-16. Moderating[p] association between gender and personal illness/injury by age group, for anxiety at time 1.



8.5.4.2. Longitudinal analyses identifying potential moderating factors

The results from the longitudinal analyses examining change in social and relational factors are shown in Table 8-8. Change in the responsibility to provide money and the recent death of someone close were not predictive of change in depression or anxiety. In addition, change in the responsibility of household tasks, financial management and a recent job threat did not predict change in anxiety. Model 2 shows those variables that moderated[p] the association between gender and change in depression/anxiety. The association between experiencing a recent close family death and increases in depression was stronger for women than men (β=-.03, p<.05). Increased responsibility for household tasks was associated with a decrease in anxiety for women, whereas it increased anxiety for men (β=.04, p<.05). The association between experiencing a recent work crisis and increased depression was stronger for men than women (β=.03, p<.05). Model 3 shows there were three instances of variation across the age groups. Figure 8-17 shows that in the 40s age group, the association between increased negative family support and increased depression was stronger for women, whereas in the 60s age group the association appeared slightly stronger for men. Figure 8-18 shows that in the 20s the association between experiencing a recent problem with someone and increased anxiety was greater for men than women, where in the 40s and 60s it was slightly greater for women. Finally, Figure 8-19 indicates that while there was little gender difference in the effect increased family support had on lowering anxiety in the 60s, in the 40s age group this negative association was stronger for women than men.

Table 8-8. Associations between social factors, gender, age-group and outcome variables at time 2.

	Depression Wave 2			Anxiety Wave 2		
	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*	Model 1 *β (SE)*	Model 2 *β (SE)*	Model 3 *β (SE)*
House tasks >50% (no)	.04 (.06)*	.02 (.08)		.01 (.07)	-.01 (.09)	
Gender (male)	-.03 (.05)*	-.05 (.07)*		-.07 (.06)**	-.10 (.09)**	
Gender X House	-	.03 (.11)		-	.04 (.12)*	
G X A (20s) X House	-	-	.02 (.28)	-	-	.01 (.31)
G X A (60s) X House	-	-	.03 (.25)	-	-	.03 (.30)
Finance tasks >50% (no)	.03 (.06)*	.03 (.08)		.02 (.06)	.03 (.08)	
Gender (male)	-.04 (.05)**	-.04 (.07)*		-.07 (.05)**	-.06 (.08)**	
Gender X Finance	-	.00 (.09)		-	-.01 (.11)	
G X A (20s) X Finance	-	-	.01 (.25)	-	-	-.02 (.28)
G X A (60s) X Finance	-	-	-.01 (.21)	-	-	-.02 (.25)
Provide money >50% (no)	.01 (.06)	.03 (.08)		.00 (.07)	.01 (.09)	
Gender (male)	-.04 (.05)*	-.03 (.07)*		-.06 (.06)**	-.06 (.08)**	
Gender X Money	-	-.02 (.10)		-	-.01 (.11)	
G X A (20s) X Money	-	-	-.01 (.27)	-	-	-.04 (.29)
G X A (60s) X Money	-	-	.00 (.22)	-	-	.01 (.26)
Illness/injury (no)	.10 (.10)**	.10 (.14)**		.08 (.11)**	.09 (.16)**	
Gender (male)	-.04 (.05)*	-.04 (.05)**		-.07 (.05)**	-.07 (.06)**	
Gender X Ill/injury	-	.00 (.20)		-	.00 (.22)	
G X A (20s) X Ill/injury	-	-	.07 (.56)	-	-	.04 (.59)
G X A (60s) X Ill/injury	-	-	.04 (.49)	-	-	.02 (.54)
Family illness/injury (no)	.06 (.07)**	.05 (.09)**		.07 (.07)**	.08 (.10)**	
Gender (male)	-.04 (.05)**	-.04 (.05)**		-.06 (.05)**	-.06 (.06)**	
Gender X Family Ill/injury	-	.01 (.13)		-	.00 (.15)	
G X A (20s) X Family Ill/injury	-	-	.00 (.01)	-	-	.00 (.37)
G X A (60s) X Family Ill/injury	-	-	.01 (.24)	-	-	-.01 (.35)
Close family death (no)	.02 (.15)*	.04 (.22)*		.01 (.15)	.02 (.21)	
Gender (male)	-.04 (.05)**	-.04 (.05)**		-.07 (.05)**	-.06 (.06)**	
Gender X Family death	-	-.03 (.29)*		-	-.01 (.30)	
G X A (20s) X Family death	-	-	.02 (1.09)	-	-	.02 (1.13)
G X A (60s) X Family death	-	-	.02 (.59)	-	-	.02 (.62)
Other close death (no)	.02 (.06)	.03 (.09)		.03 (.07)*	.03 (.10)*	
Gender (male)	-.04 (.05)**	-.04 (.05)*		-.07 (.05)**	-.06 (.06)**	
Gender X Other death	-	-.02 (.12)		-	-.01 (.14)	
G X A (20s) X Other death	-	-	.00 (.33)	-	-	-.01 (.36)
G X A (60s) X Other death	-	-	.02 (.28)	-	-	-.01 (.32)
Relationship ended (no)	.08 (.13)**	.06 (.17)**		.06 (.14)**	.05 (.19)*	
Gender (male)	-.04 (.05)**	-.04 (.05)**		-.07 (.05)**	-.07 (.06)**	
Gender X Relationship end	-	.02 (.26)		-	.02 (.27)	
G X A (20s) X Relationship end	-	-	.06 (.61)	-	-	.04 (.66)
G X A (60s) X Relationship end	-	-	.02 (.83)	-	-	.02 (.89)
Interpersonal problem (no)	.09 (.09)**	.07 (.11)**		.09 (.09)**	.09 (.12)**	
Gender (male)	-.03 (.05)*	-.04 (.05)**		-.06 (.05)**	-.06 (.06)**	
Gender X Interpersonal problem	-	.03 (.18)		-	.01 (.19)	

G X A (20s) X Interpersonal prob.	-	-	.05 (.41)	-	-	.05 (.42)*
G X A (60s) X Interpersonal prob.	-	-	.00 (.39)	-	-	.01 (.48)
Work crisis (no)	.16 (.09)**	.14 (.12)**		.16 (.10)**	.14 (.13)**	
Gender (male)	-.04 (.05)**	-.05 (.05)**		-.07 (.05)**	-.08 (.06)**	
Gender X Work crisis	-	.03 (.17)		-	.03 (.18)*	
G X A (20s) X Work crisis	-	-	.03 (.37)	-	-	.01 (.39)
G X A (60s) X Work crisis	-	-	.00 (.60)	-	-	-.01 (.63)
Job threat (no)	.12 (.12)**	.12 (.18)**		.12 (.12)	.14 (.18)**	
Gender (male)	-.05 (.05)**	-.05 (.05)**		-.08 (.05)**	-.07 (.06)**	
Gender X Job threat	-	.00 (.23)		-	-.02 (.24)	
G X A (20s) X Job threat	-	-	.05 (.49)	-	-	.04 (.51)
G X A (60s) X Job threat	-	-	.01 (.78)	-	-	-.01 (.82)
Positive friend support (0-6)	-.13 (.02)**	-.12 (.04)**		-.10 (.03)**	-.12 (.04)**	
Gender (male)	-.07 (.05)**	-.06 (.23)		-.09 (.06)**	-.15 (.25)*	
Gender X Positive friend	-	-.01 (.04)		-	.06 (.05)	
G X A (20s) X Positive friend	-	-	.03 (.11)	-	-	-.12 (.12)
G X A (60s) X Positive friend	-	-	-.02 (.09)	-	-	-.19 (.11)*
Negative friend support (0-9)	.09 (.02)**	.09 (.02)**		.11 (.02)**	.10 (.02)**	
Gender (male)	-.05 (.05)**	-.05 (.09)*		-.08 (.05)**	-.08 (.10)**	
Gender X Negative friend	-	.00 (.03)		-	.00 (.03)	
G X A (20s) X Negative friend	-	-	.04 (.08)	-	-	.02 (.08)
G X A (60s) X Negative friend	-	-	.04 (.07)	-	-	.02 (.08)
Positive family support (0-6)	-.11 (.03)**	-.11 (.04)**		-.08 (.03)**	-.09 (.04)**	
Gender (male)	-.05 (.05)**	-.04 (.25)		-.07 (.05)**	-.11 (.28)*	
Gender X Positive family	-	-.01 (.04)		-	.04 (.05)	
G X A (20s) X Positive family	-	-	.06 (.12)	-	-	-.08 (.13)
G X A (60s) X Positive family	-	-	.01 (.10)	-	-	-.08 (.11)
Negative family support (0-9)	.14 (.01)**	.15 (.02)**		.15 (.02)**	.15 (.02)**	
Gender (male)	-.03 (.05)*	-.02 (.09)		.00 (.02)	-.05 (.10)*	
Gender X Negative family	-	-.02 (.02)		-	-.01 (.02)	
G X A (20s) X Negative family	-	-	.08 (.06)	-	-	.06 (.06)
G X A (60s) Negative family	-	-	.09 (.05)*	-	-	.04 (.06)

Note: * p<.05, ** p<.001. G–gender, A–Age. Standardised coefficients reported. A number of additional results were provided in model 3, including the main effects and necessary two-way interactions between age and risk factors, however as these results are not central to the hypotheses examined in this chapter for parsimony they are not shown.

Figure 8-17. Moderating[p] association between gender and negative family support by age group, for depression at time 2.

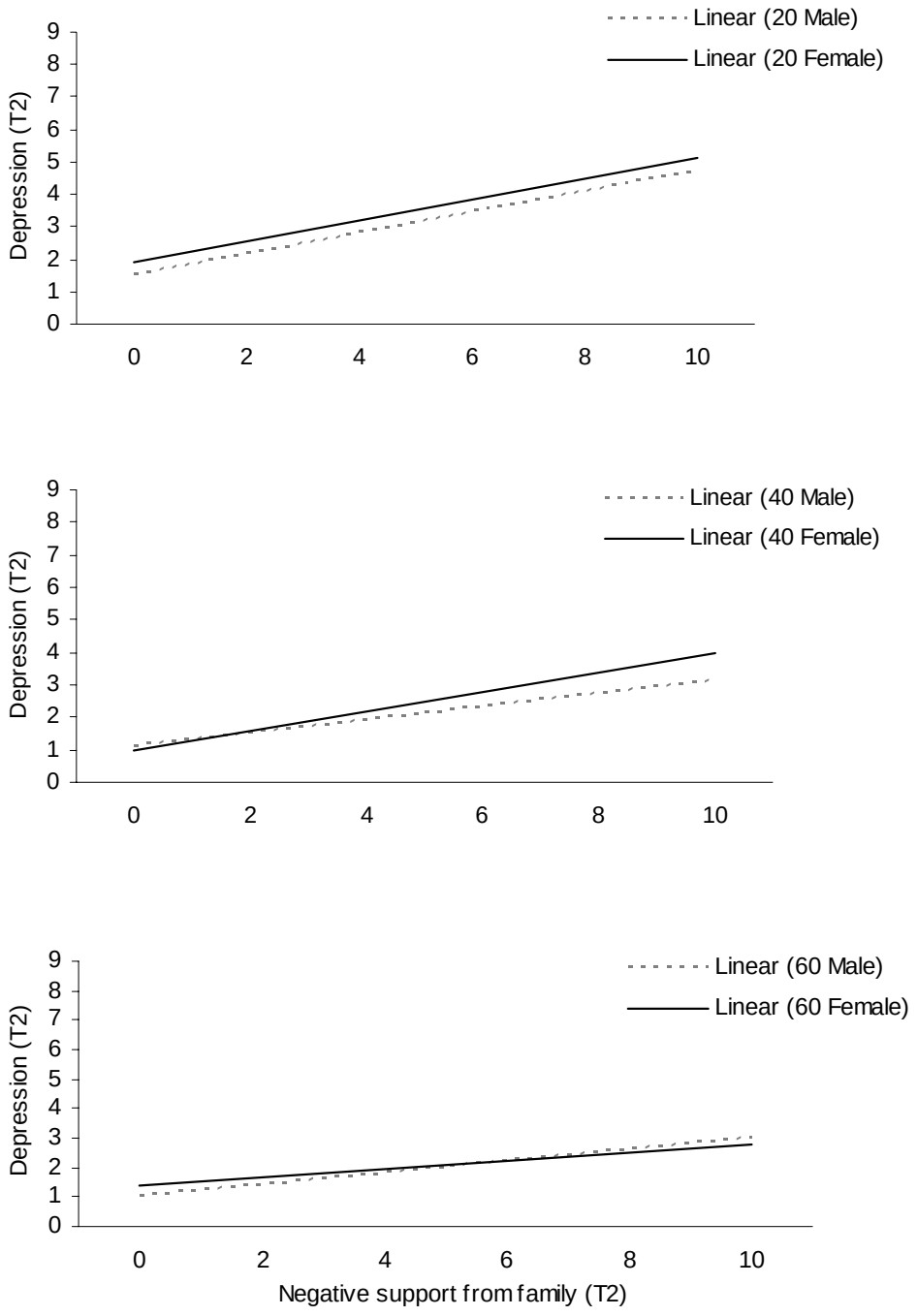


Figure 8-18. Moderating[p] association between gender and recent interpersonal problem by age group, for anxiety at time 2.

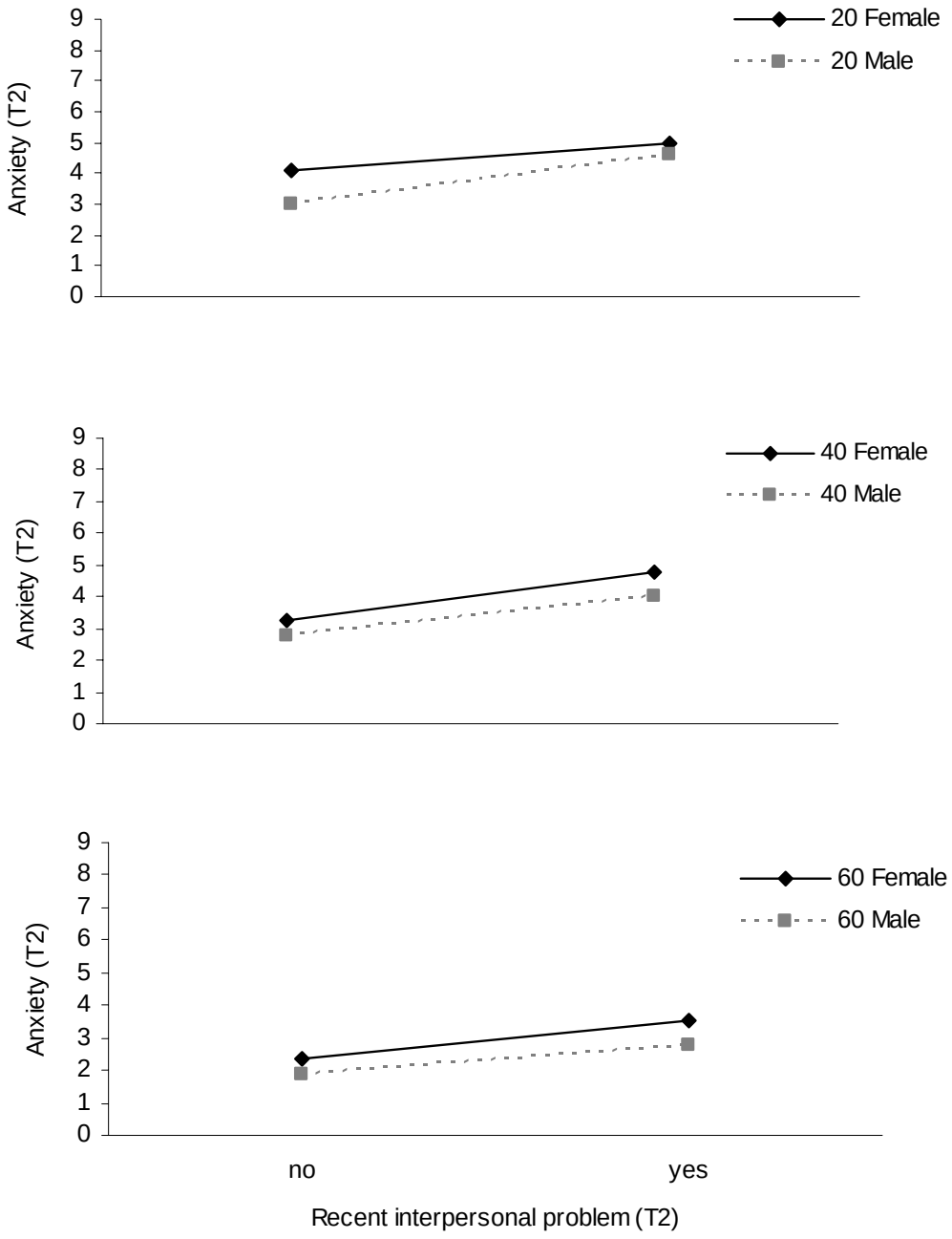
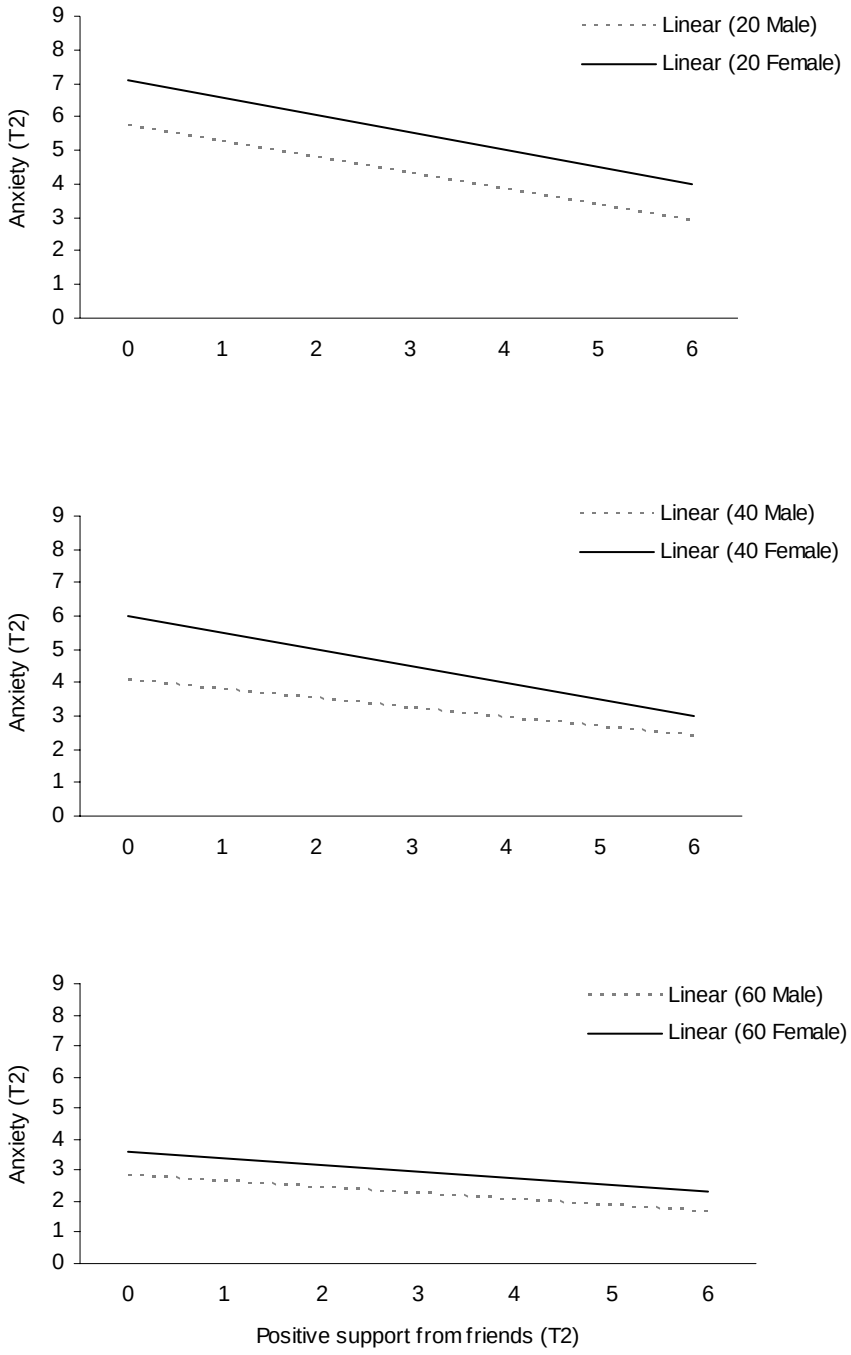


Figure 8-19. Moderating[p] association between gender and positive family support by age group, for anxiety at time 2.



8.6. Discussion

The current study showed that the levels of depression and anxiety experienced by men and women are influenced by different psychosocial factors. In some cases the effect of these risk factors varies as a function of age. Women were found to be more vulnerable towards socio-demographic factors (such as becoming married) and social factors (such as having a recent relationship end or social support withdrawn) than men in relation to psychological distress. In addition to this, men were found to have their own specific vulnerabilities including abstaining from alcohol, the responsibility for household tasks, experiencing increases in either psychoticism or rumination, or having a work crisis. The significant potential moderators identified were also found to vary for each of the age groups. For example, the effects of separation/divorce and having greater numbers of children on increases in depression and anxiety were greatest for women in their 20s, whereas men in their 20s were more vulnerable towards becoming unemployed. Further details and implications regarding each of the potential moderators and age differences identified are considered below.

