

# Music, Health, and Wellbeing

Raymond MacDonald, Gunter Kreutz, and Laura Mitchell

Print publication date: 2012

Print ISBN-13: 9780199586974

Published to Oxford Scholarship Online: May-12

DOI: 10.1093/acprof:oso/9780199586974.001.0001

## The Effects of Background Music on Health and Wellbeing

Susan Hallam

DOI: 10.1093/acprof:oso/9780199586974.003.0032

### Abstract and Keywords

There is a large body of literature devoted to examining the effects of music on behaviour and cognition, driven by a desire to understand the effect of playing music on the performance of an ongoing task, e.g., studying, driving, exercising, shopping, or eating. In this sense, background music can be defined as the act of music being played when the music itself is not the main focus for attention. This chapter presents evidence regarding the effects of background music defined in these terms on behaviour and cognition, and draws conclusions with regard to the subsequent impact on general health and wellbeing.

Keywords: background music, behaviour, cognition, music listening

### Introduction

Since the advent of recording techniques it has been possible for music to be played at any time, in any place, easily and cheaply. This has led to a proliferation of music in our lives. Commercial companies advise businesses on the best way to utilize music to attract customers, maintain their interest, and encourage them to purchase more; music is used by a range of public services to manipulate behaviour and reduce anxiety or aggressive tendencies; while individuals use music to support a variety of activities in their lives, change their moods, and create particular ambiances in their homes. Music utilized in these ways has come to be referred to as 'background music' distinguishing it from music which is actually listened to,

although music which is being listened to or created by one person may be background music to another if s/he happens to be within the same sound location.

The other difficulty in differentiating background music from other forms of music is the way that our attention focus can change from moment to moment. At any one point in time the music in the background might be transformed into the foreground or vice versa (Madsen 1987). Given that these processes are internal it is impossible to establish whether music is in the background or foreground for any individual at any point in time. Even when an individual appears to be actively listening to music they may not be focusing on the music but allowing their thoughts to stray elsewhere. This phenomenon has been explicitly articulated in terms of listening and hearing, the latter seen as essentially passive, a form of reception, while the former involves concentration, focus, or activity on the part of the listener.

Despite the difficulties in distinguishing clear theoretical underpinnings for what might constitute 'pure' background music, in practice, there is a large literature devoted to examining the effects of music on behaviour and cognition, driven by a desire to understand the effect of playing music on the performance of an ongoing task, e.g. studying, driving, exercising, shopping, or eating. In this sense, and for the purpose of the following chapter, background music can be defined as the act of music being played when the music itself is not the main focus for attention. The present chapter will present evidence regarding the effects of background music defined in these terms on behaviour and cognition and will draw conclusions with regard to the subsequent impact on general health and wellbeing.

## General responses to background music

Human beings respond to music in a variety of different ways. Responses can be physiological, motor, intellectual, aesthetic, emotional, or related to changes in mood or arousal. No clear patterns have emerged relating to physiological measures, responses to specific elements of (p. 492 ) background music, and perceived musical experience. The relationships are complex (Salimpoor et al. 2009), although generally music influences physiological arousal in the expected direction, i.e. exciting music leads to increased arousal, calming music the reverse (Abeles and Chung 1996). Music has very powerful effects on our moods and emotions. These responses, as those relating to arousal, are based on 'pre-wired' connections particularly related to the 'primitive' elements of music, e.g. loudness,

timbre, pitch, and tempo (Peretz 2010). Emotion may also be aroused when musical expectations are disconfirmed or delayed (Meyer 1956), and in response to particular musical structures, e.g. shivers down the spine, laughter, tears, and lump in the throat (Sloboda 1991).

Preferences and familiarity also affect our responses. Favourite music has been shown to lower subjective feelings of tension whatever its nature, although physiological responses may be in the expected direction (Iwanaga and Moroki 1999). Cognitions also play a mediating role. Music may be linked with particular experiences in our lives evoking pleasant or distressing memories (Robazza et al. 1994) and is also related to identity (MacDonald et al. 2009) so exposure to calming music in a genre which is alien to that identity may increase rather than reduce arousal. For these reasons quite different types of music can change mood in the same direction (Field et al. 1998). Formal music training, perhaps because of its impact on identity, affects responses but there are no clear patterns relating to gender, age, or social class (Abeles and Chung 1996). The complex and interacting nature of the factors which influence responses means that it is difficult to predict the exact effects of any particular piece of music on any individual although there do seem to be some general trends. These will be considered now in relation to health and wellbeing.

