Introduction

Music is a big part of most people's lives. Music is heard in all kinds of contexts. People use music for many different purposes, for example to relax, to evoke memories, to get into a mood, to express emotions, to create an identity, or to regulate emotions (Juslin & Laukka, 2004; North, Hargreaves & O'Neill, 2000; Roe, 1985; Saarikallio & Erkkilä, 2007; Sloboda & O'Neill, 2001; Thayer, Newman, & McCain, 1994). Only recently have the field of music psychology become cumulative in the understanding of how music express and induce emotions in listeners. Music listening primarily evokes positive emotions in listeners (e.g. Juslin & Zentner, 2002) and is therefore thought to be beneficial for wellbeing and health.

Music and emotions

In the field of music psychology, a distinction is made between perception of emotions in music (i.e. when listeners perceive or recognize emotions in music, without automatically feeling the emotion) and emotion induction through music (i.e. when music evokes emotions in listeners, without focusing on the reasons why the emotions were evoked) (Juslin & Sloboda, 2010). Emotions can be defined as short-lasting, relatively intense affective reactions to potentially important changes or events in the 'internal' or 'external' environment. An emotion typically begins with the individual's assessment of the personal meaning of some antecedent event. The process involves cognitive appraisal (e.g. evaluating the situation as dangerous), subjective feeling (e.g. feeling scared), physiological arousal (e.g. heart rate increasing), expression (e.g. screaming), action tendency (e.g. hiding), and regulation (e.g. calming down) (e.g., Ekman, 1992; Johnson-Laird & Oatley, 1992; Scherer, 2000). This appraisal process can be either conscious or unconscious. The difference between emotions and affect (a more general concept that include moods, attitudes, physical sensations and emotions) is that emotions typically have an object (e.g. Oatley & Jenkins, 1996). Emotions are 'about' something (Frijda, 1999).

For a long time the most common idea was that the emotions felt to the music are the same emotions that were expressed by the music. In later years this positive relationship between perception and induction of emotion through music has been proven to be less obvious (Gabrielsson, 2002). An emotional expression in the music can induce different emotions depending on the listener and the situation, that emotions to music may be induced without any emotion perception (i.e. when a listener experience emotions that are difficult to express by the music, e.g. feeling moved), and that a listener may respond with an opposite emotion than the emotion expressed by the music (e.g. when perceiving a happy emotion in a the music but responds with sadness because of some sad memory to that particular piece) (Gabrielsson, 2002).

Emotion induction through music – musical emotions

Ever since the 19th century it has been argued that there are emotions specifically induced by music (i.e. *musical emotions*) and that these emotions differ from other

emotions that are experienced during the day (see Zentner, Grandjean & Scherer, 2008). Not all agree that such musical emotions exist. Basic emotions (e.g. anger, joy, fear and disgust) are reactions to events that have potentially important consequences for the individual's well-being. Musical emotions (i.e. emotions induced by music) do not serve the same function. It has been suggested that the difference between musical emotions and emotions experienced in everyday life lays in their relative frequency of occurrence. There are some emotions that occur in both everyday life and in response to music (e.g. nostalgia and enchantment), although they seem to be some of the most commonly experienced emotions to music, whereas not so common in other everyday situations (Zentner, Meylan & Scherer, 2000). However, Juslin, Laukka, Liljeström, Västfjäll and Lundqvist (2011) argued that musical emotions can be referred to as 'musical' since the above mentioned definition of emotion says that emotions normally are evoked by an object – they are about something. In this case the object would be the music. The musical emotions, however, are not functionally or structurally different than emotions that occur in non-musical contexts. Some argue that music cannot induce emotions at all (Konecni, 2003) but it has been found that music evokes emotions in listeners in a variety of research. For instance, in a study done by Witvliet and Vrana (2007) participants were instructed to try to experience the emotions expressed by the music that was being played to them. The results showed that the participants responded emotionally to the music even after repeated exposure. Blood and Zatorre (2001) have found that music listening activates brain regions associated with emotion and reward. Other examples of research that shows that music evokes emotions come from mood induction (Västfjäll, 2002), self-reported feelings (Gabrielsson, 2001), physiological response (Gomez & Danuser, 2007), and helping behaviour (Fried & Berkowitz, 1979; North, Tarrant & Hargreaves, 2004). Further, Juslin and Västfjäll (2008) suggested that music in fact can induce a wide range of both basic and complex emotions in listeners via several psychological mechanisms that musical emotions share with other emotions.