In discussing the current results, it is important to emphasise the difference between the cross-sectional and longitudinal findings. While the cross-sectional analyses examine the relationship between variables at one point in time (where the duration of neither the risk factors nor the outcome factors can be determined), the longitudinal analyses examine the impact of recent change (between the waves of data) in the risk factors upon recent change in depression and anxiety. Comparing the two sets of results provide some insight into the stability of the effects of risk factors (and moderators) upon depression and anxiety. Although the focus is on significant findings, it is important to mention that in

these analyses the absence of a longitudinal association may be interpreted in two ways: a) that there was change in the risk factor, but that it was not associated with a change in depression/anxiety, and/or b) that the risk factor did not change much between the two time periods. This second possibility is relevant in instances such as 'having children in the 60s age group', where a lack of association with depression/anxiety is likely to be due to a lack of change in the risk factor. Regardless of this ambiguity, significant potential moderators from the longitudinal analyses indicate that change in a risk factor had a differential effect upon the development of men and women's depression and anxiety levels.

8.6.1. Socio-demographic findings

Cross-sectionally, none of the socio-demographic factors were found to potentially moderate the association between gender and depression. However, the longitudinal results show that becoming married or defacto was significantly associated with reduced levels of anxiety and depression, with this effect being greater for men than for women. As this effect was not present at time 1, but was significant at time 2, this finding suggests that a recent marital transition has particular benefit for men, whereas the positive consequences of longer term marriage relationships may be more evenly distributed for men and women. While it has long been suspected that marriage in general has greater physical and psychological health benefits for men than women (Gove, 1972; Kiecolt-Glaser & Newton, 2001), the distinction between newly entered and long-term marriages has rarely been considered in this context. A study conducted by Williams and Umberson (2004) did examine the specific association between marital transitions and physical health. This study utilised three waves of data from the Americans' Changing Lives survey (a US

nationally representative sample of 3617). As with the present study, the researchers found that the transition into marriage was accompanied by a significant improvement in men's but not women's self-assessed health. As continually married men were not healthier than their continually divorced or never-married counterparts, it was concluded that getting married is accompanied by a temporary improvement in self-assessed health for men that attenuates over time.

Although no moderating associations were found for the socio-demographic factors at time 1 when the age groups were pooled, the impact of several factors differed for men and women when life stage was considered. Age comparisons particularly highlighted the demographic circumstances that contribute to poor mental health in young women. In the 20s age group, a prior separation or divorce was associated with higher levels of anxiety and depression in women compared to men. Life course theory suggests that occupying particular roles at non-normative stages of life, such as being a separated/divorced women in her early 20s, can lead to reduced well-being (Elder, 1985). It is unclear whether this effect is stable or short term. The lack of a longitudinal effect at time 2 may be because the participant age increases from 20-24 to 24-28, with this later age being more normative for experiencing a separation/divorce. Both the cross-sectional and longitudinal results indicate that young women's anxiety and depression increased with an increase in the number of children. In Australia, having more than one child is another role not normally occupied by women in their early 20s. The 2006 national census found that for women aged 20-24, 85.5% had no children and 9.3% had one child, leaving only 5.2% of young women with multiple children (ABS, 2006b). Separation/divorce and having multiple children at a young age have been linked with other important predictors of poor mental

health, such as low socio-economic status, which may partially explain their effect (Deal & Holt, 1998). They are also events that in many cases stigmatise young women; another contributor towards poor mental health (Meyer, 2003).

The only socio-demographic factor linked specifically to men in their early 20s (in comparison to women), was a longitudinal association between becoming employed and a decrease in anxiety. Research has suggested that unemployment is worse for men's mental health than women's owing to the centrality of employment in men's identity and social roles (Jahoda, 1982; Theodossiou, 1998). The current results also demonstrate that becoming employed is an important boost for men's mental health. In addition, they indicate that age differences are an important consideration when comparing the effect of gaining employment for men and women, specifically that gaining employment is particularly positive for young males in their mid to late 20s. This age is likely to be a key stage in the development of a career for young men, where starting a new job might act as an encouragement, and equally, a job loss might damage confidence.

8.6.2. Health and lifestyle findings

The only health and lifestyle factor found to act as a potential moderator at time 1 was alcohol consumption. Abstaining from alcohol was found to be associated with higher levels of depression and anxiety for men than for women, whereas drinking alcohol moderately (in comparison to either abstaining or drinking excessively) was shown to be associated with lower levels of depression for men. A number of explanations for this finding are possible. The findings might be linked to gender differences in typical social activities. Traditionally, men's social interactions and stereotypical portrayals of masculinity have involved alcohol consumption (Wilsnack et al., 2000). Abstinence may

be seen to be anti-social or even deviant, which may contribute to low self esteem and hence produce depression. Alternatively, abstaining from alcohol could prevent engagement in social activities, which might increase isolation and depression. As abstaining is less common for men than it is for women (Fillmore & Vogel-Sprott, 1997; Rodgers et al., 2000), there might also be external factors which force men to make this choice. For example, a health condition or prior substance use disorder which prohibits alcohol consumption might be the factor that contributes to anxiety and depression (Anstey, Windsor, Rodgers, Jorm, & Christensen, 2005). The only three-way interaction found involving health and lifestyle factors was becoming a current smoker at time 2. The results suggest this factor had stronger associations with depression and anxiety for men in their 20, whereas in the 40s the associations were similar for both genders.

8.6.3. Psychological findings

The cross-sectional results showed that women were more vulnerable than men to both poor verbal intelligence and lower levels of mastery. Women had greater depression in association with lower scores on the Spot-the-Word test. This finding indicates that poor verbal intelligence is more detrimental for women than men. A study conducted by Rabbit et al., found the converse result, that lower levels of intelligence were more strongly associated with depression in men than women (Rabbitt, Donlan, Watson, McInnes, & Bent, 1995). However, this sample was restricted to those aged 50 to 93 years old – an older cohort where intelligence may have been particularly important for men's social and employment roles, and also where dementia and other health conditions might interact negatively, particularly for men who are at greater risk of dementia. In the current study, the cross-sectional results for verbal intelligence were reinforced longitudinally at time 2,

where decreases in scores were more strongly associated with decreases anxiety for women than men. These findings suggest verbal intelligence is a more important resource for women's than men's mental health.

The association between lower levels of mastery and greater depression was also found to be stronger for women than men. The reasons why low personal control has a greater impact on women than men have previously been unexplored. It is likely that other disadvantages associated with being female, such as the tendency to work in lower-level jobs, earn lower wages (Marini, 1989), and to have less authority in marital relationships (Feree, 1990), are likely to play a role in compounding the effects of low personal control (Turner, Lloyd, & Roszell, 1999). The longitudinal results showed that change in two psychological risk factors were particularly important for women in their 40s in comparison to men. Women in this age group were more vulnerable to increases in behavioural inhibition/withdrawal, but were also more protected by increases in behavioural drive/motivation, than men in this age group.

Several psychological vulnerabilities more prominent for men were also identified. While at time 1 there was a positive association between fun-seeking and depression, as well as behavioural reward-responsiveness and depression for men, there was little association between these factors for women. This was also found to be the case when examining the association between increases in psychoticism and increases in depression at time 2. These factors have been associated with ambition and aggression, are more common in men, and have previously been linked to poor mental health (Lynn & Martin, 1997). It is likely that for women, such factors play a different role. They might offset or indicate the absence of other detrimental personality characteristics such as neuroticism,

ruminative style and behavioural inhibition, assisting to prevent psychological symptoms. Unexpectedly, men were also shown to be more vulnerable to increases in ruminative style than women were at time 2. As rumination is commonly described as a female trait (Butler & Nolen-Hoeksema, 1994; Nolen-Hoeksema, 1987), perhaps men are not as adept at coping with this style of thought process. The results of the longitudinal analyses clarify this finding. At time 2 it appears that men in their 20s are more susceptible to increases in rumination as well as increases in neuroticism in the development of anxiety, as opposed to the 40s and 60s where the genders have either equal susceptibility or women appear slightly more vulnerable.

8.6.4. Social and relational findings

Several role strain measures were found to potentially moderate associations between gender and depression, and gender and anxiety. At time 1 the responsibility of performing the majority of household tasks was associated with greater anxiety and depression for men than women, while the responsibility for financial management and money provision was worse for women's mental health. At time 2, an increase in the amount of household tasks was also associated with increased anxiety for men, while there was a slight decrease for women. One straightforward explanation of these results is that taking on the main responsibility for a task that is not traditional for one's gender, is stressful. Performing tasks outside those typically required by gender stereotypes might also be an indication of role overload or being responsible for too many tasks. It has been found that employed women are more susceptible to mental health problems in situations where they still hold the majority of housework and child-rearing responsibilities (Roxburgh, 2004). The age comparisons suggest that the responsibility for household tasks

is most detrimental to men in their 40s and women in their 20s. Performing the greater share of household tasks while being male and 40, might be an indication of other problems, such as recent divorce, separation or spouse death, or lack of employment due to physical health problems, which also contribute to poor mental health. For the 20s, young women may be less ready to accept the idea of performing the majority of household tasks in comparison to women in the older age groups. Alternatively, it may arise because of necessity, with household tasks being undertaken more frequently in conjunction with childrearing during this life stage.

Findings concerning the social and relational factors, also suggest that men and women are vulnerable to different life events in association with anxiety and depression. Cross-sectionally, having had a prior relationship end was more strongly associated with anxiety for women than for men. Similarly experiencing a recent close death (at time 2) was associated with an increase in depression for women. For men, experiencing a recent work crisis (at time 2) was more strongly associated with increases in anxiety. These findings support prior research suggesting that women are more vulnerable to life events affecting their social network (Davis et al., 1999), whereas for men issues involving employment appear more salient. Events involving health particularly affected men in their 60s. Experiencing a recent injury or illness was more strongly associated with depression for men in this age group than it was for women, whereas the reverse appeared to be the case in the 20s and 40s. Thus men who are older might be sensitive to experiencing a loss of independence due to injury or illness.

The findings surrounding the importance of network events for women are echoed by the results for social support. Cross-sectionally, greater positive support from friends

was more strongly associated with low depression for women than men. Findings from the three-way interactions at time 2 indicate that for women, the 40s is a time of particular need for social support both from friends and family. For men, greater support from family was most important in their 60s, where an increase in family support was associated with a decrease in depression levels. Interestingly, the link between having experienced recent problems with someone and anxiety (at time 2) was greater for men than women in their 20s, where in the 40s and 60s it was greater for women. This finding reinforces the distress associated with social problems for women in their 40s, but also suggests that social problems are difficult for young men.

8.6.5. Similarities between anxiety and depression

When comparing the results for anxiety and depression, the two outcomes shared a number of common moderating relationships. Potential moderators that emerged for both anxiety and depression at time 1 were abstaining from alcohol, cognitive measures and household tasks, and those at time 2 were becoming married/de facto and developing psychoticism. Given the cross-over in results, it is difficult to split the potential moderators into those more closely related to either anxiety or depression. However, a distinction can be seen in the social variables that concern negative life events. Events related to men's vulnerability (becoming unemployed, experiencing a work crisis, experiencing an injury or illness in older men, and experiencing interpersonal problems in younger men) were associated with higher levels of anxiety only, whereas negative life events experienced by women were more equally associated with both depression and anxiety. For women, events related to both depression and anxiety were experiencing a recent romantic relationship breakdown and becoming married/de facto. In addition, having someone close

die was associated with depression for women. This gender difference suggests that the psychological impacts of stressful life events are more closely related to anxiety in men, whereas for women they are associated with both anxiety and depression. It also compliments findings that there is greater comorbidity between the two disorders for women then men (Ochoa, Beck, & Steer, 1992).

8.6.6. Limitations

There are two main limitations on the interpretation of the analyses in this chapter. The first has been previously outlined, that is although two waves of data have been utilised to perform longitudinal analyses, or to examine differential vulnerabilities between men and women regarding how changes in risk factors are related to changes in anxiety/depression, simultaneous changes do not provide information regarding the causal relationships between risk factors and anxiety/depression. What the longitudinal analyses do allow for is partialling out the effects of risk factors and psychological distress prior to the onset of recent changes. This provides more definitive information regarding the timing of relationships between a risk factor and anxiety/depression for men and women. Second, the univariate analyses undertaken do not provide information about the interaction between potential risk factors. It is almost certain that combinations of risk factors are involved in the development of anxiety/depression for men and women (Bebbington, 1996; Boughton & Street, 2007; Kuehner, 2003; Piccinelli & Wilkinson, 2000). Given the large number of variables investigated, it was not practical or parsimonious to construct large multivariate models and also examine the two and three-way interactions that were of primary interest. However, the breadth of psychosocial factors examined in the current

study does provide a unique and useful guide for the theoretical and practical construction of multivariate models in future research.

8.7. Chapter conclusions

The current study's findings show that men and women are vulnerable towards different types of psychosocial factors in the development of anxiety and depression. There is evidence that women are more vulnerable to negative events involving social networks, poorer cognition and mastery, and recent marriage. While for men the predominant potential moderators included alcohol abstinence, aggressive personality characteristics and employment issues. The findings also suggest that straying outside gender and age specific norms in terms of household responsibilities and demographic transitions may have a negative psychological impact. Overall, the results for anxiety and depression were similar, suggesting that men and women have similar vulnerability factors to both types of mental illness. A distinction was observed where negative life events more commonly led to anxiety for men, while for women they equally contributed towards both depression and anxiety. In returning to the vulnerability hypothesis, the findings support suggestions that women are more vulnerable than men to a particular set of risk factors, and that this contributes towards their higher levels of depression and anxiety. However, it was also conversely found that men have their own specific set of important risk factors, highlighting the importance of including both genders in research on risk factors for depression and anxiety.

The results point towards some specific challenges for men and women at each stage of the adult lifespan. In the 20s women's vulnerability appeared to be linked to overburden and stress in domestic relationships; involving divorce/separation, numbers of

children and household tasks responsibilities. Young men were more vulnerable when they became unemployed, started smoking, had increased rumination or experienced recent interpersonal problems. This indicates that being occupied by employment and other practical tasks is important for young men's mental health. For women in their 40s, poor social support emerged as a key factor as did higher behavioural inhibition and lower behavioural drive. The only vulnerability that was found for men in their 40s was having the majority of responsibility for household tasks. While no particular vulnerabilities emerged for women in their 60s, men in this age group were susceptible to poor health and low levels of family support. These results indicate that men in older generations require care from their spouses and family, particularly when experiencing health problems.

9. GENDER DIFFERENCES IN DEPRESSION AND ANXIETY ACROSS THE LIFESPAN: FINAL DISCUSSION AND CONCLUSIONS

9.1. Summary

This chapter summarises the main findings of this thesis and discusses the theoretical and practical implications. Gender differences in levels of depression and anxiety were found to vary across the lifespan, with the largest difference in both outcomes occurring for young people in comparison to two older age groups. An examination of the Goldberg Anxiety and Depression Scales confirmed that gender-biased items were not responsible for the greater endorsement of symptoms by women than men in any age group. A large set of potential psychosocial mediators and moderators were identified as possible risk factors for the preponderance of depression and anxiety in women, with some variation in findings across age. Across each of the investigations many similarities were evident in the findings for depression and anxiety. Overall, these findings suggest a lifespan approach is important, both when describing gender differences in depression and anxiety, and examining associated psychosocial risk factors. They also demonstrate that gender differences in both exposure and vulnerability are important when identifying how a potential risk factor affects gender disparities in symptomology. While there are several important limitations within this study that require acknowledgement, unique strengths include the broad range of psychosocial factors studied and the expansion of the literature surrounding gender differences in anxiety.

9.2. Research findings

The main aims of this thesis were to: a) describe variation in the gender difference for levels of depression and anxiety across the adult lifespan, and b) establish and examine simultaneously the role of a wide range of psychosocial factors at various life stages. A subsidiary aim was to expand the literature surrounding the gender difference in anxiety, using available research addressing the gender difference in depression as a template. The following sections draw together the main findings from each of the study chapters in relation to the aims of the thesis.

9.2.1. Describing gender differences in depression and anxiety across the adult lifespan

Women were found to experience higher levels of both depression and anxiety across the three age groups tested (20s, 40s and 60s). However, the magnitude of this difference varied across the age groups, suggesting that the simple 2:1 ratio commonly used in the literature to describe gender differences in anxiety and depression is imprecise. The findings showed that the greatest difference for both psychological outcomes occurred for the youngest age group in comparison to the two older groups. When change in levels of anxiety and depression was assessed over a four year time period, and all three age groups were pooled, no gender differences were observed. However, comparisons between the age groups did show that the gender difference in anxiety narrowed over time for the 20s age group in comparison to the 40s, and that a general measure of mental health narrowed over time for the 20s in comparison to the 60s. It was concluded that a 4 year period was not long enough to detect significant age changes in the gender disparity across time, and that further longitudinal studies over a greater duration are required.

9.2.2. Attributing gender differences in depression and anxiety to biased items

The Goldberg Anxiety and Depression Scales were investigated for gender-biased items to examine whether the gender disparities found in the PATH dataset were the result of a spurious or artefactual effect. The scales were found to measure two separate depression and anxiety factors, and to contain no gender-biased items. This was found to be the case for all three age group samples (20s, 40s, and 60s) and at two time points. These findings demonstrated that gender differences in the endorsement of items from the Goldberg Scales were not due to gender-biased items. This study highlighted the importance of choosing appropriate methods of analysis when assessing item bias and confirmed the appropriateness of the Goldberg Scales as a measure of the gender difference in levels of depression and anxiety.

9.2.3. Potential mediating and moderating roles for psychosocial factors

The research undertaken in this thesis suggests gender differences in exposure and vulnerability to potential psychosocial risk factors are an important component of explaining the gender disparity in depression and anxiety levels. Table 9-1 provides a summary of those psychosocial factors that each gender was found to be either more exposed to (potential mediators) or more vulnerable towards (potential moderators) in association with higher levels of depression or anxiety. This information is provided for each of the cohorts examined. In the table it is clear that more potential risk factors were identified for women than men. This is not unexpected, as the research questions proposed in this thesis, and the variable selection, were focussed upon explaining the preponderance of symptoms amongst women.

Table 9-1. Vulnerability and exposure to potential psychosocial risk factors.

	20s		40s		60s	
	Men	Women	Men	Women	Men	Women
Socio-demographic factors						
Married/de facto		V V		V V		V V
Separated/divorced		E V V				
Not employed	V			E E		
Number of children (more)		V V				
Fewer years of education	E			E		E
Health and Lifestyle factors						
Tobacco use						
Regular cannabis use	E					
Alcohol: Abstain	V V		V V		V V	E E
Alcohol: Moderate use		V		V		V
Alcohol: Heavy use						
Less physical activity		E E				E
Poor physical health		E E		E E		E E
Psychological factors						
Lower mastery		E E V		E E V		E E V
Lower extraversion			E			
Higher psychoticism	E E V V		V V		V V	
Lower behavioral drive			V			
Lower behavioral fun	V		V		V	
Lower behavioral reward	V		V		V	
Higher behavioral inhibition		E E		E E V		E E
Lower verbal intelligence*		V V		V V		E V V
Poorer working memory#						
Higher ruminative style	V	E E		E E		E E
Higher neuroticism	V	E E		E E		E E
Social and interpersonal factors						
Household tasks		E V V	V		V	
Financial planning						
Providing money		V V		V V	E	V V
Recent illness/injury	E E				V	
Recent family illness/injury		E E				
Recent close family death		V		V		V
Recent other close death						
Recent relationship ended		E E V		V		V
Recent interpersonal prob.		E E		E E		E E
Recent work crisis	V		E E V		E E V	
Recent threat to job	E E				E	
Less support from friends	E E	V	E E	V V	E	V
Negative events with friends	E E		E E		E E	
Less support from family						
Negative events with family		E E		E V		
No. of childhood adversities		E E		E E		E E

Note: 'E' indicates greater exposure. 'V' indicates greater vulnerability. Black text denotes findings for depression. Grey text denotes findings for anxiety. Highlighted text (yellow) denotes the same findings for depression and anxiety.

9.2.3.1. Explanatory factors identified for both depression and anxiety

Table 9-1 summarises the socio-demographic, health and lifestyle, psychological and social factors that men and women were either more frequently exposed to or more vulnerable towards in the development of depression and anxiety. A large number of these factors are highlighted, indicating that the same effects were found for both depression and anxiety. Across all age groups women's depression and anxiety were associated with greater exposure to poor physical health, poor mastery, greater behavioural inhibition, greater rumination, greater neuroticism, having a recent interpersonal problem, and greater childhood adversity. Women of all ages were also more vulnerable to both depression and anxiety if they were married/defacto, had low verbal intelligence and were responsible primarily for money provision, than men were in these circumstances. In addition, for women in the 20s age group, both outcomes were associated with higher exposure to less physical activity, a recent family illness/injury, a recent relationship break-up and negative interactions with family members, as well as a greater vulnerability towards separation/divorce, higher numbers of children, and being primarily responsible for household tasks. For women in the 40s age group, additional findings associated with both outcomes were higher exposure to not being employed, as well as greater vulnerability towards higher levels of behavioural inhibition and lack of support from friends. For women in their 60s, the only additional effect relevant to both psychological outcomes was exposure to alcohol abstinence.

A number of specific explanatory variables were also found to be associated with higher levels of depression and anxiety for men. Across all age groups men's depression and anxiety were associated with higher exposure to negative events with friends, as well

as more vulnerability towards alcohol abstinence and higher levels of psychoticism, than women experienced. In addition, for men in the 20s age group, both outcomes were associated with higher exposure to higher levels of psychoticism, a recent personal illness/injury, a recent job threat and receiving less support from friends. Additional findings for men in the 40s age group relevant to both outcomes included exposure to a recent work crisis and receiving poor support from friends, whereas the only additional effect for men in their 60s was exposure to a recent work crisis.