## Influences on individual responses to background music

While music, clearly, has the potential to have a positive impact on health and wellbeing, impacting as it does on arousal and mood, there are issues arising specific to the nature of background music. The first is whether the individual has selected the music to be played or whether it is imposed by others. Self-selection is likely to lead to a positive impact relating to the specific purpose for which it has been selected. Individuals display considerable metacognitive skills in relation to music and its impact. They seem to know how music can help to achieve the particular aim that they have set for themselves. For instance, Cassidy and MacDonald (2009) found that performance and lived experience in a game-driving task were best when participants selected the background music for themselves. Kotsopoulou and Hallam (2010) have shown that young people recognize the kinds of studying tasks where music will interfere with their success, know what kinds of music will support their learning, and turn music off if they feel that it is interfering. These skills seem to develop over time and are not evident in younger children who believe that they work better if they like the music even where this is not the case (Hallam and Godwin 2000). The

evidence to date suggests that individuals have considerable skill in self-selecting background music to meet their particular needs at any specific time, including helping them to relax, making a boring task less tedious, enhancing concentration for a difficult task, or reinforcing a particular mood state, the latter not always in a positive direction.

Secondly, music is closely related to identity (see MacDonald et al. 2009). Music that is selected to be played in the background reflects that identity. Some music, referred to by North and Hargreaves (2008) as 'problem music', can through its lyrics promote attitudes and behaviours which may not be in the best interests of the health and wellbeing of the individual who has selected the music. Perhaps more importantly, this may then affect those with whom they interact, or who may be exposed to the music, for instance younger siblings. Even where music is not (p. 493) considered 'problematic' it may be influential. For instance, there is evidence that the level of playing country music with its focus on problems commonly experienced in everyday life, for instance, relationship difficulties, alcohol abuse, and alienation from work may negatively impact on those who are suicidal. Research in 49 metropolitan boroughs in the USA found that when greater airtime was devoted to country music there was a higher suicide rate even when other factors were taken into account (Stack and Gundlach 1992).

Thirdly, background music can have indirect effects on health and wellbeing through the behaviour it can elicit. If background music influences the nature of our purchasing behaviour, or encourages us to spend more than we can afford this could have an impact on our financial position, our lifestyle and, ultimately, health, and wellbeing.

Fourthly, if background music is imposed whether in a public space, in an on-hold telephone situation, or at home it could, in some cases, cause extreme distress. In a public or telephone situation the individual can take action to remove him or herself from the situation but at home this is more problematic and can lead to legal action being taken to restrain the source. The type of music and whether it is live or recorded is irrelevant here. Classical musicians practising can be as irritating as someone playing loud rock music.

A large survey of people's views of background music played in public places in the UK found that 34% of the general public found it 'annoying', although 36% did not notice it. Older people (45-54-year-olds) were more disturbed (45%) than younger respondents (15-25-year-olds) (21%), as were those of higher socioeconomic status (51%). The group for whom it created real

problems were the hard of hearing. Eighty-six per cent reported that it frequently drowned out speech and announcements, this being particularly problematic in restaurants. It also impacted on them in the home when played on radio and TV as people were speaking (National Opinion Poll 1998). The playing of background music in public places also impacts on those working in those environments. A survey, carried out by the UK Noise Association (2007) found that 40% of employees disliked it, 28% tried to ignore it, and only 7% actually liked it. Such is some people's dislike of background music that various pressure groups have been set up to lobby for its removal.

The previous two sections have considered issues relating to general and individual responses to background music. The following sections explore research focusing on the effects of background music on specific populations and in health situations where the use of music has been shown to have an impact on wellbeing.

## The use of music to promote the health and wellbeing of children

Perhaps the most striking example of the power of music to impact on health comes from research on babies born prematurely. In comparison with groups not provided with background music, music-exposed groups gain weight, increase food intake, and reduce their length of stay in hospital (e.g. Cassidy and Standley 1995). These effects seem to be maintained across a range of variables including the gestational age of the infant, the volume of the music (within certain parameters), the means of delivery (in a free field or through earphones), and the birth weight of the infant (Standley 2002). Music also contributes to improving the occurrence of quiet sleep states, reduces the extent of crying, and lowers mother anxiety. Improvement seems to occur on a daily basis indicating a cumulative effect (Lai et al. 2006).