9.2.3.2. Explanatory factors identified specific to depression

The non-highlighted findings in Table 9-1 show that there were a number of additional finding specific to depression alone. Across all age groups, women's depression specifically was associated with greater vulnerability towards low levels of mastery and having a recent close family death. In addition, for women in the 20s age group depression was associated with higher exposure to separation/divorce, and greater vulnerability to lack of support from friends. For women in their 40s, depression was associated with higher exposure to fewer years of education, and vulnerability towards negative events with family. For women in their 60s depression was associated with higher exposure to fewer years of education, less physical activity and lower verbal intelligence, as well as greater vulnerability to poor support from friends. Table 9-1 also shows that men's depression across all of the age groups was associated with greater vulnerability towards high levels of behavioural fun and reward. Additional findings for men in their 20s show that depression alone was associated with higher exposure to fewer years of education and cannabis use, while for men in their 40s the only effect specific to depression was exposure to lower levels of extraversion. Finally, for men in their 60s depression was specifically

associated with exposure to being the primary money provider, experiencing a recent job threat and receiving poor support from friends.

9.2.3.3. Explanatory factors identified specific to anxiety

Table 9-1 also shows those findings specific to anxiety. Across all of the age groups women's anxiety was specifically associated with greater vulnerability towards moderate alcohol use and experiencing a recent relationship end. For women in their 20s and 60s, there were no additional findings specific to anxiety. For women in their 40s, the only additional finding was that anxiety was associated with higher exposure to negative events with family. For men, in all age groups vulnerability to anxiety alone was associated with a recent work crisis. For men in their 20s anxiety was also specifically associated with not being employed, as well as higher levels of both rumination and neuroticism. Additional findings for men in their 40s show that anxiety alone was associated with greater vulnerability to low behavioural drive, and in both the 40s and 60s men were more vulnerable if they were responsible primarily for household tasks.

9.3. Previous research and theoretical implications

9.3.1. Taking a lifespan approach to gender differences in depression and anxiety

The findings from this thesis provide evidence that age is an important factor when examining the gender difference in anxiety and depression. Each of the studies showed variation in either the gender difference in depression and anxiety levels across the lifespan or the explanatory factors involved. Study 1 found that the gender difference in levels of depression and anxiety varied across three age groups, while studies 3 and 4 found that a

number of the potential risk factors women and men are exposed and/or vulnerable towards vary across age.

Previous reviews and commentaries support the importance of a developmental approach to the gender disparity in depression (Boughton & Street, 2007; Kuehner, 2003) and anxiety (Mackinaw-Koons & Vasey, 2000). However, few studies have investigated variation across age, and those which have, focus on a particular developmental transition rather than the full life course. For example, studies by Angold et al. (Angold & Worthman, 1993) (Angold et al., 1998; 1993) and Hankin (1998) have focused on the development of gender differences in depression across puberty, with the aim of describing change in the gender ratio during this specific life stage. Other studies have examined age variation for the gender gap in depression at the alternate end of the lifespan such those conducted by Barefoot, Mortensen, Helms, Avlund and Schroll (2001), Green et al. (1992) and Stallones (1990). The most comprehensive data on gender differences in depression and anxiety prevalence that includes a wide age range comes from large epidemiological studies such as the Australian NSMHWB, the ECA studies, and the NCS. While these data are an extremely useful starting point for exploring age variation in these gender disparities, they are predominantly cross-sectional. In addition, there is little comment in the literature about how the findings of these studies might be used to map potential changes in gender differences across the life course.

The current study found that the gender difference in depression and anxiety was greatest for young people, and was maintained in a narrower form during mid and later life. Epidemiological studies that have similarly shown the gap is greatest for young people include a study of the Camberwell Register (Der & Bebbington, 1987), the NIMH Study of

the Psychobiology of Depression (Leon et al., 1993), the Australian NSMHWB (ABS, 1997), and the UK National Survey of Psychiatric Morbidity in regards to depression (Bebbington et al., 1998), and NSMHWB in regards to anxiety (ABS, 1997). Despite these findings and contrary to the present study's results, there is an underlying perception in the literature that the gender difference in depression emerges during puberty, *peaks during midlife* and then narrows in old age. Much of the evidence for this theory has been pieced together from separate studies, with varying sample groups and methodologies, or is based on the early meta-analysis conducted by Jorm (1987). While there is little contention that the gender difference for depression emerges in puberty, the findings of what happens after puberty vary widely and are far from conclusive. The current findings suggest more credence should be accredited to the period of early adulthood as the life stage where gender differences in depression and anxiety are greatest.

Research examining the aetiology of gender differences in depression and anxiety has rarely investigated variation across the lifespan. The majority of studies have focused on identifying risk factors without considering possible age variation. For example Dalgard, Dowrick, Lehtinen et al. (2006), examined the effects of negative life events and social support on the gender difference in depression with a sample ranging from 18 to 64, and Nolen-Hoeksema, Larson and Grayson (1999) examined the effects of chronic strain, rumination and mastery in a sample ranging from 25-75 years old. Although these studies provide valuable information about the possible correlates of the gender difference in depression, they assume that the effects of these correlates are consistent across the age range they sample, when this may not be the case. An alternate approach has been to focus on a particular age group, such as young people or the elderly. For example a study

conducted by Bergdahl, Allard, Alex, Lundman and Gustafson (2007) examined factors associated with depression for women and men aged 85 and over only. While this provides additional information about risk factors specific to a particular age group, it is difficult to compare findings across studies due to different methodologies and sample types.

The current thesis adopted a consistent methodology in order to compare the potential risk factors for the gender difference in depression and anxiety levels across three age groups. The findings suggest there is some variation in the explanatory factors involved based on age. For women in their 20s depression and anxiety were associated with an overload of responsibilities not synonymous with this age group, such as being divorced, having multiple children and having ill family members, whereas for women aged in their 40s and 60s psychological distress was associated with traditional female disadvantages, such as being unemployed, experiencing less education, being more inhibited and experiencing negative family interactions. One of the only other studies that has explored a broad range of risk factors across wide age range was conducted by Mirowsky (1996). This study found that the gender difference in depression was greatest during mid-life, and linked this epidemiological finding to social pressures prevalent for women at this life stage, such as marital roles, lack of employment opportunities and household/child-rearing responsibilities. Conversely, the current findings suggest that the gender difference in depression peaks during young adulthood and links this age period with a greater number of negative social and relational events for women, as well as vulnerability towards stressful domestic responsibilities and relationship problems. Despite the inconsistencies between this investigation and Mirowsky's findings, both studies are unique in attempting to explore age variation in gender differences in psychological

distress, a concept that other commentaries and reviews have acknowledged is important but rarely investigated.

9.3.2. The role of mediators and moderators when investigating explanations for the gender difference in levels of depression and anxiety

A further premise advanced by this thesis is that both mediators and moderators, or gender differences in both exposure and vulnerability to potential risk factors, are important when investigating explanations for the gender difference in depression and anxiety. This argument was based on an understanding that there are two dominant pathways for how a risk factor might cause women to experience greater psychological distress than men, a) the risk factor is more prevalent in women than men or b) the risk factor has a stronger effect on women than men. In this thesis, different factors were found to either mediate or moderate the association between gender and depression, suggesting each of these pathways is different and important.

In examining the findings from Table 9-1, it is apparent that most of the psychosocial factors investigated played a distinct role either in terms of exposure or vulnerability. In general, risk factors that were more prevalent in women than men, but that women were not disproportionally susceptible towards, included poor physical health, a more ruminative coping style, greater neuroticism, more interpersonal problems and a greater number of childhood adversities. In general, risk factors that women were clearly more susceptible towards than men were, but that women were not disproportionally exposed to more often, included being married/defacto, drinking alcohol moderately, having lower verbal intelligence, being the main money provider, experiencing a recent relationship end and having low social support from friends. In testing a wide range of

psychosocial risk factors as potential mediators and moderators, this thesis provides a broader view of how risk factors might influence the gender difference in depression and anxiety, than has previously been available.

While the exposure and vulnerability hypotheses, and mediation and moderation models, underlie much of the research examining risk factors for the gender difference in depression, they have rarely been explicitly conceptualised as such, or examined in conjunction with one another. A study conducted by Nolen-Hoeksema et al. (1999) hypothesised that women were more depressed than men because they experienced greater chronic strain and rumination, and less mastery. Although this is an application of the exposure hypothesis, the authors do not explicitly use this term. Another study conducted by Mirowsky (1996) hypothesised that women were more depressed than men because of gender differences in marital status, employment, housework, childcare and economic strains, another unstated application of the exposure hypothesis. Studies applying the vulnerability hypothesis include early work by Gove (1972), who suggested that women who were married were more vulnerable to depression than men who were married, and studies by Kendler, Myers and Prescott (2005) and Olstad, Sexton and Sogaard (2001) which suggested that women with low social support and more vulnerable than men with low social support. A few more recent studies have assessed the role of potential risk factors both in terms of exposure and vulnerability, in order to gain a more holistic understanding how risk factors might work. For example, a recent study conducted by Dalgard et al. (2006) hypothesised that women's greater depression is due to a combination of exposure to negative life events and poor social support, as well as vulnerability to negative events and lack of support. A second study by Kendler, Thornton

and Prescott (2001) also examined gender differences in both the rates of exposure and sensitivity to stressful life events as an explanation for the gender difference in depression. This approach as illustrated here is likely to lead to a more sophisticated understanding of gender issues.

9.3.3. Distinguishing between gender differences in levels of depression and anxiety

Throughout this thesis the findings for depression and anxiety have largely mirrored one another. The research investigating overlap in depression and anxiety suggests there are three main possibilities for this: a) the Goldberg Anxiety and Depression Scales both tap a broader component of negative psychological affect (or a distress factor) b) there is a causal relationship between the gender gap in depression and anxiety, which results in high comorbidity, and/or c) both outcomes have similar risk factors. It is likely that all three of these explanations contribute towards the similar findings for depression and anxiety.

Prior investigations of the Goldberg Scales suggest they do reliably tap distinct depression and anxiety factors. Studies conducted in this thesis (Chapter 5) and Christensen et al. (1999) have confirmed that a two factor model with separate dimensions for depression and anxiety fits the scale items well. Original tests for the scales carried out by Goldberg et al. (1988) also found they have a high sensitivity towards detecting Major Depressive Episodes and Generalised Anxiety Disorder. These studies suggest that the Goldberg Scales do reliably assess separate components of depression and anxiety. Occasional variations in the findings from this thesis for each outcome also suggest differentiation between the depression and anxiety scales. For example, in Chapter 7 it was shown that the potential mediators identified explained the gender difference in depression

but not anxiety, for young adults. Despite evidence that the Goldberg Scales measure separate outcomes, there is clearly some overlap in depression and anxiety as evidenced by their high correlation and comorbidity. A number of continuous scales measuring depression and anxiety have been shown to tap a general measure of negative mood (Feldman, 1993). Therefore, it is likely that the similar findings for both outcomes are at least in part due to a general component of negative affect in the scales (Fergusson, Horwood & Boden, 2006; Clark & Watson, 1991).

Assuming that the Goldberg Scales assess separate factors, a second possibility for the overlap in results is that the gender difference in both outcomes is highly comorbid. There is some evidence to suggest that the gender difference in anxiety precedes the gender difference in depression, resulting in high levels of comorbidity (Moffitt et al., 2007). In support of this causal relationship, a longitudinal study conducted by Wetherell, Gatx and Pedersen (2001) found that anxiety symptoms led to depressive symptoms over a six year period, and that this relationship was not reciprocal. In a review of the comorbidity between anxiety and depressive disorders Mineka (1998) also comments that anxiety disorders are commonly followed by depressive disorders resulting in high comorbidity, as shown in large epidemiogical studies such as the International World Health Organisation CIDI field trials (Lepine, Wittchen, & Essau, 1993) and the NCS (Kessler et al., 1997). Despite evidence that anxiety precedes depression leading to high levels of comorbidity, research by Simonds and Whiffen (2003) and Parker and Hadzi-Pavlovic (Parker & Hadzi-Pavlovic, 2004) has demonstrated that the gender difference in depression and anxiety remains after accounting for comorbidity. A study by Breslau et al. (1995) found that controlling for a prior anxiety disorder reduced the gender gap in depression by 50%,

suggesting that prior or comorbid anxiety is only partially responsible for the similarities between the gender difference in depression and anxiety.

A final explanation for the similar results found for depression and anxiety, again assuming the Goldberg Scales at least partially assess separate factors, is that gender differences in both outcomes have similar risk factors. This is potentially the case, as many of the risk factors assessed in this thesis have been shown to correlate with both outcomes, including low levels of education and unemployment (Ansseau et al., 2008), poor physical health (Scott et al., 2007) greater rumination (Nolen-Hoeksema, 2000), higher neuroticism and extraversion (Jorm et al., 2000), memory problems (Jorm et al., 2004), stressful life events (de Beurs et al., 2001) and childhood adversity (Levitan, Rector, Sheldon, & Goering, 2003). The similarities in risk factors for each outcome, is likely to translate into similarities in the risk factors for gender differences in each outcome, as has been the case in the current thesis.

9.4. Practical/clinical implications

The burden depressive and anxiety disorders place on public health provides a clear incentive for designing effective prevention and treatment strategies. A number of recent papers in the *Lancet* journal have outlined the enormous weight neuropsychiatric problems place on health care systems and individual's quality of life (Chisholm et al., 2007; Patel, Flisher, Hetrick, & McGorry, 2007; Prince et al., 2007). More specifically, a report examining the burden of disease and injury in Australia found depression carried the fourth highest disease burden of any one illness in Australia (4%) when both fatal and non-fatal health outcomes were considered, and was the leading cause of years of life lost due to disability (Mathers et al., 1999). The broad impact of anxiety disorders has also been

documented by epidemiological studies in Australia and the US, where they have been recorded as the most common of the mental illness categories (Andrews et al., 2001; Kessler, McGonagle, Zhao et al., 1994). As women experience depression and anxiety twice as often as men, much of the burden associated with these illnesses clearly falls to women. A study examining priorities for women's health using data from the 2005 Global Burden of Disease study confirms the impact of depression upon women globally (Ribeiro, Jacobsen, Mathers, & Garcia-Moreno, 2008). Unipolar depressive disorders were found to be the second leading cause of non-fatal disease burden for women aged 15-44, behind HIV/AIDS, and the fifth leading cause for women aged over 45. Panic disorder was also found to be the 10th leading cause of non-fatal disease burden for women aged 15-44. In response to these findings, the authors of this report call for screening programs which routinely inquire about risk factors associated with women's psychiatric illness, with the aim of filtering at risk individuals into appropriate prevention or early intervention programs.

The analyses in the present thesis identify potential risk factors that might prove useful in early intervention or prevention, and point to the importance of age appropriate programs. Risk factor research is vital for developing effective gender and age appropriate prevention and treatment strategies for depression and anxiety (Ribeiro et al., 2008). Zandi and Rebok (2007) state there are four necessary steps in developing a public health prevention plan for illness: "1) defining the problem, 2) identifying risk and protective factors, 3) developing, implementing and testing interventions and 4) ensuring wide spread adoption of evidence-based practice" (pg. 594). In this thesis the public health problem of interest could be defined as 'the existence of a gender difference in depression and anxiety

prevalence'. In response, this thesis informs steps 1 and 2 of a prevention plan by: 1) confirming that the gender gaps in depression and anxiety reflect 'true' differences that vary across the lifespan and, 2) identifying risk and protective factors that explain why the gender difference in both outcomes occurs, for a variety of age groups.

Information about the role potential risk factors play, either through exposure or vulnerability, is also an important element of structuring gender appropriate intervention strategies. Risk factors that women are more exposed to highlight broad areas of inequality between the genders that social or public health policy should address. For example, findings from this thesis show that women experience more childhood adversities than do men, leading to higher rates of depression and anxiety. This result indicates a specific area of gender inequality that subsequently impacts negatively on women's mental health. In this case broad social policy should be aimed at reducing childhood adversity for women. Risk factors that women are more vulnerable towards are not markers of gender inequality, but are instead indicators of pre-existing conditions or vulnerabilities specific to women. For example, the results of this thesis show that women are more vulnerable to depression and anxiety if they have poor social support than men in this circumstance. In response, prevention plans should focus on increasing women's awareness and resources surrounding social support. In both the examples provided although the prevention response is similar (to introduce gender specific prevention strategies), knowing the source of the problem (gender inequality vs. pre-existing vulnerabilities) adds important additional information.

9.5. Limitations and Strengths

9.5.1. Limitations

There are a number of limitations that restrict the extent to which the current findings provide accurate, generalisable information about gender differences in depression and anxiety.

9.5.1.1. Selection of survey participants

Caution should be taken when generalising the findings of the current study to the Australian population. The response rates for Wave 1 of the PATH survey were 58.6% for the youngest age group, 64.6% for the middle age group and 58.3% for the oldest age group. These figures demonstrate that a substantial number of people declined to participate in the survey. Although it is not possible to ascertain differences in mental health between those who participated in the study and those who declined involvement, some research has suggested that people who choose not to participate in surveys or are uncontactable do not have poorer mental health than those who do participate (i.e. Hebert, Bravo, Korner-Bitensky, & Voyer, 1996). In addition, the PATH participants were from Canberra and Queanbeyan only. Consequently, they may not be representative of the general Australian population. For example, Canberra residents have been shown to have higher average weekly incomes and labour force participation rates, than the national average (ABS, 2008a, 2008b).

Attrition between the two waves of the survey was minimal. For the 20s and 40s age groups, there were no differences in mental health between those who participated in the first wave of the survey only and those who participated in both waves. However, in

the 60s age group, those just in the first wave had higher levels of depression and anxiety than those who completed both waves. Consequently, wave two mean levels of depression and anxiety in this age group may be underestimated. It is important to note however, that differences in mental health across attrition were shown for both women and men in the 60s group, suggesting that estimates of gender differences in depression and anxiety for this age group are still valid (i.e. the impacts of attrition are equivalent for both genders).

9.5.1.2. Outcome and risk factor measurement

With the exception of the cognitive tests (Spot-the-Word test and Digit Symbol Backwards), all the measures used in the current thesis were self-report. Research has shown that participants reveal more personal information when self-report methods of data collection are used than other face-to-face interview techniques (Aquilino, 1992; Jorm et al., 1989; Perlis et al., 2004), however, there is no way of ensuring the accuracy of responses provided by PATH participants.

It is also important to note potential variation in findings between self-report and interview methods in the measurement of depression and anxiety. While the current study has used the self-report Goldberg Anxiety and Depression Scales to assess levels of depression and anxiety, the findings might vary if diagnostic interview techniques such as the Composite International Diagnostic Interview (CIDI) (WHO, 1990) or the Structured Clinical Interview for the DSM-III-R (SCID) (Spitzer, Williams, Gibbon, & First, 1992) were used. Indeed, the dimensional approach taken in the current thesis may account for some of the differences between current findings and those in previous studies, where those studies have adopted categorical or diagnostic measures of depression and anxiety. However, differences in the current findings and those of Mirowsky (1996) (one of the

only other studies that has explored a broad range of risk factors across wide age range) cannot be attributed to variation in categorical versus dimensional measurement of anxiety and depression, as both studies adopted a dimensional approach. The current study used the Goldberg Scales, whereas Mirowsky used the CES-D. Other studies in this field that have similarly adopted a dimensional approach include Dalgard, Dowrick, Lehtinen et al. (2006), Nolen-Hoeksema and Larson (1999), and Bergdahl, Allard, Alex, Lundman and Gustafson (2007). While some researchers may argue that the current findings are limited in their clinical relevance because of the dimensional approach adopted, others emphasise the strong link between subclinical and dimensional measures and the classification of clinical pathology (i.e. Angst & Merikangas, 2001).

Another limitation of the study design was a lack of measures assessing biological and genetic factors. Although a large array of potential mediators and moderators were examined, a number of potential metabolic and genetic factors were not available for study. These factors differ substantially between men and women and have the potential to play an important part of explaining gender differences in depression and anxiety.

9.5.1.3. Data and analysis interpretation issues

The uncertainties arising from using cross-sectional data to investigate both causal relationships have been noted throughout this thesis. While the current findings point the reader towards potential mediators and moderators of the association between gender and depression/anxiety, it was not possible to evaluate the causal direction of these links. Nevertheless, these analyses are informative in that they rule out variables that are not potential causal agents. Regardless of causal ambiguity regarding potential mediators and moderators in the models presented, non-significant findings can be eliminated from

further consideration. Moreover, external information about plausible causal relationships may be used in interpretation when significant effects are found. A second uncertainty arising from cross-sectional data is the inability to distinguish between age and cohort effects. Again, this limitation has been noted throughout this thesis. While the current findings point towards age differences in the gender difference for depression and anxiety, and the explanatory risk factors involved, further waves of longitudinal data would be necessary to establish that cohort effects are not involved.

A major aim of this thesis was explore a wide range of variables in their roles as potential risk factors. Therefore this thesis sought to minimise Type II errors (false negative findings), and ensure none of the variables that might potentially mediate or moderate the association between gender and depression/anxiety were erroneously discarded. As such, no adjustments were made to the significance levels for multiple testing both of variables and groups. This decision reflects the purpose of the thesis to identify potential risk factors worthy of further research, as well as a desire to apply comparable standards of evidence to previous research, which has for the most part focused on variables either individually or in small groups. It is acknowledged that if significance levels were adjusted for multiple testing, the number of significant results may decline. However, this would at least in part be due to a reduction in statistical power.