If music is played by adults in the home, children may be passive recipients of it. This can lead to marked changes in their behaviour. Several studies have shown that children of primary school age exhibit increased activity levels when exposed to music (Furman 1978) and that fast exciting (p. 494) music has the most dramatic effect, which can be detrimental to good behaviour (Reiber 1965; Ferguson et al. 1994; Hallam and Godwin 2000). These effects seem to be particularly powerful in children with emotional and behavioural difficulties. Relaxing quiet background music can improve behaviour and on-task performance in these children (e.g. Hallam and

Price, 1998; Jackson and Owens, 1999) and induces physiological changes including reductions in systolic and diastolic blood pressure, pulse rate, and temperature (Savan 1999).

## Use of music to reduce anxiety and increase wellbeing

A frequent use of background music in public places, by organizations and individuals is to manipulate arousal levels and moods. In a review of music's use in hospitals, Standley (1995) identified reducing pain, anxiety, or stress; enhancing the effects of anaesthetic/analgesic drugs or reducing their usage; and reducing the length of hospitalization as the most common applications. Music was found to have a favourable impact on almost all of the medically-related conditions studied, with children responding more positively than adults and infants and females more positively than males. Interestingly, behavioural and physiological measures tended to present more positive outcomes than patients' self-reports.

Calming background music has been shown to have a direct impact on biological indicators of stress such as cortisol (e.g. Flaten et al. 2006) and blood pressure (e.g. Triller et al. 2006), in addition to perceived anxiety (Pelletier 2004), although the level of effectiveness depends on the type of stress, age, the way the music is used, musical preferences, and prior level of musical experience. Numerous studies have indicated that music can help to alleviate stress in patients waiting for treatment. For example, Cooke et al. (2005) found that listening to selected preferred music during the preoperative wait reduced anxiety in day surgery patients. Music can also be effective during some treatments. For instance, children having casts fitted showed less increase in heart rate compared with controls when music was playing (Liu et al. 2007). Similarly, anxiety relating to dental treatment can be reduced through background music (Bare and Dundes 2004). It can also assist in promoting relaxation to aid recovery. For instance, there is a greater impact on reduction in heart rate, respiratory rate, myocardial oxygen demand, and anxiety following heart attacks when music is played in the recovery environment and these effects are maintained over a longer period of time (White 1999).

Older people specifically report that music reduces anxiety and stress levels, increasing thresholds for pain endurance, reducing recovery and shortening convalescent periods after surgical procedures. While active music making plays a crucial role, listening to recorded music is also important providing



'inner happiness, inner contentment and inner peace' (Hays and Minichiello 2005).

Background music can also contribute to alleviating anxiety in pregnancy (e.g. Yang et al. 2009) and stress in childbirth (for a review see McKinney 1990). Music selected to be played by the mother can assist in cuing rhythmic breathing and relaxation, prompt positive associations, and help focus attention on the music as a diversion from pain and hospital sounds (e.g. Hanser et al. 1983), although not all mothers find this use of music appealing (Sammons 1984).

Although research is at an early stage, the ability of music to lower stress and increase feelings of wellbeing seems to be related to improved immune system functioning as measured by levels of salivary immunoglobulin A, an indicator of the ability of the respiratory system to fight off infection. While the most positive effects are related to live music, there is evidence that background music can also have an impact (Charnetski and Brennan 1998).

Given the capacity of music to induce relaxation it is not surprising that it has been shown to be able to induce and improve the quality of sleep. Playing relaxing background music for (p. 495 ) 45 minutes at the sleep times of 10 to 11-year-olds improved its quality (Tan 2004), while women with sleep disorders over the age of 70 showed decreased time to the onset of sleep, decreases in the number of night time disturbances and improvement in the subjective experience of sleep (Johnson 2003). These findings are supported by a recent meta-analysis of the impact of music-assisted relaxation for sleep in adults and elders with and without sleep problems (de Niet et al. 2009). These findings seem to generalize across cultures (e.g. Deshmukh et al. 2009).

## Background music in commercial environments

Unsurprisingly, there has been considerable research on the use of background music in commercial environments (see North and Hargreaves 2008, for a review). The extent to which this impacts on health and wellbeing depends on whether individuals are induced through music to behave in ways that might be detrimental to them. For instance, Milliman (1982) found that when slow music was played in supermarkets it led to customers shopping more slowly and spending more money. Slow music played in a restaurant had a similar effect leading to slower eating and greater expenditure (Milliman 1986). The playing of certain types of music may affect what is bought. For example, Areni and Kim (1993) played classical

music and pop music in a wine cellar. They found that although the two different types of music did not lead to customers buying any more wine, classical music led to customers buying more expensive wine. Similarly, providing the right 'fit' of music to products can induce customers into entering shops (see North and Hargreaves 2008, for a review), classical music tending to create an upmarket feel (North et al. 2000a). Once in the shop customers are more likely to make a purchase. Music playing while on hold on the telephone can also sustain customer's patience, relaxing music being the most effective, perhaps because it causes the least offence to the majority of people (North et al. 1999). In all of these cases, the extent to which the induced behaviours impact on health and wellbeing depend on the nature of the products and services on offer and the extent to which they may promote unhealthy behaviours or encourage individuals to spend beyond their means. For instance, spending more in the supermarket or restaurant might lead to health problems associated with being overweight or drinking too much alcohol, while expenditure on computer games may encourage sedentary behaviour. Whether this is actually the case in practice will, of course, depend on the influence of the many other factors which impinge on an individual's behaviour.

## Background music at work

Songs have long been utilized to support work related activities, and the advent of recorded music in the twentieth century increased the use of music in the workplace to maintain morale, reduce boredom and fatigue, improve productivity and reduce errors. It is no coincidence that this practice became widespread during the Second World War. The BBC's *Music While You Work* programme continued long after the war effort giving an indication of how successful the cheerful, lively music was in enhancing the moods and productivity of the workers. Subsequent research has supported the effectiveness of music enhancing mood (for a review, see North and Hargreaves 2008), although in some circumstances a positive mood can be detrimental to work performance. For instance, Au et al. (2003) found that when music was used to induce a positive mood in traders on financial markets they lost money, perhaps because it induced risk taking, whereas music that generated a neutral or negative mood led to profits.

Surveys have shown that many people enjoy work more when music is played (e.g. Music Works 2009). The introduction of personalized systems of listening to music has facilitated the individualized selection of preferred music. A survey of employees' use of music on personal (p. 496) players in



the office (Haake 2006) established that 80% listened to music at work, on average for 36% of the time. Music most often accompanied routine tasks working alone, word processing, web-surfing, and emailing and was reported to improve concentration and block out unwanted noise. It also reduced stress, enhanced feelings of wellbeing and enhanced the ambience of the work place, providing a topic of conversation with work colleagues. For those doing low-demand tasks music relieved boredom. Disadvantages included music being played too loudly and interfering with the work of others and communication when people were wearing headphones. There may be a role for the use of personal players in open plan offices where the presence of general background noise is a particular problem, reducing performance and job satisfaction, and leading to increased stress and health problems (e.g. Evans and Johnson 2000; Knez and Hygge 2002).

Where personalized listening is allowed there have been significant improvements in performance, enhanced morale, and greater commitment to remain in post, and, overall, a reduction in stress (Oldham et al. 1995; Lesuik 2005) although there are differences between those working on simple or complex tasks (Oldham et al. 1995). Where work is simple and repetitive music reduces boredom but where tasks are complex it can interfere with performance as might be expected on the basis of the Yerkes-Dodson law which suggests that internal arousal levels optimal for particular tasks vary according to task difficulty, the more complex the task the lower the optimal arousal level (Yerkes and Dodson 1908).

## Effects of background music in everyday life

Recent studies of self-selected music listening in daily life report that the functions of music listening frequently relate to mood regulating strategies and the support a range of activities. (e.g. Thayer et al. 1994; DeNora 2000; Sloboda et al. 2001; North et al. 2004a; Sloboda et al. 2009). As people listen to music that they like their feelings of wellbeing are usually enhanced (Juslin and Laukka 2004). Individuals apply metacognitive skills when selecting music for mood management, although there are individual differences, females tending to be more skilled than males (Sloboda 1999; North et al. 2000b). These skills seem to develop through experience of choosing, listening and responding to different music and evaluating its impact on desired outcomes (Batt-Rawden and DeNora 2005).

The generation of positive mood states may also increase altruism. Working with children aged 10–11 years, Hallam et al. (2002) developed short written

scenarios where the children could select a course of action which was either altruistic or selfish. More altruistic intentions towards others were reported when calming, relaxing music was being played in the background as opposed to no-music or exciting aggressive music. Similarly, North et al. (2004b) either played pop music which students liked or highly complex computer music which elicited a good deal of annoyance in a gym. As people left the gym they were asked to either sign a petition in support of a fictional sporting charity or distribute leaflets on behalf of the same charity. The pop music affected the distribution of leaflets in a positive manner, although it had no effect on signing the petition.