9.5.2. Strengths

Not withstanding the limitations outlined above there are several important strengths to the current investigation. The present study used a large sample, obtained using randomisation procedures, which included three age cohorts and two time periods. The three narrow aged cohorts in the PATH study provided the opportunity to take a

lifespan approach. The current study also examined a wide range of factors as potential mediators and/or moderators of the gender difference in depression and anxiety, and in the case of the mediation analyses, examined these factors within multivariate models. There have been no previously published studies which have examined gender differences in both depression and anxiety that include the broad range of relevant psychosocial factors found in the present study. Unique to the moderation models examined, is the longitudinal exploration of concurring change in potential risk factors and change in depression and anxiety. In addition, the current investigation is one of the first studies to examine gender differences in anxiety on a comprehensive scale.

A final strength of this study is that potential risk factors for depression and anxiety are investigated for both genders. While the research framework adopted in this thesis focused on the preponderance of psychological symptoms in women, men's symptoms are the reference point for these comparisons. Therefore the methods of analysis undertaken provide information not only about women's psychological distress, but also men's. In each of the sub-investigations undertaken, describing symptom levels, checking for gender-biased assessment items, and identifying potential mediators and moderators, parallel results are presented for both women and men. In a review of the literature surrounding men's depression Addis (2008) stresses that removing men from an analysis of gender and depression prohibits a holistic understanding of how gender operates, and can lead to false assumptions that depression is not a problem for men. Regardless of the pattern of gender differences in depression and anxiety over the lifespan, it is important to remember that psychological symptoms can emerge at all stages of life, for men and women.

9.6. Directions for future research

The findings from the current thesis generate several broad areas for future research. Specific directions for future research emerging from particular study chapters have been discussed with the relevant chapter.

The literature reviewed indicates the need for an updated meta-analysis describing variation in the gender ratios for depression and anxiety across the lifespan. This research could be modelled on the earlier meta-analysis conducted by Jorm in 1989, which examined effect sizes for the gender difference in both depression prevalence and mean scores, from childhood through to old age. Since Jorm's meta-analysis was conducted, many large national and international epidemiological studies have recorded information about the prevalence of depression for both genders across various age groups. As the findings from these epidemiological studies vary greatly in some instances, an updated meta-analysis (or some type of data-bank which pools together epidemiological data from a number of sources) would provide a clearer picture of the pattern of gender differences across the lifespan. As argued from the outset in this thesis, accurate epidemiological data concerning change in the gender ratio across the lifespan is a necessary evidence base by which explanations for why gender differences occur can be evaluated.

While the current findings have classified a broad range of risk factors as potential mediators and moderators, further longitudinal studies are required to confirm the causal relationships involved. Future research should expand upon the current findings, with the aim of identifying changes in risk factors that *precede* changes in the gender difference in depression and anxiety. The difficulties facing such research include sourcing or collecting population-based data that is both longitudinal and contains the wide range of risk factors

under investigation. There are also challenges involved in generating meaningful and parsimonious findings, when complex multivariate longitudinal analyses are conducted. Once the identification of causal risk factors has been confirmed, further work aimed at quantifying the amount of risk that can be attributed to specific risk factors for women and men would be of great benefit. Such information is currently a powerful tool used in prevention strategies and awareness campaigns surrounding illness such as smoking, obesity and heart disease.

A final broad direction for future research is to continue expansion in the literature surrounding the gender difference in anxiety. The current thesis adopted the research evidence available for the gender difference in depression as a starting point for exploring anxiety, however, there may be other unmeasured risk factors unique to the gender gap in anxiety that remain unexplored. This is likely, given that the mediators tested in this thesis were unable to account for the preponderance of anxiety in young women. This finding indicates gender differences in the prevalence of additional unmeasured risk factors. Possible candidates for investigation include body image concerns (Andrist, 2003), and pressures surrounding tertiary study, leaving home and financial arrangements (de Goede et al., 1999).

9.7. Final conclusions

This thesis has described and investigated explanations for the gender difference in levels of depression and anxiety across the lifespan. The research undertaken has identified that a lifespan perspective and both the exposure and vulnerability frameworks are important components of understanding the gender difference in levels of depression and anxiety. Because this thesis has drawn together a vast body of research to paint a clearer

picture of the epidemiology and aetiology of gender differences in depression and anxiety symptomology across the lifespan, the approach has been broad. The next stage of important research for this area involves fine grained analyses of each of the identified potential risk factors, using both longitudinal research data combined with an experimental approach, with the aim of identifying causal directions and quantifying the amount of risk attributed to each risk factor for men and women, at varying stages of the adult lifespan.

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APPENDICES

Appendix 1. Publication in the *Journal of Nervous and Mental Disease* from this thesis.

ORIGINAL ARTICLE

Gender Differences in the Endorsement of Symptoms for Depression and Anxiety

Are Gender-Biased Items Responsible?

Liana S. Leach, BAppPsych (Hons), Helen Christensen, PhD, and Andrew J. Mackinnon, PhD

Abstract: Gender-biased items are one explanation for the gender difference in reports of depression and anxiety symptoms. This hypothesis was explored using responses from the Goldberg Anxiety and Depression scales. Responses were drawn from 2 waves of a community-based survey with participants in 3 age cohorts: 20 to 25, 40 to 44, and 60 to 64 at wave 1. The results showed that a 2-factor model fitted the scales well. Multiple group analyses showed that that for all 3 age groups and both time points the fit indices changed minimally between a model that constrained parameters to be equal across gender and a model that permitted variation. These findings indicate that gender differences in the endorsement of items from the Goldberg scales are not because of gender-biased items. This study points to alternate biopsychosocial explanations and highlights the importance of choosing appropriate methods of analysis when assessing item bias.

Key Words: Depression, anxiety, gender differences, item bias, measurement.

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It is widely acknowledged that women report a greater number of depressive symptoms than men. This finding is stable across multiple studies, involving both clinical samples and those representative of the general population (Kuehner, 2003; Nolen-Hoeksema, 1987; Weissman and Klerman, 1977; Wolk and Weissman, 1995). A variety of biological, social, and psychological mechanisms have been proposed for this disparity, each with varying degrees of support in the literature. Despite these theories and data available, clear answers to the key question "What causes the gender difference in the prevalence of depressive symptoms?" have not been given (Bebbington, 1996; Kessler, 2003; Kuehner 2003).

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One possible explanation is that the gender difference in symptom endorsement is not "real" but is the result of one or more artifacts. Proposed "artifactual hypotheses" include greater help seeking, illness disclosure, and symptom recall among women, the possibility that depression is masked by substance use in men, and that clinicians overdiagnose women. These explanations have received insufficient support in recent reviews (Bebbington, 1996; Kessler et al., 1993; Maier et al., 1999; Piccinelli and Wilkinson, 2000; Wolk and Weissman, 1995). However, measurement or item bias in the diagnostic tools and scales used to assess depression is one artifactual hypothesis that requires further investigation (Salokangas et al., 2002; Stommel et al., 1993). Gender bias in measurement has been investigated for a number of psychological problems where differential sex prevalence rates have been obtained, including both personality and affective disorders (Anderson, et al., 2001; Angst and Dobler-Mikola, 1984; Cole et al., 2000). However, the majority of available research has focused upon depression. Specifically, it has been proposed that some of the items commonly used to assess depression are gender biased. That is, for a given level of depression, women are more likely to report the item than men, artificially inflating women's depression levels (Salokangas et al., 2002).

Measurement bias has been acknowledged as a serious problem in the development and implementation of psychometric tests. Measurement bias is also known as differential item functioning. Both terms refer to systematic group differences in scale or item scores where the groups are often defined by a demographic variable, such as gender (Camilli and Shepard, 1994; Millsap, 2006). These systematic group differences become a problem or bias when they remain after individuals have been "matched" on the construct being assessed by the scale or item (Millsap, 2006). For example, gender bias in a depression measure is said to occur when men and women score differently after controlling for overall levels of depression. It is important to make the distinction between items or scales that exhibit a gender difference and those that show a gender bias. Gender differences in scale or item scores in the absence of any matching are not necessarily an indication of gender bias (Millsap, 2006). The term, "gender-bias items" is subsequently used throughout to refer to systematic gender differences in items measuring depression, given matching for overall depression across gender.

Previous investigations of gender-biased items in depression assessments can be categorized in terms of the methods used to match or control for depression. The first method involves using clinically diagnosed samples and who thus may be considered to be comparably depressed. In this case, diagnosis is considered as a control measure. Examples of this approach include a study conducted by Carter et al., (2000) which found that depressed women reported weight gain, appetite increase, and emotionality significantly more often than depressed men when assessed using the Hamilton Rating Scale. Similarly, Wenzel et al. (2005) found that depressed women endorsed items about appetite changes and fatigue from the Beck Depression Inventory (BDI) more often. A second and more direct group of methods used to identify gender-biased items is known as observed score methods. Millsap (2006) characterizes these methods as "choosing the sum of the item scores for the scale under study as the measure used for matching" (p. 171). Examples include the Mantel-Haenszel procedure, standardization methods, and logistic regression. An extension of the Mantel-Haenszel method was used by Cole et al. (2000). This study found that the proportional odds of women endorsing the item "crying spells" on the Centre for Epidemiologic Studies Depression Scale (CES-D) was 2.14 times that of men after matching for overall CES-D level. Salokangas et al. (2002) investigated item bias in the BDI and the Depression Scale (DEPS) using a standardization process. They found that "crying" and "loss of interest in sex" from the BDI were the most likely to contain gender bias. Although observed-score methods are easy to implement, require fewer numbers than more complex analyses, and are sensitive to certain forms of bias, they are not appropriate for assessing short scales as the tool used to match individuals, and their total scale score is more likely itself to contain bias (Millsap, 2006).

Latent variable models, such as those used in item response theory and factor analytic methods, are the third way that gender-biased items in depression measures have been assessed. These methods investigate whether the same latent variable model for depression holds for both genders. If this is the case, the items within the model can be considered unbiased (Millsap, 2006). A factor analytic method was used by Zuroff et al. (1990) to examine properties of the Depressive Experiences Questionnaire (DEQ). This study found that factor loadings derived from the DEQ were very similar across gender, indicating no gender bias. An alternate study conducted by Stommel et al. (1993) investigated the degree to which the CES-D was factorially invariant across gender by comparing a series of models that required parameters for men and women to be either equal or permitted them to vary. The results showed that more women endorsed "crying spells" and that more men endorsed "talked less" given equal levels of depression across gender. A further study conducted by Christensen et al. (1999) examined items in the Goldberg Anxiety and Depression Scales for age bias using MIMIC models. As an adjunct to investigating age bias, the study also examined gender bias. The authors found that for the same level of depression, men were more likely to report "lost interest," "difficulty concentrating," and "waking early" than women. Although latent variable models require greater samples, certain latent variable assumptions to be met, and can be complex, they provide richer information about possible forms of bias than observed score methods (Millsap, 2006).

Further investigations of gender-bias items in depression assessments could add knowledge in 3 key areas. First, studies in this area have not always adopted appropriate methods of analysis. This is particularly the case regarding the factorization of binary data where traditional methods based on Pearson correlation coefficient are problematic. Secondly, previous studies have tended to investigate gender differences in restricted age groups. As the gender difference in levels of depression is not consistent over the lifespan, it would be informative to examine whether findings are consistent across age (Jorm, 1987). Finally, given the high correlation between anxiety and depression, the possible causal links between the two, and the gender difference that exists for both constructs (Pigott, 1999), it is surprising that few studies have assessed anxiety and depression simultaneously. There also seems to be a paucity of research investigating item bias for anxiety measurements; as hypothesized for depression, it might also be that items used to measure anxiety are gender biased, resulting in higher scores for women than men on anxiety assessments. For these reasons, it would be useful to investigate items measuring both constructs concurrently. In the current study we address each of these limitations with the aim of extending and clarifying what we know about gender-biased items in the assessment of depression and anxiety.

The aim of the present study was to investigate item bias as a hypothesis for gender differences in the endorsement of items from the Goldberg Anxiety and Depression Scales (Goldberg et al., 1988). A latent variable method appropriate for factoring binary data was adopted for the analyses. We examined the factor structure of the scales in addition to item bias. The analyses were conducted across 3 age groups and for 2 separate occasions separated by a 4-year period.

METHODS

Sample

The sample was from the first and second waves of the PATH through life project, a community survey recording the health and well-being of residents from Canberra and Queanbeyan, NSW. The PATH project follows 3 cohorts of participants, 20 to 24, 40 to 44, and 60 to 64, interviewing them once every 4 years over a 20-year period. The project is conducted by the Centre for Mental Health Research at The Australian National University. Participants in the initial wave were randomly selected from the Canberra and Queanbeyan electoral rolls. It is required for all Australians aged 18 and above to register on the electoral roll. Initial participation rates for each cohort were 58.6%, 64.6%, and 58.3% respectively. In the first wave, 2404 people aged between 20 and 25 were interviewed, as were 2530 people aged 40 to 44, and 2551 people aged 60 to 64. In the second wave, the total number of people retained was 2140 (89%) in the 20s age group, 2354 (93%) in the 40s, and 2222 (87%) in the 60s.

Survey Procedure

Persons randomly selected from the electoral roll were sent a letter with information about the survey and explaining

that an interviewer would contact them. A convenient time and place for the interview was arranged for those who agreed to participate. The interview took 1.5 to 2 hours and was usually conducted at either the person's home or at the Centre for Mental Health Research. The interviewer took the participant through the first set of questions, demonstrating how to enter responses into a Hewlett-Packard 620LX palmtop personal computer using Surveycraft software. The remaining questions were completed by the respondent alone, except for some of the physical and cognitive tests that were administered by the interviewer. Participants from the first wave were contacted by telephone approximately 4 years later and asked whether they would like to continue participation in the second wave of the study. Those who agreed were interviewed after a similar process as originally carried out in wave 1. In wave 2, responses were recorded using a laptop computer (Toshiba Portege 3500 tablet PC) with Surveycraft software.

Questionnaire

In both waves of the survey, participants were asked a series of questions covering sociodemographic characteristics, personality, anxiety and depression symptoms, substance abuse, cognitive function, physical health, health habits, use of health services, childhood experiences, and coping styles. Basic physical tests were also carried out. Participants were asked to supply a check swab for genetic studies. Wave 2 included a series of additional questions about personal relationships, brain injury, drug use, gambling, financial status, cognition, physical health, and posttraumatic stress disorder. The components of the questionnaire relevant to the present article are the Goldberg Anxiety and Depression Scales (Goldberg et al., 1988).

The Goldberg scales contain 2 sets of 9 items, one measuring depression and the other anxiety. Respondents are asked to respond to questions concerning "how you have been feeling in the past month." Total scale scores for anxiety and depression are calculated by summing the number of items endorsed, providing scores of 0 to 9. The scales have been validated for detecting elevated levels of depression and anxiety in epidemiological studies (Mackinnon et al., 1994).

Statistical Analyses

In the analysis of wave 1 data, 42 cases were removed due to missing data on all of the Goldberg items. Fourteen cases with partial missing data remained in the analyses, and were included in model estimations by adopting the EM algorithm in maximum likelihood estimation (Muthén and Muthén, 2006). Final samples were 2387 in the 20 to 24 age group (48.4% men), 2515 in the 40 to 44 age group (47.1% men), and 2541 in the 60 to 64 age group (51.8% men). For wave 2, 41 cases were removed due to missing data. Sixty-five cases with partial missing data remained in the analyses. Final samples were 2131 in the 20 to 24 age group (47.4% men), 2345 in the 40 to 44 age group (46.8% men), and 2199 in the 60 to 64 age group (51.7% men).

Confirmatory factor analysis (CFA) was first undertaken for each age group to verify the underlying factor structure of the Goldberg scales. For dichotomous variables, CFA models include the factor loading which indexes the strength of association between the item and the underlying dimension and the item threshold which is related to where on this dimension the item lies (see Millsap, 2006; Muthén and Muthén, 2006). Multiple group models were then fitted to test the comparability of the factor structure across gender. This set of multiple group analyses (MGA) compared a constrained model in which all loadings and thresholds were constrained to be equal for both genders against an unconstrained model where loadings and thresholds were free to vary across gender (Muthén and Muthén, 2006). In the case where an unconstrained model fits substantially better than a constrained model, it can be concluded that there are considerable differences between the genders on item parameters and that each gender responds to the items in different ways. Subsequent analyses may be undertaken to locate those items that are the source of noninvariance. The Mplus DIFFTEST procedure was used to examine the statistical significance of the change in fit between constrained and unconstrained models (Muthén and Muthén, 2006). This procedure was used because the WLSMV estimator in Mplus does not allow χ^2 values of nested models to be compared directly. In both the CFAs and MGAs, model fit was evaluated using the χ^2 statistic, the Root Mean Square Error of Approximation (RMSEA), the Comparative Fit Index (CFI) and the Tucker Lewis Index (TLI) (Muthén and Muthén, 2006). All analyses were conducted separately for each age group, rather than an all-inclusive gender by age model. This decision was made in the interest of parsimony and in accordance with the aims of the analyses—to investigate gender-biased items in 3 age groups. The full set of analyses was repeated using wave 2 data to investigate the repeatability of the results.

All statistical analyses were undertaken using Mplus version 4.10 (Muthén and Muthén, 2006). This program factor analyses binary data through the calculation of tetrachoric correlation coefficients and then applies appropriate estimation procedures (Bartholomew and Knott, 1999). Previously, binary data has frequently been analyzed by calculating Pearson correlation coefficients and applying conventional factor analysis. This technique is inappropriate for categorical data and can result in low loadings and artifactual factors (Geer et al., 2003). Recognizing and appropriately analyzing items as binary also provides information about the thresholds of each item, and invariance in thresholds across groups.

RESULTS

Item responses for both Goldberg scales are shown by gender and age group in Table 1. For every item where there was a significant gender difference in endorsement, women reported experiencing the symptom more frequently. Means for the scales are also shown. Higher levels of depression and anxiety were associated with being a women for all 3 age groups, and overall this gender difference seemed to decrease across age. Cronbach alphas for the anxiety scale were 0.80, 0.81, and 0.78 for each of the age groups respectively, and were 0.76, 0.80, and 0.74 for the depression scale.

TABLE 1. Percentage of Items Endorsed by Males and Females in Each Age Group

	20s		40s		60s	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
Anxiety[a]						
1. Have you felt keyed up or on edge?	37.3	47.8**	45.5	50.0*	23.2	31.6**
2. Have you been worrying a lot?	43.9	61.9**	38.2	43.0*	20.0	27.3**
3. Have you been irritable?	42.3	61.3**	40.5	51.7**	23.9	23.3
4. Have you had difficulty relaxing?	35.4	52.6**	38.8	42.8*	19.7	24.7*
5. Have you been sleeping poorly?	35.3	45.2**	39.5	41.1	26.7	31.3*
6. Have you had head/neckaches?	40.0	63.7**	43.1	57.3**	28.3	41.1**
7. Have you had any of the following: trembling, tingling, dizzy spells, sweating, diarrhea or needing to pass water more than usual?	24.7	38.0**	21.7	24.9	18.5	22.2*
8. Have you felt worried about health?	32.7	34.7	32.7	31.3	23.9	22.5
9. Have you had difficulty falling asleep?	28.1	38.6**	28.6	28.9	15.6	26.3**
Depression[a]						
1. Have you been lacking in energy?	39.1	50.3**	37.8	46.1**	25.6	32.8**
2. Have you lost interest in things?	27.7	28.5	23.9	22.1	11.3	9.2
3. Have you lost confidence in yourself?	17.8	28.1**	15.3	21.7**	7.6	10.1*
4. Have you felt hopeless?	18.0	27.0**	12.2	18.0**	5.7	8.0*
5. Have you had difficulty concentrating?	37.7	48.1**	33.1	33.8	17.2	17.8
6. Have you lost weight (due to appetite)?	11.4	12.1	3.4	4.8	1.7	2.3
7. Have you been waking early?	41.9	43.6	45.4	42.4	48.9	47.2
8. Have you felt slowed up?	30.2	41.7**	33.4	39.7*	26.8	31.4*
9. Have you tended to feel worse in the morning?	32.5	38.6*	22.7	27.1*	13.1	18.9**
	M (*SD*)	**M (*SD*)**	**M (*SD*)**	**M (*SD*)**	**M (*SD*)**	**M (*SD*)**
Total anxiety scale[b]	3.2 (2.6)	4.4 (2.7)**	3.3 (2.7)	3.7 (2.7)**	2.0 (2.2)	2.5 (2.4)**
Total depression scale[b]	2.6 (2.3)	3.2 (2.4)**	2.3 (2.3)	2.6 (2.4)*	1.6 (1.8)	1.8 (1.9)*

[a]Chi square tests were used to calculate significant differences in percentages.
[b]*T*-tests were used to calculate significant differences in means.
*$p < 0.05$; **$p < 0.001$.

Confirmatory Factor Analysis

A two-factor model was fitted for each age sample. The model consisted of 2 latent variables anxiety and depression, permitted to correlate. Nine items purportedly assessing anxiety loaded onto the anxiety variable, and the 9 depression items loaded onto the depression variable. The model was a fairly good fit for the 20s sample with a chi square value of 1404.20 ($df = 100$) $p < 0.001$, a CFI of 0.90, a TLI of 0.96, and a RMSEA value of 0.07. Similar results were found for the 40s sample with a chi square value of 1377.92 ($df = 96$) $p < 0.001$, a CFI of 0.92, a TLI of 0.97, and a RMSEA of 0.07, and again for the 60s sample ($\chi^2 = 1291.97$, $df = 88$, $p < 0.001$, CFI = 0.90, TLI = 0.95, RMSEA = 0.07). In each sample the modification indices showed that the model fit would benefit substantially from correlating anxiety items 5 (poor sleep) and 9 (difficult falling asleep). The correlation matrices showed that item 7 on the depression scale (waking early) correlated poorly with the other depression items. The low correlations justified removing this item in accordance with previous analyses of the Goldberg scales (cf. Jorm et al., 2005). The above adjustments were made (taking into account theoretical implications) and the model fit for all 3 age samples improved considerably. Details for the final model are shown in Table 2. All the items were significantly associated with the relevant latent factor, and the correlation between anxiety and depression was significant for the 3 samples.