Not all music generates positive effects on mood and behaviour. Music may contribute to the development of identities which are antisocial in nature, although findings relating to the changes in attitudes towards violence and women following exposure to particular types of rap (Fried 1997) and the relationships between heavy metal music and suicidal thoughts (Stack et al. 1994; Scheel and Westfield 1999), anger (Gowensmith and Bloom 1997), and the increased acceptance of negative attitudes and violence towards women (Lawrence and Joyner 1991) are inconclusive. A study of the perceptions of listeners revealed that very few believed that music affected their (p. 497) actual behaviour (Gardstrom 1999). The direct effects of listening to particular types of music on violent behaviour depend on a range of complex factors and listening is unlikely, of itself, to promote aggression, but for those already predisposed to violence, already holding the views expressed in the music, it may offer support for particular actions.

We also know little about the impact these lyrics may have on the developing identities of those who are exposed regularly from a young age or those who are portrayed negatively. Currently, a quarter of teenage girls in the UK suffer physical violence at the instigation of their boyfriend, while one-third has suffered an unwanted sexual act. The abuse tends not to be reported, partially through fear of the relationship ending, but also because it is seen as 'normal' (Barter et al. 2009). Research needs to address not only whether music affects the behaviour of perpetrators but also the acquiescence of their victims.

Beyond its uses in changing mood and reinforcing identity music can be used to support other activities. For instance, it can support driving where it increases concentration and prevents people falling asleep (Cummings et al. 2001), although it can decrease performance if it disrupts attention (Stutts et al. 2001; Dibben and Williamson 2007). Overall, the effects depend

on the nature and complexity of the driving conditions and the nature, speed and intensity of the music (see Sloboda et al. 2009). Music can also support exercise, not necessarily by improving performance per se but by distracting individuals from any discomfort that they are experiencing (e.g. Ferguson et al. 1994; Pujol and Langefield 1999). The evidence from studies of the music selected to accompany exercise has suggested that music of moderate or faster tempo is preferred for higher-intensity exercise (Karageorghis et al. 2006, 2008) supporting the notion that given choice music is selected to create the appropriate mood and arousal level for the activity to be undertaken, leading to more successful outcomes which in turn help to maintain self-esteem and enhance wellbeing.

## Conclusions

The playing of music in the background is not new. Music perceived as an art form to be revered and listened to in silence is a relatively recent phenomenon (Goehr 2007). The development of recording techniques has made it possible to play music in a wide variety of environments at little cost, while the introduction of personalized listening devices has provided individuals with the ability to listen to music of their choice whenever they wish. Many clearly learn to utilize music in ways which are beneficial to themselves, but others need support in developing the necessary metacognitive skills. We know relatively little about the ways in which individuals acquire these skills and what factors might affect their acquisition. This is clearly an area for future research.

Music has a very powerful impact on arousal, emotions, and moods and as a result can influence behaviour. The full implications of this are still emerging. While music can be used to positive effect to enhance health and wellbeing this is not always the case, negative effects are frequently found when individuals do not have control of the music and it is a poor 'fit' in relation to their self-perceptions and needs. Walking away can resolve this in many situations but where this is not possible individuals may experience considerable distress.

## References

### Bibliography references:

Abeles, H.F. and Chung, J.W. (1996). Responses to music. In: D.A. Hodges (ed.) *Handbook of Music Psychology*, PP. 285–342. San Antonio, CA: IMR Press.

Areni, C.S. and Kim, D. (1993). The influence of background music on shopping behaviour: classical versus top forty music in a wine store. *Advances in Consumer Research*, **20**, 336-40.

(p. 498 ) Au, K., Chan, F., Wang, D., and Vertinsky, I. (2003). Mood in foreign exchange trading: cognitive processes and performance. *Organizational Behavior and Human Decision Processes*, **91**, 322-38.

Bare, L.C. and Dundes, L. (2004). Strategies for combating dental anxiety. *Journal of Dental Education*, **68**(11), 1172-7.

Barter, C., McCarry, M., Berridge, D., and Evans, K. (2009). *Partner exploitation and violence in teenage intimate relationships*. National Society for Prevention of Cruelty to Children.

Batt-Rawden, K. and DeNora, T. (2005). Music and informal learning in everyday life. *Music Education Research*, **7**, 289-304.

Cassidy, G. and MacDonald, R. (2009). The effects of music choice on task performance: A study of the impact of self-selected and experimenter-selected music on driving game performance and experience. *Psychology of Music*, **33**(2), 357-86.

Cassidy, J.W. and Standley, J.M. (1995). The effect of music listening on physiological responses of premature infants in the MCU. *Journal of Music Therapy*, **32**(4), 208-27.

Charnetski, C.F. and Brennan, F.X. Jr. (1998). Effect of music and auditory stimuli on secretory immunoglobulin A (IgA). *Perceptual Motor Skills*, **87**, 1163-70.