Multiple Group Analysis

MGAs were conducted to assess the comparability of the factor structure across gender for each age sample. The DIFFTEST results in Table 3 indicate that for the each of the 3 age groups, there was a significant difference in fit between the constrained and unconstrained models. However, as the other fit indices (CFI, TLI, and RMSEA) in Table 3 indicated that both models fitted equally well, it was concluded that the significant DIFFTEST was a reflection of the large sample size used (Bentler and Bonett, 1980). As can be seen in Figure 1, when left unconstrained the factor loadings for both men and women were similar, also suggesting that there was little difference between the unconstrained and constrained models.

Threshold information for the unconstrained models was also available. In the great majority of cases, thresholds for men were lower than were those for women. This was thought to be a function of constraining the factor means, as is necessary for model identification in Mplus. To test this hypothesis an alternate parameterization method was applied

TABLE 2. CFA Fit Statistics and Factor Loadings for Each Age Group

	20s (n = 2387)	40s (n = 2515)	60s (n = 2541)
Model fit indices			
χ^2, df, p value	781.954, 89, <0.001	776.991, 86, <0.001	600.375, 80, <0.001
CFI	0.948	0.958	0.955
TLI	0.977	0.982	0.978
RMSEA	0.057	0.057	0.051
Factor loadings of the latent anxiety variable onto items[a]			
Keyed up	0.66	0.73	0.76
Worrying	0.85	0.84	0.82
Irritable	0.78	0.75	0.75
Difficulty relaxing	0.84	0.85	0.84
Sleeping poorly	0.64	0.72	0.62
Head/neckaches	0.54	0.52	0.52
Trembling, etc.	0.59	0.62	0.59
Health worries	0.62	0.67	0.68
Difficulty falling asleep?	0.61	0.63	0.56
Factor loadings of the latent depression variable onto items[a]			
Lacking energy	0.78	0.85	0.87
Lost interest	0.77	0.87	0.83
Lost confidence	0.79	0.86	0.85
Felt hopeless	0.81	0.84	0.85
Difficulty concentrating	0.77	0.81	0.79
Lost weight	0.50	0.59	0.52
Felt slowed up	0.83	0.88	0.86
Feel worse in the morning	0.58	0.67	0.68
Anxiety and depression (r)	0.88	0.87	0.84

[a]Standardized.

TABLE 3. MGA Fit Statistics for Each Age Group With Parameters for Gender Unconstrained and Constrained

	20s		40s		60s	
	Unconstrained	Constrained	Unconstrained	Constrained	Unconstrained	Constrained
Wave 1 Model fit indices[a]						
χ^2, df, p value	830.276, 167, <0.001	846.535, 168, <0.001	791.125, 159, <0.001	787.551, 158, <0.001	618.038, 143, <0.001	609.003, 139, <0.001
CFI	0.946	0.945	0.961	0.961	0.957	0.958
TLI	0.975	0.974	0.983	0.983	0.978	0.977
RMSEA	0.058	0.058	0.056	0.056	0.051	0.052
χ^2 DIFFTEST		56.724, 10, <0.001		45.599, 9, <0.001		48.181, 10, <0.001
Wave 2 Model fit indices[b]						
χ^2, df, p value	696.937, 158, <0.001	768.570, 157 <0.001	786.465, 148, <0.001	715.459, 140, <0.001	574.947, 139, <0.001	560.375, 135, <0.001
CFI	0.957	0.952	0.957	0.961	0.957	0.958
TLI	0.981	0.978	0.981	0.982	0.975	0.975
RMSEA	0.057	0.060	0.061	0.059	0.053	0.054
χ^2 DIFFTEST		85.446, 9, <0.001		27.998, 8, 0.001		42.551, 10, <0.001

[a]For the 20s age group, n = 2387; for the 40s age group, n = 2515; and for the 60s age group, n = 2541.
[b]For the 20s age group, n = 2131; for the 40s age group, n = 2345; and for the 60s age group, n = 2199.

(Millsap and Yun-Tein, 2004). In this case thresholds remained fixed across both groups, and factor loadings and means were permitted to vary (Muthén and Muthén, 2006). The results confirmed that the lower thresholds for men could be accounted for by higher anxiety and depression factor means for women.

Replication of Analyses at a Second Time Point

The analyses were repeated using the second wave of the PATH data set. The results were very similar to those found using wave 1. Once again, fit statistics for the CFA improved greatly for all 3 age samples when anxiety items 5 and 9 were correlated and depression item 7 was removed.

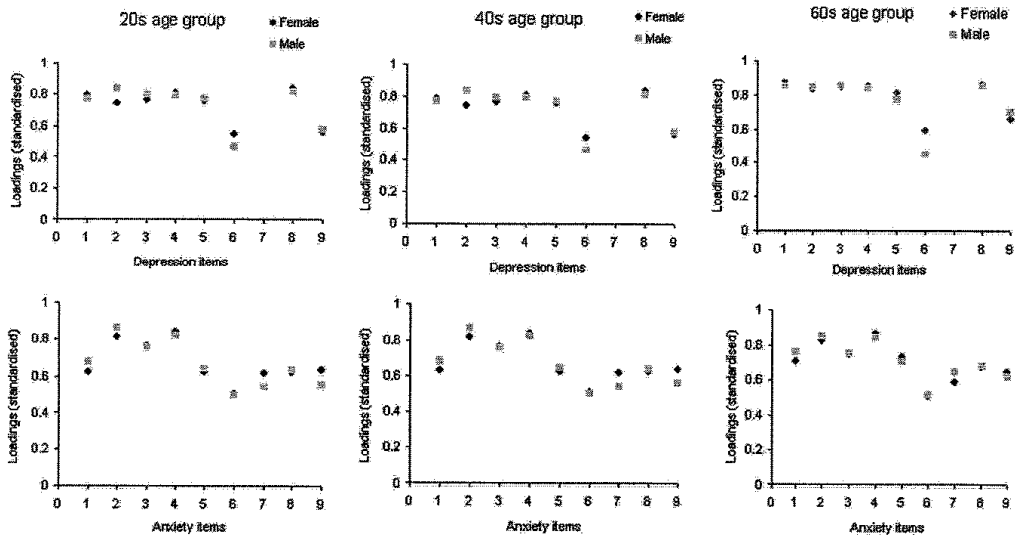

FIGURE 1. MGA Factor loadings for males and females on the Goldberg Anxiety and Depression scales for each age group.

Results from the MGA showed that whereas the DIFFTEST was significantly different between constrained and unconstrained models, other fit statistics indicated minimal change (Table 3). The standardized factor loadings were again similar for both genders in each age group.

DISCUSSION

The current study suggests that gender differences in levels of anxiety and depression on the Goldberg Scales are not because of gender-biased items. The results showed that in 3 separate age groups (20s, 40s, and 60s) and at 2 different time points: (a) the factor structure of the scales improved when 2 anxiety items (5 and 9) about sleep were correlated and one depression item (7) about waking early was removed, and (b) the same factor structure fit equally across both men and women.

The changes made to improve the factor structure of the scales were comparable to those made in previous research. Studies conducted by Christensen et al. (1999) and Jorm et al. (2005) examined the factor structure of the Goldberg scales using conventional factor analytic techniques and also found that the model improved from correlating anxiety items 5 (sleeping poorly) and 9 (difficulty falling asleep). The current findings also accord with a study suggesting that the high correlation between sleep items might indicate a third factor related to sleep disturbance (Mackinnon et al., 1994). Jorm et al. also removed the depression item enquiring about waking early. Given the high levels of endorsement for this item, perhaps respondents are interpreting "waking early" as getting up early or waking at dawn, instead of the insomnia often associated with depression (Fava, 2004). This might explain the low correlations between "waking early" and the other depression items.

The absence of gender-biased items in the Goldberg depression scale does not necessarily conflict with previous research. Items previously highlighted as possible sources of bias are predominantly questions about crying, loss of interest in sex, and talking less (Cole et al., 2000; Salokangas et al., 2002; Stommel et al., 1993). The Goldberg Depression Scale does not contain items addressing these behaviors. The current results are also consistent with those of Zuroff et al. (1990) who found that men and women had similar factor scores on the DEQ. However, the results do differ from previous research indicating a gender bias in somatic items, such as appetite, weight, fatigue, and sleep (Carter et al., 2000; Wenzel et al., 2005). The disparity between the present study and these others may be due to differences in the samples investigated and/or differences in the methods used to examine item bias. The studies conducted by Carter et al. and Wenzel et al. used clinically depressed populations, whereas the current study used a representative sample of the general population. They also used clinical samples as a means of controlling for depression levels across gender, whereas the present study adopted a latent variable approach.

The current results differ from those of Christensen et al. (1999), who identified the Goldberg depression items "losing interest," "having difficulty concentrating," and "waking early," as being endorsed more often by men given equal levels of depression with women. The variation in results is partly because of the different methods used to test for item bias. Although both studies adopted a latent variable method of examining item bias, the analysis techniques used in the current study are appropriate for analyzing binary data, whereas the use of Pearson correlation coefficients in the MIMIC model adopted by Christensen et al. assumes that the factorized outcome data is continuous. The current results could therefore be considered a

refinement to those of Christensen et al. based on the adoption of improved methodology.

The current analyses suggest that men and women will score items in the Goldberg Anxiety Scale similarly, after controlling for the underlying anxiety construct being measured. Virtually no research has investigated the possibility of gender-biased items in anxiety measures. However, the study mentioned above by Christensen et al. (1999) did find that that Goldberg Anxiety items "worry a lot," "having head and neck aches," and "trembling," etc. were biased favoring women. Once again, the variation in findings can partially be accounted for by the statistical methods used.

The present study suggests that items within the Goldberg Anxiety and Depression Scales do not provide a gender-biased result. It also indicates that the scales are appropriate for exploring those factors that might explain the gender disparity in these affective symptoms. These results add validity to epidemiological findings recording gender differences in anxiety and depression. Although the impact of measurement bias could predominantly be seen as a theoretical or methodological concern and therefore neglected by epidemiological or applied researchers looking at the gender disparity in symptoms, this information is a valuable tool for the validation and interpretation of results. This finding builds upon a variety of research that concludes that the gender disparity in depression levels and diagnosis is a true difference (Angst and Dobler-Mikola, 1984; Young et al., 1990).

Limitations

There are some potential limitations that should be considered. Firstly, the results of this study apply specifically to the items within the Goldberg scales. Although this information adds to the literature surrounding gender-biased items as a hypothesis for gender differences in anxiety and depression, the results cannot be generalized to all items measuring depression. Secondly, the analyses conducted do not test whether the Goldberg Scales in their entirety are gender-biased or whether the construct of depression itself is linked to gender. Instead, the analyses focus on the gender bias of individual items. It is possible that although the items themselves are not biased, there might be total scale properties that artificially inflate women's levels of depression. If all the items were uniformly biased, no differential item functioning would be detected. Thirdly, it is important to recognize that different methods of testing for measurement bias can provide different results. A recent review found that the identification of biased items varied depending on whether observed score, item-response, or factor analytic methods were adopted (Millsap, 2006). The conclusions adopted in the present study are somewhat based on judgment regarding goodness-of-fit indices and statistical tests of model fit, and it is possible that alternate methods of investigating item bias may provide a different set of results. On the other hand, this study is strengthened and improves on previous investigations, by adopting statistical techniques that are considered appropriate for factorizing binary outcome data. Positive elements of the study also include the inclusion of items measuring anxiety, a large epidemiological sample, and the replication of results at 2 different time points.

CONCLUSIONS

This study indicates that the greater endorsement of symptoms from the Goldberg Anxiety and Depression Scales by women is not explained by gender-biased items. This points to alternate biological, social, and psychological explanations for the gender difference. The current study also highlights the importance of choosing appropriate statistical methods when examining item bias. It suggests that previous investigations should be interpreted in light of the analysis techniques used. Future research could repeat previous studies using more recent statistical methods to tease out the impact of analysis choice.

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ORIGINAL PAPER

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Gender differences in depression and anxiety across the adult lifespan: the role of psychosocial mediators

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Abstract *Background* There is robust epidemiological and clinical evidence that a greater number of women than men experience depression and anxiety. This study investigated a number of socio-demographic, health and lifestyle, psychological and social factors as possible mediators for the gender difference in depression and anxiety in three cohorts (20–24, 40–44, 60–64). *Methods* Responses were from a representative, community based survey (n = 7,485) conducted in Canberra and Queanbeyan (NSW), in Australia. Depression and anxiety were measured using the self-report Goldberg Anxiety and Depression Scales. The analyses initially identified gender differences in the potential mediators, followed by univariate and multivariate mediation models. *Results* The results indicated several shared mediators for depression and anxiety across the three age groups including: childhood adversity, mastery, behavioural inhibition, ruminative style, neuroticism, physical health, physical activity, and perceived interpersonal and employment problems. There was a decrease in the number of social mediators as age increased. The multivariate models accounted for gender differences in both conditions for all age groups, except for anxiety in the 20–24 years old. This suggests further important unmeasured mediators for this age group. *Conclusions* These findings add to the literature surrounding gender differences in depression and anxiety, and provide a basis for future research exploring variation in these gender disparities over the adult lifespan.

Key words anxiety – depression – gender – etiology – mediation

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Introduction

Approximately twice as many women as men are diagnosed with major depression. This finding has been widely documented across multiple studies and in a variety of settings [49, 88]. In addition to diagnostic findings, many community-based surveys have found that women have, on average, higher levels of depressed mood than men as measured by self-report scales [37, 45, 59]. Although numerous demographic, biological, social and psychological explanations for these differences have been proffered, the relative contribution of these factors and their causal connections remain uncertain [7]. The gender difference in depression is not stable across age, implying that the importance of each explanatory factor involved might also vary over the lifespan. One view is that the gender difference emerges during adolescence, stabilises throughout adulthood, and then declines during old age [37]. Women are also approximately twice as likely as men to be diagnosed with generalised anxiety disorder [91] and score more highly on self-report scales measuring anxiety [55, 79]. However, this gender difference remains relatively under researched, with little information available regarding stability across the lifespan and the explanatory factors involved [1].

There is ongoing debate surrounding the degree of separation between depression and anxiety, both in terms of clinical diagnoses, subclinical symptom levels and mood states [14]. However, there are clear indications that the two outcomes overlap. Examples

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of this include the typically high correlations reported in epidemiological studies, comorbidity between mood and anxiety disorders [47, 56], and suggestions that major depression and generalised anxiety disorder have a shared genetic etiology [41]. The parallels between depression and anxiety might give rise to similarities regarding the etiology and explanatory factors responsible for the gender disparity in both psychological outcomes. For example, similar biological theories have been proposed for the gender difference in both depression and anxiety. These include genetic determinants, the disturbance of neurotransmitter systems and fluctuations in reproductive hormones [64, 80]. A common set of psychosocial risk factors might also be involved in explaining the gender difference for both conditions.

The present study aimed to incorporate a rich representation of the socio-demographic, health status and psychosocial factors which *mediate or explain* the effect that gender has on depression across the adult lifespan. The study also seeks to ascertain whether similar factors explain the relationship between gender and anxiety. Mediation occurs when an independent variable causes an intervening variable (mediator) which, in turn, causes an outcome [53]. In order for a variable to be considered a possible mediator of the association between gender and depression/anxiety two criteria need to be met: (a) there must be a gender difference in the mediator and (b) the mediator must be related to depression/anxiety. The approach taken in the current paper was to identify explanatory factors from the depression literature and explore their effects in both the depression and anxiety domains using a representative sample of young, midlife and older adults. Depression and anxiety were measured using the self-report Goldberg Anxiety and Depression Scales [30]. These scales were designed to detect and discriminate depression and anxiety, by counting of the number of symptoms experienced. Mediation effects were identified using a test recently developed by Preacher and Hayes [66, 67], which improves on previously developed methods to determine mediation effects such as Baron and Kenny's approach [5] and the Sobel test [78], and which accommodates multiple mediating variables. The following section highlights the common socio-demographic, health status and psychosocial factors identified in the depression literature that were also selected for investigation and frames them in terms of the two criteria required for mediation.

Socio-demographic factors

Unequal distribution of socio-economic resources has been strongly linked to gender differences in depression. Women generally earn less than men, are less likely to be employed and are less well educated [68]. Such factors have also been associated with depression. Longitudinal data from the Belgian Households Panel Survey showed that an increase in financial strain resulted in an increase in depressive symptoms (as measured by the Health and Daily Living Form) [51]. The Australian national survey of mental health and well-being (NSMHWB) also found that being unemployed was correlated with a DSM-VI diagnosis of major depression [89]. Indirect support for the role of socio-economic factors is found in populations where minimal gender differences in depression have been observed, such as college students [81] and the Yoruba culture, where women have greater economic independence [57]. Relationship status and responsibility for children are also important demographic factors. Research in this area has previously examined complex interactions based on theory suggesting that women are more vulnerable towards marriage and child-rearing due to an uneven distribution of household tasks and time pressure [72]. In the mediation context, there may be important gender differences in relationship and family status across the adult lifespan that help to explain why the gender difference in depression varies with age. For example, there are more young divorced women than young divorced men, as women tend to marry earlier. As divorce has been associated with major depression (e.g. longitudinal results from the ECA Studies [9]) this might be a more relevant mediator during young adulthood as opposed to middle adulthood, where the number of divorced men and women is more equal.

Health and lifestyle status factors

There is some evidence to suggest that substance use is associated with gender differences in depression. The regular use of substances such as tobacco, alcohol and cannabis is more common among men [35, 85], and high use of these substances has been associated with depression. The NSMHWB found that smoking was associated with major depression [89] and that cannabis use was higher in those with an affective disorder [21]. The same survey found that alcohol use disorders were highly comorbid with affective disorders [19]. Alternatively, abstaining from drinking alcohol appears to be more common among women and abstinence has been associated with higher mean levels of distress (K-10) [70]. Physical activity might also be an important explanatory factor. Although evidence is scant, some research indicates that men exercise more than women [3]. As clinical interventions have shown that exercise reduces levels of mild to moderate depression [22], this might be one mechanism through which men lower their risk for depression. Another important factor to consider is physical health. Women have been found to report

greater physical morbidity than men [31], and it is well known that poor physical health is highly comorbid with depression [27]. Population studies such as the NSMHWB have shown that having a comorbid physical illness is associated with major depression [89].

Psychological factors

Relevant psychological factors include personality characteristics, coping styles and cognitive abilities. Ruminative style has been associated with the gender difference in depression. Nolen-Hoeksema has theorised that women are more likely than men to ruminate about negative experiences or thought processes, resulting in higher levels and lengthier episodes of depression [59]. In one study of college students, women were found to ruminate on an existing sad mood more often than men, and having a ruminative response style predicted higher scores on the Beck Depression Inventory [11]. Gender differences in personality might also be relevant. Power inequity and helplessness models have suggested that the path to depression and helplessness is through the socialisation of passive characteristics [59, 88]. There is some limited support for this idea scattered throughout the literature on personality and individual differences. A meta-analysis [25] found that females were less assertive, had lower self-esteem, and higher levels of anxiety than males. A review of personality and mood disorders found strong evidence that neuroticism and mood disorders are closely associated [15]. Finally, cognitive function might also be linked to gender differences in depression. Lower levels of cognitive function (e.g. working memory and processing speed) have been associated with higher rates of depression in older individuals [32]. However, gender differences in cognitive function are difficult to measure accurately and have not been consistently observed [see review 25].

Social and relational factors

A number of interpersonal factors have been implicated in the gender disparity for depression. Traditionally, there is an uneven distribution of household tasks in families with women doing most of the domestic and child-rearing tasks. The US National Survey of Functional Health Status found that this inequity was associated with higher levels of depression in women (as measured by the Centre for Epidemiologic Studies Depression Scale) [8]. Recent negative or stressful experiences involving interpersonal relationships are likely to mediate the gender difference in depression. Meta-analyses have shown that women report greater levels of stress in interpersonal relationships than men [e.g. 18], and there is strong evidence that stressful life events are associated with major depression [42, 44]. Childhood sexual abuse (CSA) is also a probable explanatory factor. Reports of CSA prevalence vary wildly, with figures ranging from 2 to 62% of women and 3–16% of men depending on the sample studied and the definition used [36]. Accurate prevalence rates are difficult to pin down, particularly for men, as many cases of abuse go unrecognised and/or unreported [33]. There is strong evidence from community, clinical and college studies that CSA is linked to depression [87]. A final important interpersonal factor to consider is social support. Women appear to have more social support than do men [83] and social support is associated with lower levels of depression [62], suggesting it is a protective factor for women. However, having greater social support or social networks also provides greater opportunity for negative interpersonal experiences (e.g. death of someone close), which may in fact lead to higher rates of depression.

In comparison to depression, research exploring gender differences in anxiety is less extensive. While a few studies have explored possible explanations for gender differences in specific anxiety disorders such as post-traumatic stress disorder [28] and panic disorder [26], virtually no research has examined the etiology of gender differences for general anxiety in the general community. Gender specific research for anxiety has focused on epidemiology, clinical presentation, and treatment, rather than etiology. It has also centred on biological hypotheses, such as neurotransmitter systems, hormonal influences and reproductive factors, while psychosocial explanations remain largely unexplored [1, 64].