Cooke, M., Chaboyer, W., Schluter, P., and Hiratos, M. (2005). The effect of music on preoperative anxiety in day surgery. *Journal of Advanced Nursing*, **52**(1), 47-55.

Cummings, R., Kopesell, T.D., Moffat, J.M., and Rivara, F.P. (2001). Drowsiness, counter-measures to drowsiness, and the risk of a motor vehicle crash. *Injury Prevention*, **7**, 194-9.

De Niet, G., Tiemens, B., Lendemeijer, B., and Hutschemaekers, G. (2009). Music-assisted relaxation to improve sleep quality: meta-analysis. *Journal of Advanced Nursing*, **65**(7), 1356-64.

DeNora, T. (2000). *Music in Everyday Life*. Cambridge: Cambridge University Press.

Deshmukh, A.D., Sarvaiya, A.A., Seethalakshmi, R., and Nayak, A.S. (2009). The effect of Indian classical music on quality of sleep in depressed patients: A randomized controlled trial. *Nordic Journal of Music Therapy*, **18**(1), 70-8.

Dibben, N. and Williamson, V. (2007). An exploratory survey of in-vehicle music listening. *Psychology of Music*, **35**, 571-89.

Evans, G.W. and Johnson, D. (2000). Stress and open-office noise. *Journal of Applied Psychology*, **85**, 779-83.

Ferguson, A.R., Carbonneau, M.R. and Chambliss, C. (1994). Effects of positive and negative music on performance of a karate drill. *Perceptual Motor Skills*, **78**, 1217-18.

Field, T., Martinez, A. Nawrocki, T., Pickens, J., Fox, N.A. and Schanberg, S. (1998). Music shifts frontal EEG in depressed adolescents. *Adolescence*, **33**(129), 109-16.

Flaten, M.A., Asli, O., and Simonsen, T. (2006). The effect of stress on absorption of acetaminophen. *Psychopharmacology*, **185**(4), 471-8.

Fried, C.B. (1997). Bad rap for rap: Bias in reactions to music lyrics. *Journal of Applied Social Psychology*, **26**(23), 2135-46.

Furman, C.E. (1978). The effect of musical stimuli on the brainwave production of children. *Journal of Music Therapy*, **15**, 108-17.

Gardstrom, S.C. (1999). Music exposure and criminal behavior: Perceptions of juvenile offenders. *Journal of Music Therapy*, **36**(3), 207-21.

Goehr, L. (2007). *Imaginary Museum of Musical Works: an essay in the philosophy of music*. Oxford: Oxford University Press.

Gowensmith, W.N. and Bloom, L.J. (1997). The effects of heavy metal music on arousal and anger. *Journal of Music Therapy*, **1**, 33-45.

Haake, A.B. (2006). *Music-listening practices in workplace settings in the UK*. In M. Baroni, A.R. Addessi, R. Caterina and M. Costa (eds.) *Proceedings of the 9th International Conference on Music Perception and Cognition*. University of Bologna, Bologna, Italy.

Hallam, S. and Godwin, C. (2000). The effects of background music on primary school pupils' performance on a writing task. Paper presented at the annual conference of the British Educational Research Association, University of Wales, Cardiff.

(p. 499 ) Hallam, S. and Price, J. (1998). Can the use of background music improve the behaviour and academic performance of children with emotional and behavioural difficulties? *British Journal of Special Education*, **25**(2), 88-91.

Hallam, S., Price, J., and Katsarou, G. (2002). The Effects of Background Music on Primary School Pupils' Task Performance. *Educational Studies*, **28**(2), 111-22.

Hanser, S., Larson, S.C. and O'Connell, A.S. (1983). The effect of music on relaxation of expectant mothers during labor. *Journal of Music Therapy*, **20**(2), 50-8.

Hays, T. and Minichiello, V. (2005). The meaning of music in the lives of older people: a qualitative study. *Psychology of Music*, **33**, 437-51.

Iwanaga, M., and Moroki, Y. (1999). Subjective and physiological responses to music stimuli controlled over activity and preference. *Journal of Music Therapy*, XXXVI(1), 26-38.

Jackson, J.T. and Owens, J.L. (1999). A stress management classroom tool for teachers of children with BD. *Intervention in School and Clinic*, **35**(2), 74-8.

Johnson, J.E. (2003). The use of music to promote sleep in older women. *Journal of Community Health Nursing*, **20**(1), 27-35.

Juslin, P.N. and Laukka, P. (2004). Expression, perception and induction of musical emotions: A review and a questionnaire study of everyday listening. *Journal of New Music Research*, **33**, 217-38.

Karageorghis, C.I., Jones, L., and Low, D.C. (2006). Relationship between exercise, heart rate and music tempo preference. *Research Quarterly for Exercise and Sport*, **77**(2), 240-4.

Karageorghis, C.I., Jones, L. and Stuart, D.P. (2008). Psychological effects of music tempi during exercise. *International Journal of Sports Medicine*, **29**(7), 613-19.



Kotsopoulou, A. and Hallam, S. (2010). The perceived impact of playing music while studying: age and cultural differences. *Educational Studies*, **36** (4), 431-40.

Knez, I., and Hygge, S. (2002). Irrelevant speech and indoor lighting: Effects on cognitive performance and self reported affected. *Applied Cognitive Psychology*, **16**, 709-18.

Lai, H., Chen, S., Chang, F., Hsieh, M., Huang, H., and Chang, S. (2006). Randomized controlled trial of music during kangaroo care on maternal state anxiety and preterm infants' responses. *International Journal of Nursing Studies*, **43**, 139-46.

Lawrence, S. and Joyner, D.J. (1991). The effects of sexually violent rock music on males' acceptance of violence against women. *Psychology of Women quarterly*, **15**, 49-63.

Lesuik, T. (2005). The effect of music listening on work performance. *Psychology of Music*, **33**(2), 173-91.

Liu, R.W., Mehta, P., Fortuna, S., Armstrong, D.G., Cooperman, D.R., Thompson, G.H., et al. (2007). A randomized prospective study of music therapy for reducing anxiety during cast room procedures. *Journal of Pediatric Orthopaedics*, **27**(7), 831-3.

MacDonald, R., Hargreaves, D.J., and Miell, D. (2009). Musical identities. In S. Hallam, I. Cross, and M. Thayer (eds.) *Oxford Handbook of Music Psychology*, pp. 462-70. Oxford: Oxford University Press.

Madsen, C.K. (1987). Background music: Competition for focus of attention. In C.K. Madsen and C.A. Prickett (eds.) *Applications of research in music behaviour*, PP. 315-24. Tucaloosa, AL: The University of Alabama Press.

McKinney, C.H. (1990). Music therapy in obstetrics: a review. *Music Therapy Perspectives*, **8**, 57-60.

Meyer, L.B. (1956). *Emotion and meaning in music*. Chicago, IL: University of Chicago Press.

Milliman, R.E. (1982). Using background music to affect the behaviour of supermarket shoppers. *Journal of Marketing*, **46**, 86-91.

Milliman, R.E. (1986). The influence of background music on the behaviour of restaurant patrons. *Journal of Consumer Research*, **13**, 286–9.

Music Works (2009). *Radio in the workplace: Increasing morale and productivity*. Available at: <http://www.musicworksforyou.com> (accessed 3 January 2010).

National Opinion Poll. (1998). *Muzak: Music to whose ears?* London: Royal National Institute for the Deaf.

North, A.C. and Hargreaves, D.J. (2008). *The social and applied psychology of music*. Oxford: Oxford University Press.

(p. 500 ) North, A.C., Hargreaves, D.J. and McKendrick, J. (1999). The influence of in-store music on wine selections. *Journal of Applied Psychology*, **84**(2), 271–76.

North, A.C., Hargreaves, D.J. and McKendrick, J. (2000a). The effects of music on atmosphere and purchase intentions in a bank and a bar. *Journal of Applied Social Psychology*, **30**, 1504–22.

North, A.C., Hargreaves, D.J. and O'Neill, S.A. (2000b). The importance of music to adolescents. *British Journal of Educational Psychology*, **70**, 255–72.

North, A.C., Hargreaves, D.J., and Hargreaves, J.J. (2004a). Uses of music in everyday life. *Music Perception*, **22**, 41–77.

North, A.C., Tarrant, M., and Hargreaves, D.J. (2004b). The effects of music on helping behaviour: a field study. *Environment and Behavior*, **36**, 266–75.

Oldham, G., Cummings, A., Mischel, L., Schmidtke, J. and Zhou, J. (1995). Listen while you work? Quasi-experimental relations between personal-stereo headset use and employee work responses. *Journal of Applied Psychology*, **80**(5), 547–64.

Pelletier, C.L. (2004). The effect of music on decreasing arousal due to stress. *Journal of Music Therapy*, **41**, 192–214.

Peretz, I. (2010). Towards a neurobiology of musical emotions. In P.N. Juslin and J.A. Sloboda (eds.) *Handbook of Music and Emotion: Theory, Research, Applications*, pp. 99–126. Oxford: Oxford University Press.