The present study

The current investigation had two main aims. The first was to identify the socio-demographic, health and psychosocial factors that mediate the association between gender and depression, and investigate whether these same factors mediate the relationship between gender and anxiety. The second was to examine differences in these mediators across three separate age groups (20–24, 40–44 and 60–64). The latter examination aimed to identify whether mediators operated consistently or only at certain periods of the lifespan. The dataset used was uniquely suited to the study's aims due to the large range of explanatory variables available and three widely spaced narrow-age cohorts. This allowed not only for testing mediation in three age periods, but also for multiple mediation models to be applied. Multivariate models evaluated the effect of each factor in the presence of others, thereby refining previous research that has examined potential mediators individually.

Methods

Sample

The sample was from the first wave of the PATH Through Life Project, a community survey recording the health and well-being of residents from Canberra and Queanbeyan (NSW) in Australia. The PATH project follows three cohorts of participants, 20–24, 40–44 and 60–64, interviewing them once every four years over a 20-year period. Participants in the initial wave were randomly selected from the Canberra and Queanbeyan electoral rolls. All Australians aged 18 and above are required to register on the electoral roll. The initial participation rates for each cohort were 58.6, 64.6 and 58.3% respectively. In the first wave 2,404 people aged 20–24 were interviewed, as were 2,530 people aged 40–44 and 2,551 people aged 60–64. This sample has previously been described in detail [39].

Survey procedure

Persons randomly selected from the electoral roll were sent a letter with information about the survey and explaining that an interviewer would contact them. A convenient time for the interview was arranged for those who agreed to participate. The interview took one-and-a-half to 2 h and was usually conducted at either the person's home or at the research centre. The interviewer took the participant through the first set of questions, demonstrating how to enter responses into a Hewlett-Packard 620LX palmtop computer using Surveycraft software. The remaining questions were completed by the respondent alone, except for some physical and cognitive tests administered by the interviewer. The components of the questionnaire relevant to the present investigation are described below.

Measures

The measures in the current study were categorised into four domains; (a) socio-demographic: gender, age, relationship and employment status, number of children and education level, (b) health and lifestyle: cannabis and alcohol use, physical activity and physical health, (c) psychological: mastery, extraversion, psychoticism, behavioural activation, behavioural inhibition, two cognitive tests, ruminative style and neuroticism, and (d) social: role strain, recent negative events, social support and childhood adversities.

Socio-demographic measures

Participants were asked about their gender, age, marital status, employment status (employed part/full-time vs. not in the labour-force/unemployed), and the number of children they had. Several questions about education were used to calculate total years of education.

Health and lifestyle measures

Tobacco use or smoking was assessed by asking "Do you currently smoke?" Possible responses were either 'yes' or 'no'. Cannabis use was assessed using the question 'How often do you use marijuana/hash?' Regular use was categorised as once a month or more. Alcohol use was measured using three items from the alcohol use disorders identifications test (AUDIT) [76]. Participants were then classified into one of three categories based on the National Health and Medical Research Council (2001) guidelines: (a) non-drinkers or occasional drinkers (monthly or less), (b) moderate drinkers (<28 standard drinks per week for men and <14 for women), or (c) hazardous or harmful drinkers (28 or more drinks for men and 14 or more for women) [58]. Moderate or vigorous exercise at least once a week (0 'no', 1 'yes') was also recorded. Physical health was assessed with the physical component summary of the 12-item Short Form Health Survey, where a higher score indicates better health [84].

Psychological measures

Perceived control over one's future, or mastery, was measured using a 7-item scale, where higher scores reflected a higher level of mastery [63]. Neuroticism, extraversion and psychoticism (a measure of aggression) were measured using the short form of the eysenck personality questionnaire (EPQ) [24]. Higher scores on each of these measures indicated greater levels of the associated personality trait. The 24-item behavioural inhibition and activation scales (BIS-BAS) were used to measure tendency towards approach and avoidant behaviour [12]. Behavioural inhibition (BIS) is associated with avoiding negative outcomes, whereas behavioural activation (BAS) is associated with seeking out reward and goal-directed activity. There were three elements to the BAS measure: BAS-drive, BAS-fun seeking and BAS reward-responsiveness. For each BIS-BAS scale greater scores indicated more of the associated construct. Two cognitive measures were included: Spot the Word test Version A, a 60 item vocabulary test [4] and the Digit Symbol Backwards subtest of the Wechsler Memory Scale [86]. Ruminative style was measured using a 10-item short scale drawn from the 21-item Ruminative Response Scale [61]. Greater scores indicated a higher degree of rumination about negative feelings and experiences.

Social measures

Role strain was assessed in three domains: housework, financial planning and financial provision. Responses were coded as either 1: 'about 75% or more responsible' or 0: 'about 50% or less responsible'. Participants were also asked about negative life events during the past 6 months. Six of these questions were taken from Brugha and Cragg's List of Threatening Experiences [10]: personal injury/illness, family illness/injury, close family death, close friend or other relative's death, a steady relationship ended, and a serious problem with a close friend, neighbour or relative. Two further questions taken from the British National Survey of Health and Development referred to a work or career crisis and the threat of losing employment [69]. Each of these items was responded to with either 1: 'yes' (experienced) or 0: 'no' (not experienced). Social support and negative social interactions were assessed using two sets of five items, each applied to both friends and family relationships [77]. Higher scores indicated either greater social support or negative interactions. Seventeen questions asked about negative childhood experiences [71]. A childhood adversity score was calculated by adding the total number of events experienced.

Outcome measures

The Goldberg Anxiety and Depression Scales, two separate nine-item tests, were used to assess subclinical symptom levels of anxiety and depression [30]. Participants responded to 'some specific questions about your health and how you have been feeling in the past month'. Responses to each item were either 0: 'no' or 1: 'yes'. Total scale scores ranged from 0 to 9 and represent the number of depressive or anxiety symptoms experienced. The Goldberg Depression and Anxiety scales were created by Goldberg and colleagues as a screening tool for anxious and depressive illnesses. At specified cut-off scores, the anxiety scale had a sensitivity of 82% and the depression scale had a sensitivity of 85%, implying that they can detect major depressive episodes and Generalised Anxiety Disorder effectively [30]. As a continuous count of symptoms experienced, the scales have been found to detect elevated levels of depression and anxiety [54]. While the correlation between the two scales is high ($r = 0.71$, $P < 0.001$ in the current sample) a two

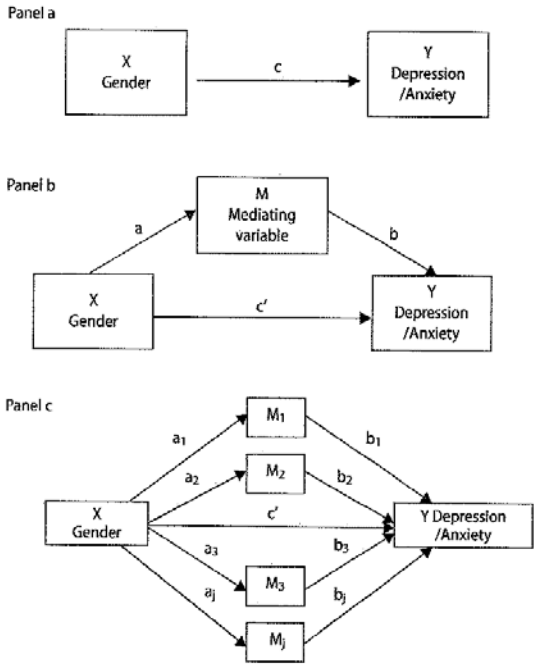

Fig. 1 The mediation model with no mediators, a single mediator and multiple mediators *Note*: Panel **a)** the direct effect between gender and an outcome variable. Panel **b)** the univariate mediation model. Panel **c)** the multivariate mediation model

factor model with separate depression and anxiety dimensions has been found to fit the symptoms substantially better than a single factor model [13, 50]. A previous study has ruled out gender-biased in scale items [50]. Based on the development of the original screening tools, and subsequent investigations, the current study accepts the Goldberg Anxiety and Depression scales as useful indicators of depression and anxiety.

Statistical analyses

A large majority of participants (n = 7,108, 95%) had complete data. Forty-six cases were omitted due to missing data on more than 25% of the variables included in the analyses. The full set of variables was used to impute missing data for a further 331 cases, with 90% of these cases requiring imputation of two or fewer variables. Missing data were imputed using the expectation-maximization algorithm in SPSS MVA procedure in version 15.0. The algorithm used is described by Enders [23] The key assumption in this approach is the missingness is either completely at random or can be predicted from observed values (missing at random; MAR). MAR is an untestable assumption but is reasonable given the wide range of variables collected. Given the very small proportion of data imputed, the effect of any violation of the MAR assumption would be negligible. Final samples included were: 2,384 in the 20–24 age group (48.4% male), 2,516 in the 40–44 age group (47.1% male) and 2,539 in the 60–64 (51.7% male) age group.

Figure 1a, b illustrate the basic or univariate mediation model applied to the relationships tested in the current study. In this application X is gender, Y is the outcome variable (depression/anxiety) and c is the effect of gender on the outcome variable. Once a mediating variable (M) is added into the model c becomes c' or the effect of gender on the outcome variable after adjusting for the potential mediator. If the gender effect were fully mediated c' would become zero. The present study also explored multivariate models for mediation. This elaboration of the model is illustrated in panel 'c'. Testing all possible mediators concurrently provides information about the effect of a specific mediator in the presence of other mediators, the relative strengths of the mediators, and allows for testing the incremental effects of adding additional mediators [67]. Inclusion for a large number of potential mediators has the potential of reducing bias in estimating the true direct effect of gender on depression/anxiety, as estimating this effect accurately requires there to be no unmeasured confounders for the effect of both gender and the potential mediators on the outcome. If such confounders are not in the model, a spurious association between gender and depression may be observed [see 17].

The analyses proceeded in three stages. First, a series of t tests and χ^2 tests (two-tailed) identified significant gender differences in potential mediators for each age group. Effect sizes were also calculated (Cohen's 'h' for differences in frequency and Cohen's 'd' for differences in means [16]). Second, Preacher and Hayes' test of mediation [66, 67] was applied to each potential mediator individually, with separate analyses conducted for depression and anxiety and each age group. This recently developed mediation test utilises bootstrapping to "generate a reference distribution, which is then used for confidence interval estimation and significance testing" [52, p. 601]. Bootstrapping overcomes the normality assumptions necessary in other tests of mediation, such as the Sobel test [78]. This method also improves on Baron and Kenny's approach, which although commonly used, has been found to have low statistical power [53]. Following the univariate mediation tests, those variables that were not significant mediators were removed from further analyses.

Third, Preacher and Haye's test was used to identity significant mediators within multivariate models. In this third stage, potential mediators were grouped into categories and added to models sequentially: model 1) gender, model 2) socio-demographic factors, model 3) health and lifestyle factors, model 4) psychological factors, and model 5) social factors. This sequence was based on the general concept that factors with higher stability, such as socio-demographic, health and personality variables are likely to causally precede more variable influences such as social relationships in the chain of events leading to depression or anxiety. Given conceptual similarities between ruminative style, neuroticism, anxiety and depression, and the high correlations between these factors (r = 0.56–0.71), the multivariate mediation effects of ruminative style and neuroticism were tested separately.

Results

Gender differences in potential mediating variables

There were significant gender differences in both anxiety and depression across all three age groups as shown in Table 1. There were also significant gender differences in many of the potential mediating variables. This section focuses on those differences that had at least a 'small' effect size (i.e. $h \geq 0.2$ or $d \geq 0.2$) [12]. For the socio-demographic variables, in the 20s age group fewer men were married or had children and more women were divorced or separated. In both the 40 and 60s more men than women were employed. In the 60s age group men had more years of education and were more often married than women. For the health variables, in all age groups men did more physical activity and in the 20

Table 1 Gender differences in potential mediators

Variables	20–24			40–44			60–64		
	Men % or mean (SD)	Women % or mean (SD)	*P* value (effect size)	Men % or mean (SD)	Women % or mean (SD)	*P* value (effect size)	Men % or mean (SD)	Women % or mean (SD)	*P* value (effect size)
Depression	2.59 (2.28)	3.18 (2.44)	0.000 (0.25)	2.28 (2.30)	2.56 (2.43)	0.003 (0.12)	1.58 (1.83)	1.77 (1.92)	0.009 (0.10)
Anxiety	3.20 (2.60)	4.44 (2.67)	0.000 (0.47)	3.29 (2.67)	3.72 (2.72)	0.000 (0.16)	1.99 (2.25)	2.50 (2.39)	0.000 (0.22)
Socio-demographic mediators									
Married or de facto (0, 1)	18.6%	27.9%	0.000 (0.21)	81.5%	77.4%	0.006 (0.12)	86.7%	68.9%	0.000 (0.44)
Separated or divorced (0, 1)	0.3%	1.6%	0.001 (0.28)	8.9%	14.8%	0.000 (0.19)	9.3%	15.4%	0.000 (0.19)
Employed (0, 1)	85.8%	84.4%	0.358 (0.06)	94.8%	85.7%	0.000 (0.32)	49.2%	32.0%	0.000 (0.35)
Number of children (0+)	0.09 (0.39)	0.21 (0.59)	0.000 (0.24)	2.05 (1.33)	2.24 (1.34)	0.000 (0.14)	2.85 (1.51)	2.83 (1.60)	0.688 (0.01)
Years of education (0+)	14.67 (1.59)	14.89 (1.65)	0.001 (0.14)	14.87 (2.32)	14.47 (2.33)	0.000 (0.17)	14.29 (2.74)	13.38 (2.68)	0.000 (0.34)
Health and lifestyle mediators									
Tobacco use (0, 1)	31.9%	31.1%	0.691 (0.02)	20.3%	17.9%	0.127 (0.05)	9.8%	11.8%	0.110 (0.06)
Regular cannabis use (0, 1)	18.4%	8.8%	0.000 (0.27)	6.9%	1.9%	0.000 (0.27)	0.2%	0.0%	0.500 (0.00)
Alcohol: abstainer/occasional (0, 1)	27.7%	36.8%	0.000 (0.19)	19.5%	35.1%	0.000 (0.34)	21.0%	40.3%	0.000 (0.41)
Alcohol: moderate use (0, 1)	66.1%	56.2%	0.000 (0.21)	74.2%	57.9%	0.000 (0.34)	72.4%	54.3%	0.000 (0.38)
Alcohol: heavy use (0, 1)	6.1%	7.0%	0.410 (0.04)	6.3%	7.1%	0.474 (0.04)	6.6%	5.4%	0.211 (0.09)
Vigorous/moderate activity (0, 1)	87.4%	73.1%	0.000 (0.36)	73.2%	60.8%	0.000 (0.26)	74.5%	59.7%	0.000 (0.32)
SF12 Physical health (0+)	53.39 (6.42)	52.67 (7.19)	0.010 (0.11)	52.09 (7.39)	51.27 (8.52)	0.011 (0.10)	48.89 (9.64)	47.33 (10.53)	0.000 (0.15)
Psychological mediators									
Mastery (7–28)	23.11 (3.41)	22.53 (3.47)	0.000 (0.17)	22.23 (3.58)	21.83 (3.58)	0.006 (0.11)	22.23 (3.64)	21.50 (3.46)	0.000 (0.21)
EPQ extraversion (0–12)	8.18 (3.38)	8.40 (3.37)	0.109 (0.07)	6.73 (3.65)	7.26 (3.53)	0.000 (0.15)	6.55 (3.47)	6.81 (3.43)	0.059 (0.08)
EPQ psychoticism (0–12)	3.13 (1.80)	2.35 (1.65)	0.000 (0.45)	2.43 (1.63)	1.85 (1.51)	0.000 (0.37)	1.86 (1.43)	1.59 (1.35)	0.000 (0.19)
Behavioral A. (drive) (4–16)	11.40 (2.31)	10.93 (2.29)	0.000 (0.20)	10.35 (2.38)	9.75 (2.45)	0.000 (0.25)	10.04 (2.39)	9.19 (2.61)	0.000 (0.34)
Behavioral A. (fun) (4–16)	12.60 (2.10)	12.11 (1.98)	0.000 (0.24)	11.04 (2.11)	10.79 (2.10)	0.003 (0.12)	10.26 (2.30)	10.40 (2.27)	0.137 (0.06)
Behavioral A. (reward) (5–20)	17.12 (1.98)	17.47 (1.14)	0.000 (0.22)	16.20 (2.09)	16.71 (1.95)	0.000 (0.25)	16.00 (2.10)	16.57 (2.15)	0.000 (0.27)
Behavioral inhibition (7–28)	19.14 (3.53)	21.70 (3.27)	0.000 (.75)	19.78 (3.32)	22.50 (3.13)	0.000 (0.84)	17.50 (3.17)	20.90 (3.02)	0.000 (1.10)
Spot the Word (0–60)	47.78 (5.56)	47.43 (5.11)	0.102 (0.07)	50.76 (5.80)	50.22 (5.57)	0.016 (0.09)	51.93 (5.89)	51.54 (5.73)	0.091 (0.07)
Digit symbol backwards (0–10)	5.47 (2.32)	5.23 (2.27)	0.012 (0.10)	5.36 (2.36)	5.10 (2.24)	0.005 (0.11)	4.76 (2.22)	5.01 (2.26)	0.005 (0.11)
Ruminative style (0–30)	8.70 (5.07)	10.81 (5.34)	0.000 (0.41)	8.04 (4.46)	9.21 (4.52)	0.000 (0.26)	6.33 (3.85)	7.68 (3.76)	0.000 (0.35)
EPQ neuroticism (0–12)	4.02 (3.28)	5.58 (3.33)	0.000 (0.47)	3.53 (3.15)	4.53 (3.27)	0.000 (0.31)	2.92 (2.98)	3.73 (3.02)	0.000 (0.27)
Social mediators									
Household tasks (>50%) (0, 1)	19.3%	39.2%	0.000 (0.45)	22.9%	79.3%	0.000 (1.19)	24.4%	80.8%	0.000 (1.22)
Financial planning (>50%) (0, 1)	26.8%	33.3%	0.001 (0.13)	56.1%	55.6%	0.809 (0.00)	63.0%	51.6%	0.000 (0.22)
Providing money (>50%) (0, 1)	19.8%	18.9%	0.568 (0.03)	67.8%	28.0%	0.000 (0.82)	65.2%	35.5%	0.000 (0.59)
Recent illness/injury (0, 1)	10.9%	7.4%	0.003 (0.14)	7.8%	6.5%	0.215 (0.04)	8.8%	8.1%	0.618 (0.04)
Recent family illness/injury (0, 1)	19.2%	23.5%	0.011 (.12)	21.5%	22.3%	0.664 (0.00)	14.6%	17.2%	0.073 (0.06)
Recent close family death (0, 1)	1.0%	1.1%	0.846 (0.00)	2.6%	3.2%	0.409 (0.00)	3.0%	3.5%	0.501 (0.04)
Recent other close death (0, 1)	20.6%	20.2%	0.799 (0.03)	14.9%	19.4%	0.004 (0.11)	18.8%	20.3%	0.367 (0.03)
Recent relationship ended (0, 1)	16.6%	20.0%	0.034 (0.08)	3.4%	3.5%	0.913 (0.06)	1.1%	0.9%	0.561 (0.00)
Recent problem with someone (0, 1)	16.9%	23.7%	0.000 (0.17)	11.2%	16.2%	0.000 (0.15)	6.0%	11.0%	0.000 (0.18)
Recent work crisis (0, 1)	19.8%	22.0%	0.208 (0.05)	21.7%	18.3%	0.036 (0.10)	6.5%	2.5%	0.000 (0.19)
Recent threat to job (0, 1)	15.3%	11.6%	0.010 (0.09)	13.4%	8.6%	0.000 (0.13)	3.0%	1.2%	0.002 (0.15)
Positive support from friends (0–6)	4.84 (1.33)	5.26 (1.08)	0.000 (0.35)	4.46 (1.34)	5.09 (1.16)	0.000 (0.50)	4.96 (1.31)	5.40 (1.04)	0.000 (0.37)
Negative events with friends (0–9)	3.47 (1.81)	3.23 (1.68)	0.001 (0.14)	2.99 (1.60)	2.78 (1.68)	0.001 (0.13)	2.54 (1.64)	2.30 (1.68)	0.000 (0.14)
Positive support from family (0–6)	5.32 (1.12)	5.43 (1.00)	0.011 (0.10)	5.21 (1.18)	5.16 (1.25)	0.343 (0.04)	5.43 (1.06)	5.46 (1.07)	0.438 (0.03)
Negative events with family (0–9)	3.97 (2.04)	4.23 (2.21)	0.003 (0.12)	4.24 (2.00)	4.62 (2.13)	0.000 (0.18)	3.34 (1.87)	3.37 (1.93)	0.711 (0.02)
No. of childhood adversities (0–17)	1.35 (1.94)	1.79 (2.39)	0.000 (0.20)	1.74 (2.32)	2.14 (2.59)	0.000 (0.16)	1.40 (1.87)	1.66 (2.16)	0.001 (0.13)

and 40s more men were likely to report regular cannabis use. In all age groups a greater number of men drank alcohol moderately and in the 40 and 60s more women were low consumers or abstinent. For the psychological variables, in all age groups women had higher levels of rumination, neuroticism, behavioural reward-responsiveness and behavioural inhibition and less behavioural drive. In the 20s men scored higher for fun seeking, in both the 20 and 40s men scored higher for psychoticism, and in the 60s they scored higher for mastery. For the social variables, the responsibility of household tasks lay with women across all three age groups. Men were more responsible for providing money in the two older age groups and for financial planning in the 60s. At all ages women experienced greater positive support from friends. Women also reported more childhood adversities in the 20s age group.

Mediation analyses

Table 2 shows the results for the univariate mediation analyses. Tables 3 and 4 show the results for the multivariate mediation analyses. In each of the tables, the coefficients shown correspond to ordinary least squares (OLS) regressions conducted as part of the analyses. They demonstrate the association between each potential mediating factor and outcome variable, after adjusting for the effect of gender (and other potential mediators in the case of the multivariate analyses). Bold text indicates a significant gender effect after the potential mediator was added. The asterisks indicate the significant mediators identified using the Preacher and Hayes test for mediation. The following section describes the results in Tables 2–4, categorising them in terms of their status as positive and negative mediators. Positive mediators mediate or explain the gender difference in depression/anxiety and are associated both with being female and higher levels of depression/anxiety. Although less common, several negative mediators were also found. Negative mediators exacerbate the gender difference and are associated with being male and higher depression/anxiety.

Univariate mediators for the gender difference in depression

Table 2 shows that several of the significant univariate mediators for the gender difference in depression were consistently identified across all three age groups. For demographic factors, greater separation/divorce was a consistent positive mediator. Consistent positive health and lifestyle mediators were alcohol abstinence, less frequent moderate drinking, less vigorous exercise and poorer physical health. Positive psychological mediators across all three age groups were lower levels of mastery, behavioural drive and the Digit Symbol scores, as well as higher levels of behavioural inhibition, rumination and neuroticism. Consistent negative psychological mediators were greater psychoticism and lower levels of behavioural reward. Positive social mediators maintained across the age groups were a greater responsibility for household tasks, a recent problem with someone, more negative events with friends, and more childhood adversities. Consistent negative social mediators were less positive support from friends, and a recent job threat.

In addition to those mediators consistent across age groups, several additional mediators were identified for each age group. For the 20–24 years old having more children, more responsibility for financial planning, experiencing a recent family illness/injury, having a recent relationship end, and more negative family events were additional positive mediators. Further negative mediators for this age group were poorer education, more frequent cannabis use, higher levels of psychoticism, lower levels of behavioural reward, greater personal injury, and less positive support from family. For the 40–44 years old additional positive mediators were being in a marriage/defacto relationship, poorer education, not being employed, poorer Spot the Word scores, and experiencing a recent close personal death. Further negative mediators for this age group were more frequent cannabis use, more frequent work crises and less extraversion. For the 60–64 years old additional positive mediators were being in a marriage/defacto relationship, not being employed, poorer education, and poorer Spot the Word scores. Additional negative mediators were a greater responsibility to plan and provide financially, and more frequent work crises.

Univariate mediators for the gender difference in anxiety

Many of the variables found to mediate the gender difference in depression also mediated the association for anxiety. Table 2 shows that for the 20s no variables acted as unique mediators for anxiety. The only disparity between the two outcomes was that alcohol abstinence and the Digit Symbol Backwards test acted as mediators for depression only. Mediators unique to anxiety in the 40s were psychoticism (positive) and providing money (negative). Variables identified as mediators for depression but not anxiety were education, cannabis use, alcohol abstinence, behavioural drive, Spot the Word scores and Digit Symbol scores. For the 60s no variables acted as unique mediators for anxiety. The variables married/defacto, separated/divorced, Spot the Word scores, household tasks, financial planning, providing money, and a recent job threat acted as mediators for depression only.

Table 2 Univariate mediation effects for gender differences in depression and anxiety

	Depression 20s		Depression 40s		Depression 60s		Anxiety 20s		Anxiety 40s		Anxiety 60s	
	Gender (β)	Mediator (β)	Gender (β)	Mediator (β)	Gender (β)	Mediator (β)	Gender (β)	Mediator (β)	Gender (β)	Mediator (β)	Gender (β)	Mediator (β)
Direct gender effect (female)	**−0.13**		**−0.06**		**−0.04**		**−0.23**		**−0.08**		**−0.09**	
Socio-demographic mediators												
Married or defacto (no)	**−0.14**	−0.05	**−0.06**	−0.13*	−0.03	−0.10*	**−0.23**	−0.02	**−0.08**	0.10*	**−0.09**	−0.03
Separated/divorced (no)	**−0.12**	0.30*	**−0.05**	0.09*	**−0.04**	0.05*	**−0.23**	0.20*	**−0.07**	0.07*	**−0.09**	0.03
Employed (0, 1)	**−0.13**	−0.17	**−0.04**	−0.17*	−0.03	−0.09*	**−0.23**	−0.12	**−0.07**	−0.15*	**−0.08**	−0.08*
Number of children (0+)	**−0.12**	0.32*	**−0.06**	0.01	**−0.04**	0.01	**−0.23**	0.18*	**−0.08**	0.01	**−0.09**	−0.01
Years of education (0+)	**−0.14**	−0.21*	**−0.05**	−0.11*	−0.02	−0.10*	**−0.24**	−0.13*	**−0.08**	−0.03	**−0.08**	−0.07*
Health and lifestyle mediators												
Heavy cannabis use (no)	**−0.16**	0.13*	**−0.07**	0.08*	**−0.04**	0.20	**−0.25**	0.10*	**−0.08**	0.03	**−0.10**	0.22
Alcohol: Abstain/occasional	**−0.13**	0.04*	**−0.05**	0.07*	−0.02	0.11*	**−0.23**	0.01	**−0.08**	0.03	**−0.08**	0.08*
Moderate	**−0.12**	−0.09*	**−0.04**	−0.10*	−0.02	−0.10*	**−0.23**	−0.05*	**−0.07**	−0.06*	**0.08**	−0.09*
Heavy	**−0.13**	0.09	**−0.06**	0.06	**−0.04**	0.00	**−0.23**	0.07	**−0.08**	0.07	**−0.10**	0.03
Vigorous/moderate activity (no)	**−0.10**	−0.20*	**−0.05**	−0.11*	−0.02	−0.15*	**−0.21**	−0.14*	**−0.06**	−0.11*	**−0.07**	−0.12*
SF12 Physical health (0+)	**−0.12**	−0.22*	**−0.05**	−0.31*	−0.02	−0.30*	**−0.22**	−0.21*	**−0.07**	−0.27*	**−0.07**	−0.26*
Psychological mediators												
Mastery (7–28)	**−0.09**	−0.50*	−0.04	−0.47*	−0.01	−0.34*	**−0.20**	−0.39*	**−0.06**	−0.41*	**−0.06**	−0.33*
EPQ extraversion (0–12)	**−0.14**	−0.23	**−0.08**	−0.18*	**−0.05**	−0.16	**−0.24**	−0.17	**−0.09**	−0.15*	**−0.10**	−0.13
EPQ psychoticism (0–12)	**−0.15**	0.06*	**−0.06**	0.03	**−0.05**	0.0.04	**−0.25**	0.07*	**−0.07**	−0.06*	**−0.10**	0.01
Behavioural A. (drive) (4–16)	**−0.12**	−0.12*	**−0.06**	−0.05*	**−0.04**	−0.05*	**−0.23**	−0.07*	**−0.08**	−0.04	**−0.09**	−0.04*
Behavioural A. (fun) (4–16)	**−0.13**	−0.03	**−0.06**	0.02	**−0.04**	−0.01	**−0.23**	−0.03	**−0.08**	−0.03	**−0.10**	−0.02
Behavioural A. (reward) (5–20)	**−0.14**	−0.07*	**−0.06**	0.03	**−0.05**	−0.01	**−0.24**	−0.03*	**−0.08**	0.04	**−0.10**	−0.01
Behavioural inhibition (7–28)	0.00	0.34*	0.02	0.34*	−0.01	0.18*	**−0.11**	0.32*	0.02	0.38*	**−0.05**	0.23*
Spot the Word (0–60)	**−0.13**	−0.02	**−0.06**	−0.06*	**−0.04**	−0.05*	**−0.23**	0.05	**−0.08**	0.03	**−0.09**	−0.05
Digit Symbol Backwards (0–10)	**−0.13**	−0.07*	**−0.06**	−0.08*	**−0.04**	−0.08*	**−0.23**	−0.02	**−0.08**	−0.04	**−0.09**	−0.05*
Ruminative style (0–30)	0.00	0.58*	0.02	0.66*	**0.04**	0.60*	**−0.12**	0.49*	−0.01	0.54*	−0.02	0.56*
EPQ neuroticism (0–12)	0.01	0.61*	0.03	0.60*	0.01	0.46*	**−0.10**	0.56*	0.01	0.59*	**−0.03**	0.51*
Social mediators												
Household tasks (> 50%) (no)	**−0.10**	0.15*	0.01	0.12*	−0.01	0.05*	**−0.20**	0.14*	−0.04	0.07*	**−0.09**	0.02
Financial planning (> 50%) (no)	**−0.12**	0.11*	**−0.06**	0.03	**−0.05**	0.04*	**−0.23**	0.09*	**−0.08**	0.04	**−0.10**	0.02
Providing money (> 50%) (no)	**−0.13**	0.11	−0.08	0.05	**−0.06**	0.06*	**−0.23**	0.14	**−0.11**	0.06*	**−0.10**	0.03
Recent illness/injury (no)	**−0.14**	0.14*	**−0.07**	0.20	**−0.04**	0.13	**−0.24**	0.15*	**−0.08**	0.19	**−0.10**	0.14
Recent family illness/injury (no)	**−0.12**	0.13*	**−0.06**	0.10	**−0.04**	0.04	**−0.23**	0.13*	**−0.08**	0.12	**−0.09**	0.06
Recent close family death (no)	**−0.13**	0.06	**−0.06**	0.07	**−0.04**	0.02	**−0.23**	0.06	**−0.08**	−0.05	**−0.09**	0.05
Recent other close death (no)	**−0.13**	0.08	**−0.06**	0.06*	**−0.04**	0.02	**−0.23**	0.09	**−0.08**	0.06*	**−0.09**	0.04
Recent relationship ended (no)	**−0.13**	0.07*	**−0.06**	0.11	**−0.04**	0.10	**−0.23**	0.09*	**−0.08**	0.11	**−0.10**	0.07
Recent problem with someone (no)	**−0.11**	0.20*	**−0.05**	0.18*	**−0.03**	0.15*	**−0.21**	0.20*	**−0.07**	0.18*	**−0.08**	0.17*
Recent work crisis (no)	**−0.12**	0.23	**−0.07**	0.21*	**−0.05**	0.16*	**−0.23**	0.24	**−0.09**	0.21*	**−0.10**	0.16*
Recent threat to job (no)	**−0.14**	0.16*	**−0.07**	0.14*	**−0.05**	0.09*	**−0.24**	0.16*	**−0.09**	0.12*	**−0.10**	0.03
Positive support from friends (0–6)	**−0.18**	−0.31*	**−0.12**	−0.22*	**−0.07**	−0.14*	**−0.28**	−0.25*	**−0.13**	−0.20*	**−0.11**	**−0.10***
Negative events with friends (0–9)	**−0.15**	0.28*	**−0.07**	0.20*	**−0.05**	0.14*	**−0.25**	0.27*	**−0.09**	0.18*	**−0.10**	0.14*
Positive support from family (0–6)	**−0.14**	−0.23*	**−0.06**	−0.24	**−0.05**	−0.15	**−0.24**	−0.21*	**−0.08**	−0.20	**−0.10**	−0.12
Negative events with family (0–9)	**−0.11**	0.32*	**−0.04**	0.20*	**−0.04**	0.17	**−0.21**	0.32*	**−0.06**	0.23*	**−0.09**	0.22
No. of childhood adversities (0–17)	**−0.10**	0.29*	**−0.04**	0.22*	**−0.03**	0.18*	**−0.21**	0.27*	**−0.06**	0.22*	**−0.08**	0.19*

Reference categories/scales (min–max) in brackets. 'Bold text' $P < 0.05$ for the gender coefficient. β standardised coefficients
*$P < 0.05$ for test of mediation

Table 3 Mediated effects for gender differences in depression

Variables	20–24					40–44					60–64				
	Model 1 (β)	Model 2 (β)	Model 3 (β)	Model 4 (β)	Model 5 (β)	Model 1 (β)	Model 2 (β)	Model 3 (β)	Model 4 (β)	Model 5 (β)	Model 1 (β)	Model 2 (β)	Model 3 (β)	Model 4 (β)	Model 5 (β)
Direct gender effect (female)	**−0.13**	**−0.13**	**−0.11**	−.01	−.02	**−0.06**	−0.03	−0.02	0.03	0.03	**−0.04**	0.00	0.03	**0.06**	0.04
Socio-demographic mediators															
Married or defacto (no)		–	–	–	–		−0.09*	−0.06*	−0.03	−0.02		−0.08*	−0.06*	−0.07*	−0.04
Separated/divorced (no)		0.24*	0.22*	0.16*	0.12*		0.04	0.05*	0.05*	0.04		0.01	0.01	0.00	−0.02
Employed (0, 1)		–	–	–	–		−0.15*	−0.08*	−0.07*	−0.06*		−0.08*	−0.02	−0.01	−0.02
Number of children (0+)		0.14	0.15*	0.11*	0.00		–	–	–	–		–	–	–	–
Years of education (0+)		−0.19*	−0.09*	−0.07*	−0.07*		−0.09*	−0.06*	−0.05*	−0.06*		−0.08*	−0.04*	−0.03*	−0.03*
Health and lifestyle mediators															
Regular cannabis use (no)			0.11*	0.07*	0.05*			0.04*	0.03	0.01			–	–	–
Alcohol: Abstain/occ. (moderate)			0.04*	0.03	0.03			0.02	0.01	0.01			0.05*	0.05*	0.04*
Moderate/vigorous activity (no)			−0.16*	−0.09*	−0.09*			−0.05*	−0.02	−0.02			−0.06*	−0.04*	−0.04*
SF12 Physical health (0+)			−0.16*	−0.13*	−0.11*			−0.27*	−0.20*	−0.18*			−0.27*	−0.24*	−0.23*
Psychological mediators															
Mastery (7–28)				−0.35*	−0.24*				−0.36*	−0.29*				−0.26*	−0.22*
EPQ extraversion (0–12)				–	–				−0.04*	−0.05*				–	–
EPQ psychoticism (0–12)				0.09*	0.05*				–	–				–	–
Behavioral A. (drive) (4–16)				0.03	0.00				0.06*	0.02				0.00	−0.01
Behavioral A. (fun) (4–16)				–	–				–	–				–	–
Behavioral A. (reward) (5–20)				−0.02	−0.02				–	–				–	–
Behavioral Inhibition (7–28)				0.26*	0.22*				0.20*	0.18*				0.11*	0.10*
Spot the Word (0–60)				–	–				−0.02	0.02				0.05*	0.04*
Digit Symbol Backwards (0–10)				−0.03	−0.02				0.01	0.00				−0.03	−0.02
Social mediators															
Household tasks (>50%) (no)					0.03					0.02					0.01
Financial planning (>50%) (no)					0.02					–					0.01
Providing money (>50%) (no)					–					–					0.05*
Recent illness/injury (no)					0.02*					–					–
Recent family illness/injury (no)					0.07*					–					–
Recent close family death (no)					–					–					–
Recent other close death (no)					–					0.01					–
Recent relationship ended (no)					0.03*					–					–
Recent problem with someone (no)					0.05*					0.07*					0.08*
Recent work crisis (no)					–					0.12*					0.10*
Recent threat to job (no)					0.04*					0.02					0.05*
Positive support from friends (0–6)					−0.12*					−0.06*					−0.04*
Negative events with friends (0–9)					0.08*					0.06*					0.08*
Positive support from family (0–6)					0.02					–					–
Negative events with family (0–9)					0.10*					0.03					–
No. of childhood adversities (0–17)					0.09*					0.09*					0.09*

Reference categories/scales (min–max) in brackets. 'Bold text' $p < .05$ for gender coefficient
– indicates the variable was excluded (not a univariate mediator), β standardised coefficients
*$P < 0.05$ for test of mediation

Table 4 Mediated effects for gender differences in anxiety

Variables	20–24					40–44					60–64				
	Model 1 (β)	Model 2 (β)	Model 3 (β)	Model 4 (β)	Model 5 (β)	Model 1 (β)	Model 2 (β)	Model 3 (β)	Model 4 (β)	Model 5 (β)	Model 1 (β)	Model 2 (β)	Model 3 (β)	Model 4 (β)	Model 5 (β)
Direct gender effect (female)	**−0.23**	**−0.23**	**−22**	**−0.13**	**−0.13**	**−0.08**	**−0.06**	**−0.05**	0.02	0.00	**−0.09**	**−0.07**	**−0.05**	−0.03	−0.04
Socio-demographic mediators															
Married or defacto		–	–	–	–		−0.05	−0.03	−0.02	−0.00		–	–	–	–
Separated/divorced		0.17*	0.15*	0.09	0.05		0.04	0.05	0.05*	0.03		–	–	–	–
Employed (0, 1)		–	–	–	–		−0.14*	−0.08*	−0.06*	−0.07*		−0.07*	−0.02	−0.01	−0.02
Number of children (0+)		0.06	0.07	0.05	−0.06		–	–	–	–		–	–	–	–
Years of education (0+)		−0.12*	−0.05	−0.04	−0.04		–	–	–	–		−0.06*	−0.02	0.00	−0.01
Health and lifestyle mediators															
Regular cannabis use (no)			0.08*	0.04*	0.02			–	–	–			–	–	–
Alcohol: Abstain/occ. (moderate)			0.01	0.01	0.00			−0.01	0.01	−0.01			0.04*	0.04*	0.04*
Moderate/vigorous activity (no)			−0.11*	−0.05*	−0.06*			−0.06*	−0.03	−0.03			−0.05*	−0.02	−0.03
SF12 Physical health (0+)			−0.18*	−0.15*	−0.13*			−0.25*	−0.18*	−0.16*			−0.26*	−0.20*	−0.19*
Psychological mediators															
Mastery (7–28)				−0.27*	−0.15*				−0.28*	−0.21*				−0.24*	−0.21*
EPQ extraversion (0–12)				–	–				0.00	−0.02				–	–
EPQ psychoticism (0–12)				0.11*	0.06*				0.04*	0.01				–	–
Behavioral A. (drive) (4–16)				0.06*	0.03				–	–				−.01	−.02
Behavioral A. (fun) (4–16)				–	–				–	–				–	–
Behavioral A. (reward) (5–20)				−.02	−.02				–	–				–	–
Behavioral inhibition (7–28)				0.28*	0.24*				0.27*	0.24*				0.16*	0.15*
Spot the Word (0–60)				–	–				–	–				–	–
Digit Symbol Backwards (0–10)				–	–				–	–				0.00	0.00
Social mediators															
Household tasks (>50%) (no)					0.05*					0.00					–
Financial planning (>50%) (no)					0.00					–					–
Providing money (>50%) (no)					–					0.03					–
Recent illness/injury (no)					0.05*					–					–
Recent family illness/injury (no)					0.08*					–					–
Recent close family death (no)					–					–					–
Recent other close death (no)					–					0.02					–
Recent relationship ended (no)					0.05*					–					–
Recent problem with someone (no)					0.06*					0.08*					0.09*
Recent work crisis (no)					–					0.12*					0.11*
Recent threat to job (no)					0.06*					0.00					–
Positive support from friends (0–6)					−0.09*					−0.06*					−0.01
Negative events with friends (0–9)					0.08*					0.04*					0.09*
Positive support from family (0–6)					0.01					–					–
Negative events with family (0–9)					0.12*					0.08*					–
No. of childhood adversities (0–17)					0.08*					0.10*					0.11*

Reference categories/scales (min–max) in brackets. 'Bold text' $P < 0.05$ for gender coefficient
– indicates the variable was excluded (not a univariate mediator), β standardised coefficients
*$P < 0.05$ for test of mediation

Multivariate mediators for the gender difference in depression

Table 3 shows the results for the multivariate models for depression. Results for the 20–24 age group show that the direct effect of gender on depression remained significant until psychological factors were added in model 4. Model 2 presented two significant socio-demographic mediators: separation/divorce (positive) and poorer education (negative). The addition of health and lifestyle variables in model 3 introduced three significant mediators: less physical activity (positive), poorer physical health (positive) and regular cannabis use (negative). The addition of psychological factors in model 4 introduced lower levels of mastery and higher behavioural inhibition as positive mediators and higher psychoticism as a negative mediator. In the final model (5), positive social mediators were more family illness/injury, relationship problems, negative family events and childhood adversities. Negative social mediators were more personal illness or injury, less support from friends and more employment threats.

Results for the 40 and 60s age groups are also shown in Table 3. In both age groups the direct effect of gender on depression was removed in model 2, re-emerged in the reverse form in model 4 for the 60s, and was not significant in the final model. As in the univariate analyses, several mediators were the same as those identified for the 20s. Specific to the 40s, positive mediators were poorer education and employment, and negative mediators were more work crises and lower levels of extraversion. The two main additional mediators for the 60s were lower scores on the Spot the Word test (positive) and a greater responsibility to provide financially (negative).

Multivariate mediators for the gender difference in anxiety

The multivariate models for anxiety are shown in Table 4. In the 20s age group the direct effect of gender on anxiety remained significant in the final model. In model 2, greater separation/divorce (positive) and poorer education (negative) were significant mediators, however these effects were removed in subsequent models. The addition of health and lifestyle variables in model 3 introduced two enduring positive mediators; less physical activity and poorer physical health. In model 4 the positive psychological mediators included greater behavioural inhibition and less mastery, and the negative mediators were greater psychoticism and behavioural drive. However, behavioural drive was no longer significant in the final model. Positive social mediators introduced in model 5 were; greater responsibility for household tasks and more family illness/injury, relationship breakdowns, interpersonal problems, negative family events, and childhood adversities. Negative mediators were more personal illness or injury and threats to employment, and less support from friends.