- Pujol, T.J. and Langefield, M.E. (1999). Influence of music on Wingate Anaerobic Test performance. *Perceptual and Motor Skills*, **88**, 292–96.
- Reiber, M. (1965). The effect of music on the level of activity of children. *Psychonomic Science*, **3**, 325–26.
- Robazza, C., Macaluso, C., and D’Urso, V. (1994). Emotional reactions to music by gender, age and expertise. *Perceptual and Motor Skills*, **79**, 939–44.
- Salimpoor, V.N., Benovoy, M., Longo, G., Cooperstock, J.R. and Zatorre, R. J. (2009). The rewarding aspects of music listening are related to degree of emotional arousal. *PLoS One*, **4**(10), e7487.
- Sammons, L.N. (1984). The use of music by women during childbirth. *Journal of Nurse-midwifery*, **29**, 266–70.
- Savan, A. (1999). The effect of background music on learning. *Psychology of Music*, **27**(2), 138–46.
- Scheel, K.R. and Westefeld, J.S. (1999). Heavy metal music and adolescent suicidality: an empirical investigation. *Adolescence*, **34**(134), 253–73.
- Sloboda, J. (1991). Music structure and emotional response: some empirical findings. *Psychology of Music*, **19**(2), 110–20.
- Sloboda, J.A. (1999). Everyday uses of music listening: a preliminary study. In S.W. Yi (ed.) *Music, mind and science*, pp. 354–69. Seoul: Western Music Institute.
- Sloboda, J.A., O’Neill, S.A. and Ivaldi, A. (2001). Functions of music in everyday life: An exploratory study using the Experience Sampling Method. *Musicae Scientiae*, **V**, 9–32.
- Sloboda, J., Lamont, A., and Greasley, A. (2009). Choosing to hear music: motivation, process, and effect. In S. Hallam, I. Cross, and M. Thayer (eds.) *Oxford Handbook of Music Psychology*, pp. 431–330. Oxford: Oxford University Press.
- Stack, S., and Gundlach, J.H. (1992). The effect of country music on suicide. *Social Forces*, **71**, 211–18.
- Stack, S., Gundlach, J., and Reeves, J.L. (1994). The Heavy Metal Subculture and Suicide. *Suicide and Life-threatening Behaviour*, **24**(1), 15–23.

Standley, J.M. (1995). Music as a therapeutic intervention in medical and dental treatment: research and clinical applications. In: T. Wigram, B. Saperstone, and R. West (eds.) *The art and science of music therapy: a handbook*, pp. 3-22. Langhorne, PA: Harwood.

Standley, J.M. (2002). A meta-analysis of the efficacy of music therapy for premature infants. *Journal of Pediatric Nursing*, **17**, 107-13.

Stevens, K.M. (1992). My room—not theirs! A case study of music during childbirth. *Australian College of Midwives Inc Journal*, **5**(3), 27-30.

**(p. 501 )** Stutts, J.C., Reinfurt, D.W. Staplin, L., and Rodgman, E.A. (2001). *The role of driver distraction in traffic crashes*. Washington, DC: Report prepared for the AAA foundation for traffic safety.

Tan, L.P. (2004). The effects of background music on quality of sleep in elementary school children. *Journal of Music Therapy*, **41**(2), 128-50.

Thayer, R.E., Newman, J.R., and McClain, T.M. (1994). Self-regulation of mood: Strategies for changing a bad mood, raising energy, and reducing tension. *Journal of Personality and Social Psychology*, **67**, 910-25.

Triller, N., Erzen, D., Dub, S., Petrinic-Primozic, M., and Kosnik, M. (2006). Music during bronchoscopic examination: the physiological effects: a randomized trial. *Respiration*, **73**, 95-9.

UK Noise Association (2007). *Year of National Noise Strategy*. Kent: UK Noise Association.

White, J.M. (1999). Effects of relaxing music on cardiac autonomic balance and anxiety after acute myocardial infarction. *American Journal of Critical Care*, **8**(4), 220-30.

Wilson, S. (2003). The effect of music on perceived atmosphere and purchase intentions in a restaurant. *Psychology of Music*, **31**(1), 93-112.

Yang, M., Li, L., Zhu, H., Alexander, I.M., Liu, S., Zhou, W., et al. (2009). Music therapy to relieve anxiety in pregnant women on bedrest: A randomized controlled trial. *The American Journal of Maternal/Child Nursing*, **34**(5), 316-23.

Yerkes, R.M. and Dodson, J.D. (1908). The relation of strength of stimulus to rapidity of habit-formation. *Journal of Comparative Neurological Psychology*, **18**, 459–82.