Table 4 also shows the results for the 40 and 60s age groups. For both ages the direct effect of gender was removed with the addition of psychological variables in model 4. Once again, a number of the significant mediating factors were the same as those for the 20s age group. For the 40s less frequent employment was an additional positive mediator. An additional negative mediator for the 40 and 60s was more perceived work crises. In the 60s there were fewer significant mediating effects and alcohol abstinence was the only new mediator (positive) introduced.

Supplementary analyses

Multivariate models that added ruminative style and neuroticism in addition to the other factors assessed indicated that these factors were strong, significant positive mediators of the gender difference in both depression and anxiety. In each model the addition of ruminative style and neuroticism was accompanied by large reductions in the direct effect of gender upon depression/anxiety. After adjusting for other factors in the model, ruminative style mediated depression across the 20, 40 and 60s (β (*standardised coefficient*) = 0.32, 0.37, 0.35, all $P < 0.05$) as well as anxiety ($\beta = 0.23, 0.19, 0.24$, all $P < 0.05$). Neuroticism was also mediated depression across all three age groups ($\beta = 0.24, 0.31, 0.20$, all $P < 0.05$) as well as anxiety ($\beta = 0.29, 0.36, 0.32$, all $P < 0.05$).

Discussion

The current study has identified the status of a wide range of psychosocial variables as mediators of the gender difference in depression, has investigated whether a similar set of factors applied to the gender difference in anxiety, and has examined the variation in findings across three separate age groups. In the majority of multivariate models (except for anxiety in the 20s) adjusting for these variables accounted for the gender difference in levels of anxiety and depression. Many of the mediators identified were found to span both conditions across age groups, which is noteworthy. Several interesting age differences were also observed. Overall, there were few differences between the mediation models for anxiety and for depression.

Consistent mediators

Two health and lifestyle factors—poorer physical health and less physical activity—were consistent positive mediators for the gender difference in both depression and anxiety across age groups after

adjusting for other factors. The results for physical health are consistent with previous research indicating that women report higher rates of morbidity [31] and that physical health status is correlated with mental health [27]. Stress theory has commonly been proposed as an explanatory model for these associations [6], with female excesses in poor physical and mental health being attributed to strain involving work and family roles. However, results from the current analyses suggest that even after controlling for gender differences in employment and role strain, physical health remains an identifiable mediator across the adult lifespan. Physical activity was also found to be a positive mediator, supporting findings that exercise may be an important tool for lowering both anxiety and depression [22]. The current results indicate that adult women perform less moderate-to-vigorous exercise than adult men. Previous research has focused on this gender difference in children and adolescents only [3, 73]. This reinforces research into promotion of exercise for its mental health benefits across all ages, suggesting that women in particular should be encouraged to exercise.

Four psychological variables were found to consistently act as positive mediators, after adjusting for other potential mediating factors; lower levels of mastery, and higher levels of behavioural inhibition, ruminative style and neuroticism. While these factors have previously been highlighted in theories examining the gender difference in depression [61, 87, 88, 90], their role in explaining gender differences in anxiety has not been previously explored. The consistency of these factors across age groups indicates their relevance to the preponderance of depression and anxiety at a variety of life stages. An alternate interpretation which must be considered is the possibility that these mediators might simply be proxy variables for or consequences of the outcomes of interest, thus explaining their consistency [7]. This may particularly be the case for ruminative style and neuroticism, which overlap conceptually with both depression and anxiety and are highly associated with these conditions [40, 60].

The consistent social mediators involved interpersonal problems and work issues. Interpersonal problems, particularly involving family, were associated with being female as well as depression and anxiety. Women of all age groups also reported more support from friends than men did, a factor which was protective of depression and anxiety. In combination, these results are consistent with previous suggestions that women's focus on interpersonal relationships is bittersweet, with opportunities for both positive and negative interactions [46, 92]. They also imply that the majority of interpersonal problems leading to women's mental health issues involve family members rather than friends. For men, negative employment experiences were more common across all ages, a factor which was associated with greater depression and anxiety. Overall, these data suggest that the type of negative events experienced by men and women are different, creating alternate paths to mental health problems. These gender specific paths seem to fairly consistent across age.

Age differences and trends

There are several interesting trends across age. Overall, as age increased, there were fewer significant mediators for gender differences in both anxiety and depression. The category of mediators that reduced the most was the social/relational group. It appears that less relationship stability and a higher frequency of negative interpersonal events contributes particularly to the poor mental health of young women. This finding is consistent with the kindling hypothesis, which posits that the first episode of major depression is more likely to be preceded by negative life events or major stressors than subsequent episodes [65]. More specifically, as the reduction across age relates to positive mediators, rather than just risk factors applicable to both genders, the findings suggest the kindling hypothesis is more pertinent to women than men. No prior studies have directly tested gender differences in the kindling hypothesis. A study of twin females in the general population found that the relationship between stressful life events and major depression decreased with successive episodes, indicating that the kindling hypothesis is relevant for women [43]. However, a recent meta-analysis [82] found that as the percentage of women in the sample increased, the kindling hypothesis was less likely to be supported, contradicting the current findings. Although a direct test of gender differences in the kindling hypothesis was not possible in the current study, the findings provoke additional interest and future work in this area.

The role played by education also differed across age. Women the 20s age group were more highly educated than men, and education was associated with lower levels of depression. This reversed in the two older age groups where men had greater levels of education and employment. These results reflect a shift in the traditional gender divide of socio-economic resources and responsibilities towards one that favours young women [34]. Despite this development, the 20s age group still showed the greatest gender gap in levels of anxiety and depression, once again highlighting the negative impact of interpersonal problems on young women's mental health. Other variations across age included cannabis use, which was a significant negative mediator for men in their 20s, and alcohol abstinence, which was a positive mediator for women in their 60s.

The current study builds on suggestions made by Jorm [38] that some risk factors for depression and

anxiety are age specific, and additionally finds that some gender differences in risk factors might also be age specific. However, it is important to remember that the three age groups can also be viewed as three separate cohorts. If this is the case, the differences found between each cohort might reflect the different environments and social contexts in which they have lived rather than age-specific effects. For example, cannabis use was found to be a negative mediator for the gender difference in depression in the 20s age group, such that men were more likely to use cannabis regularly than women, and this use was associated with greater depression. This was not the case in the 40 and 60s. As a study by Degenhardt et al. [20] found that recent birth cohorts are more likely to use illicit drugs at some point in their lifetime than older cohorts, it is possible that the relationship between being male, cannabis use and depression in the 20s is the result of societal trends or is a cohort effect, rather than an age-specific effect. In order to disentangle age effects from cohort effects longitudinal data, either retrospective or prospective, is required.

Differences in depression and anxiety

Overall, there were few inconsistencies between the mediation models for anxiety and for depression. The clearest difference was for education, which mediated the gender difference in depression for the 20, 40 and 60s but did not do so for anxiety. Reflecting this finding, low education and other socio-economic indicators have been suggested to be greater risk factors for depression than for anxiety [74]. The enduring effect between gender and anxiety for the 20s suggests that there are other important unmeasured factors that would further explain this association. Possible stressors specific to this life stage might include relationship formation, career choice, tertiary study, leaving home and financial adjustments [29]. Each of these factors might vary by gender and also be associated with levels of anxiety. Further investigation is needed to clarify the impact of these factors, particularly given that anxiety in this age group showed the greatest gender disparity.

The large number of shared mediators identified for gender differences in depression and anxiety raises the issue of similarity between the two constructs. Attempts to differentiate anxiety and depression are ongoing, with the two constructs being viewed alternately as separate phenomenon, different manifestations of the same underlying diathesis, separate syndromes with common subtypes or different points along a continuum [14]. The commonalities in the current study support findings that anxiety and depression share a component of general negative affect [14]. Our analyses suggest that mediation may occur in this shared component, rather than the distinguishing features of each psychological outcome. While this could be considered to be a validity issue related specifically to the Goldberg scales, this general component of negative affect has been readily observed in a number of different measures [see review 14]. Furthermore, the consistency of neuroticism as a mediator across age and psychological outcome reflects Andrews et al.'s [2] proposal of 'a general neurotic syndrome', which may or may not precede the onset of mood and/or anxiety illness. However, it is also possible that neuroticism is simply a proxy for anxiety and depression, rather than a separate but related factor. The interaction between depression, anxiety and neuroticism remains unclear, highlighting the need for continued research examining etiological similarities and differences.

Strengths and limitations

There are some caveats on the interpretation of our analyses that should be considered. First, it is not possible to definitively resolve the causal direction of associations within the current study. Although the analyses undertaken cast the variables studied along a causal path responsible for gender differences in psychological distress, firm conclusions about causal precedence cannot be drawn using cross-sectional data sets. For example, although the analyses prescribe that unemployment causes increases in anxiety, it is also possible that increases in anxiety cause unemployment in which case anxiety might play a mediating role. Other causal patterns may also be plausible and could describe the pattern of associations found in our cross-sectional data. These include each variable being causally linked to gender through unrelated pathways. Nevertheless, these analyses are informative in that they rule out variables as potential causal agents. Regardless of causal ambiguity regarding potential mediators in the models presented, a non-significant variable can be eliminated from further consideration. Moreover, external information about plausible causal relationships may be used in interpretation when mediation effects are found.

Second, some of the psychological variables may be considered as alternate measures or manifestations of the outcome variable and as being highly proximal to them rather than a being a distinct mediating variable. This limitation applies particularly to ruminative style and neuroticism. Third, although a large array of potential mediators was examined, a number of potential metabolic and other biological factors were not available for study. These factors differ substantially between men and women and have the potential to play an important part of explaining gender differences in anxiety and depression. Fourth, no adjustment was made to significance levels for multiple testing both of variables and groups. This

decision reflects the aim of the analyses to identify potential mediators worthy of further research and a desire to apply comparable standards of evidence to previous research which has focussed on a limited range of variables. It is acknowledged that if significance levels were adjusted for multiple testing, the number of significant results may decline. However, this would at least in part be due to a reduction in statistical power.

Finally, this study did not extend to examining interactions between psychosocial factors and gender to answer questions surrounding whether different factors are important for men and women in predicting elevated levels of depression and anxiety. Although outside the scope of this study, research exploring such interactions (essentially moderation effects in addition to mediation) is an important component of the historical debate surrounding gender differences in psychological disorders. This is particularly the case in relation to variables such as marriage [48] and interpersonal stress [75], where gender differences in susceptibility (i.e. an interaction) have been found to predict depression. It should, however, be noted that the presence of any unmodelled moderation effects is unlikely to obscure mediation effects.

Despite these limitations, there are a number of strengths to the current investigation. The present study uses a large representative sample including three age periods. It provides the opportunity to examine a range of potential mediators, and to simultaneously examine these within multiple mediation models. We are not aware of any previously published study which examines gender differences in anxiety and depression that has included the broad range of relevant psychosocial factors of the present investigation. The current investigation is one of the first studies to examine gender differences in anxiety on a comprehensive scale. The lifespan approach adopted by the current study is also an asset. Prior research has rarely attempted to explore age differences despite the evidence that gender differences in depression are not consistent over the adult lifespan.

Conclusion

This investigation presents a rich amount of data on gender differences in potential risk factors for depression and anxiety, and the relationships these factors have with each outcome. Many of these relationships have been previously unexplored, or have been examined in isolation. The findings identify a set of variables that explain why women are more depressed and anxious than men are across all age groups. Women of all ages were found to have poorer physical health, to do less physical activity, to have lower levels of mastery, and to have higher levels of behavioural inhibition, ruminative style and neuroticism, than were men. They also had more interpersonal problems.

To achieve the breadth of this study, detailed investigation of each risk factor was not possible. However, broad directions for future research generated by the study are plentiful. It was found that the number of social mediators decreased as age increased, suggesting that interpersonal problems were particularly associated with psychological distress in young women. Anxiety and depression were also found to have a strong set of shared mediators, indicating potential overlap in the etiology of gender differences in both outcomes. The gender difference in anxiety for young people was not explained by the mediators examined, signifying further important, unidentified factors. Each of these findings requires further investigation and replication to clarify the role of psychosocial mediators across the lifespan.

The current investigation also provides information about those variables that were not successful mediators, providing a basis for further evaluation of theories surrounding gender differences in depression and anxiety and for more accurately targeted experimental and/or longitudinal investigations. This study adds substantially to the body of literature surrounding the etiology of anxiety and depression, and encourages both a comprehensive and lifespan approach to investigating these outcomes.

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Appendix 3. Letter to participants (example from the 20s age group).

Dear

We are asking your help with a medical research project we are conducting on health and well-being of people aged 20-24. This study involves a randomly selected sample of people in this age group living in Canberra or Queanbeyan.

The aims of the research and what we are asking of you are explained in the enclosed information brochure.

An interviewer will contact you in the near future to ascertain if you were **aged 20-24 on the 1st January 1999** and to ask if you are willing to help us with this research. If you are willing, an appointment will be made to see you at a convenient time and place. Because we do not know your exact age, it is possible that you are not in the age group we are researching. **If you are not in the required age group, we would appreciate it if you could contact Karen Maxwell on 62492741 or email her on Path@anu.edu.au**.

We realise that many people rely on mobile phones these days and that others are not listed in the telephone directory under their own name. If this is true for you, we would like you to telephone us to tell us whether you would be interested in taking part in our study.

We very much hope you will agree to take part. We appreciate that it takes time and effort on your part to be part of a study like the present one. However, very little is known about the health of young adults and the success of a study such as this depends on a very high participation rate from the community.

Yours sincerely

Professor Scott Henderson

Appendix 4. Ethics Committee approval for Wave 1 of PATH.

THE AUSTRALIAN NATIONAL UNIVERSITY

ETHICS IN HUMAN EXPERIMENTATION COMMITTEE

Outcome of consideration of Protocol

Protocol No. M9807 **Date of Submission:** 1 September 1998

Project Title: PATH through life project

Submitted by: Professor A F Jorm

On behalf of the Ethics in Human Experimentation Committee,

I approve/~~do not approve~~ the above protocol.

Approval is subject to the following conditions:

A sample copy of questionnaire should be provided for attachment to the protocol. *

~~**Reasons for non-approval:**~~

Review due:

Chairperson: ..... **Date:** 22/9/98

(Dr Peter McCullagh)

* This has now been received. No further conditions

PMcCullagh 1/10/98

Appendix 5. Ethics Committee approval for Wave 2 of PATH.

THE AUSTRALIAN NATIONAL UNIVERSITY

HUMAN RESEARCH ETHICS COMMITTEE

Outcome of Consideration of Protocol

Researcher: Professor Anthony F. Jorm
Contact details: Centre for Mental Health Research
Protocol No. 2002/189
Title: The PATH through life
Date on application: 30 September 2002 **Date received in Research Services Office:** 30 September 2002

On behalf of the Human Research Ethics Committee,

I approve/~~do not approve~~ the above protocol.

Approval is subject to the following conditions:

.....

.....

.....

Reasons for non-approval: .....

.....

.....

.....

Review due: .....

Chairperson: Hilary C **Date:** 11/11/02

(Professor Hilary Charlesworth)

Appendix 6. Longitudinal analyses examining potential mediators (excerpt from Chapter 7).

Methodology

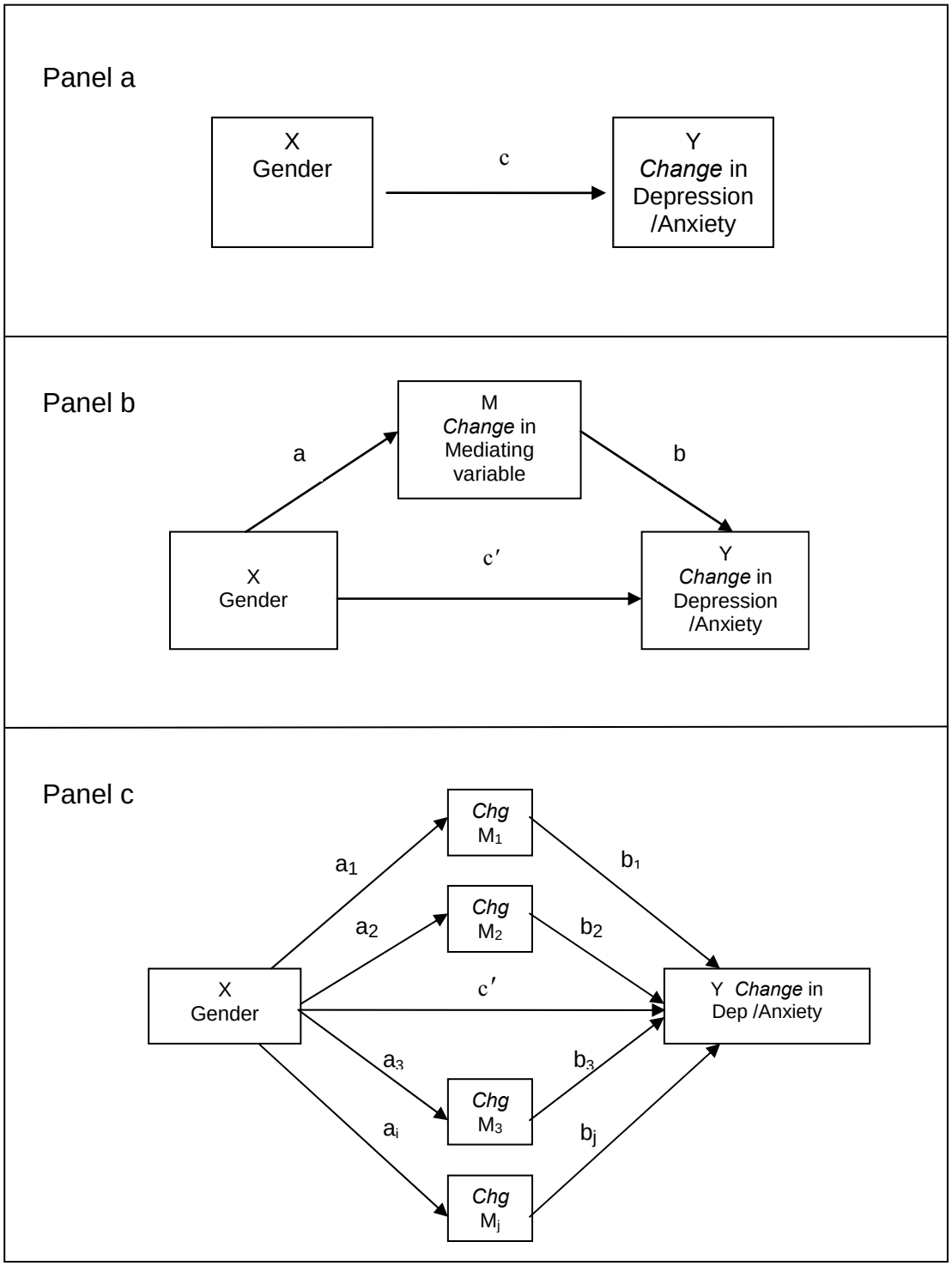
Statistical analyses

Longitudinal mediation analyses (Wave 1 and 2 data)

Seven-hundred and seventy participants completed the first wave of the survey only. These cases were removed from the analyses. A comparison between these participants who dropped out and those who completed both waves of the survey is shown in Chapter 4 (methodology chapter). A further 29 cases were omitted due to missing data on more than 25% of the variables included in the analyses. The full set of Wave 1 and Wave 2 variables was used to impute missing data for a further 1,138 cases, with 85% of these cases requiring imputation for four or fewer variables. Missing data were imputed using the expectation-maximization algorithm in SPSS MVA procedure in version 15.0. Final samples included were: 2119 in the 20-24 age group (47.5% male), 2349 in the 40-44 age group (46.8% male) and 2218 in the 60-64 (51.6% male) age group.

Figure 1 illustrates the basic or univariate mediation model already described with respect to change in both the mediators and the outcome variables across two waves of data. In this case X is gender, Y is *change* in depression/anxiety and M is *change* in the mediating factor. A longitudinal model would allow for examining whether changes in a potential mediating factor are associated with changes in the gender difference in depression/anxiety.

Figure 1. The mediation model with respect to 'change' between Waves 1 and 2.



Note: Panel a) the direct effect between gender and an outcome variable. Panel b) the univariate mediation model. Panel c) the multivariate mediation model.

The longitudinal analyses were planned to mirror the steps taken in the cross-sectional analyses (see Chapter 7). However, preliminary analyses showed that there was no relationship between gender and 'change' in depression or anxiety (Figure 2, panel a). In other words, men and women did not, on average, differ in terms of change in depression or anxiety between Waves 1 and 2. Repeated measures ANOVAs showed that this was the case for depression in each age group (20s: $f(1, 2117)=.215$, $p=.643$, 40s: $f(1, 2347)=.474$, $p=.491$, 60s: $f(1, 2216)=.125$, $p=.724$), as well as anxiety in each age group (20s: $f(1, 2117)=2.886$, $p=.089$, 40s: $f(1, 2347)=2.414$, $p=.120$, 60s: $f(1, 2216)=.175$, $p=.676$). This finding was consistent with results from Chapter 5, which showed that there was no significant interaction between gender and time (Wave 1 to Wave 2) when predicting either depression or anxiety. As this relationship is the first criteria required for mediation, no further subsequent longitudinal mediation analyses were conducted. Therefore, the results provided in Chapter 7 refer to the cross-sectional mediation analyses only.