Previous research has shown that music primarily evokes positive emotions in listeners (e.g. Juslin & Zentner, 2002; Gabrielsson, 2001). A few of the most commonly experienced emotions to music are happiness, calm and nostalgia (Sloboda, 1992; Wells & Hakanen, 1991; Zentner, et al., 2008).

So we know that music can evoke emotions in listeners, but *how* are the emotions evoked? Juslin and Västfjäll (2008) proposed a set of psychological mechanisms that can explain this: 1) Brain stem reflexes, 2) Evaluative conditioning, 3) Emotional contagion, 4) Visual imagery, 5) Episodic memory, and 6) Musical expectancy. The one thing the mechanisms have in common is that they all become activated by taking music as their 'object'. It is proposed that these mechanisms, along with cognitive appraisal, can explain most emotions induced by music in everyday life. Even though these mechanisms are suggested to explain how emotions to music are evoked, there are large individual differences to consider in every listening situation.

Music as emotion regulation

Emotion regulation is defined as the process in which people attempt to control which emotions that are experienced, when those emotions are experienced, and how they are experienced and expressed (Gross, 2008). Regulation of moods and emotions may be

conscious and unconscious, and may be targeted at different aspects of emotions: subjective experiences, behavioral expression and physiological responses. Gross proposed a process model of emotion regulation which highlights five different families of emotion regulation strategies: situation selection (deliberately choosing situations that will give rise to higher probability of certain emotions), situation modification (trying to change the situation immediately to prevent unwanted emotions), attentional deployment (redirecting attention within the situation), cognitive change (changing how one thinks about the situation or one's ability to cope with it) and response modulation (influencing physiological, experiential and behavioral responses almost directly). John and Gross (2004) distinguish between strategies that happen early in the process (i.e. antecedent-focused strategies) and strategies happening later in the process (i.e. response-focused strategies). Research of has shown that mood and emotion regulation is one of the most important motives for music listening (e.g. DeNora, 2000; Juslin & Laukka, 2004; Laukka, 2007; North et al., 2000; Saarikallio & Erkkilä, 2007; Sloboda & O'Neill, 2004; Wells and Hakanen, 1991). Saarikallio and Erkkilä (2007) identified seven regulatory strategies involving musical activities: entertainment (e.g. listening to music to maintain a positive mood or to evoke positive emotions), revival (e.g. listening to music to relax or to get energized), strong sensation (e.g. listening to music to experience intense feelings of pleasure), diversion (e.g. listening to music to forget about something undesirable), discharge (e.g. listening to music to release anger), mental work (e.g. listening to music to get inspired and get new ideas), and solace (e.g. listening to music to get some comfort). Moreover, it has been proposed that music has an effect on several phases of the emotion regulation process and that particular music-related emotion regulation strategies may be related to particular phases (i.e. early or late in the process) (Saarikallio, 2011).

The music, the listener and the situation

Music does always occur in an interaction between the listener, the music, and the situation (e.g., Jørgensen, 1988). It is impossible to predict emotional responses to music from the music by itself. Every listening situation is different from the next. Listeners do not react in the same way to a piece of music, and a listener may react differently to the same piece of music in different situations (Juslin et al, 2011). Listeners differ for example in terms of personality (Wheeler, 1985), music preference (Iwanaga & Moroki, 1999), musical training (Lehmann, 1997) and motives for listening (Behne, 1997). Examples of motives for listening to music are to get into the mood, to relieve stress, to reduce loneliness, to change bad moods, to create a personal image, to evoke memories, to express emotions, to listen to the lyrics, and to raise energy (Juslin & Laukka, 2004; North, Hargreaves & O'Neill, 2000; Roe, 1985; Saarikallio & Erkkilä, 2007; Sloboda & O'Neill, 2001; Thayer, Newman, & McCain, 1994). Liking of the music have been found to influence listeners responses to music (e.g. MacDonald, Mitchell, Dillon, Serpell, Davies & Ashley, 2003). Gabrielsson (2001) found that physical state (e.g. feeling well or ill), cognitive factors (e.g. expectations or familiarity with the musical style), and emotional state affected participants' strong experiences to music.

Previous research has shown that people often experience different emotions when they are listening to music alone and when they are listening to music in the presence of others (e.g. Juslin, et al., 2008). Further, type of activity can influence the emotional response to music (e.g. music listening as the main activity, or accompanying other activities like housework or commuting) (Juslin & Laukka, 2004; Sloboda & O'Neill, 2001). The ability to choose the music yourself affects the emotional responses to music as well (Sloboda, O'Neill & Ivaldi, 2001; Juslin, et al, 2008). Other examples of situational factors that may affect the emotional reactions to the music are way of listening to the music (recorded or live music), time of day, behavior of the audience and/or performer, and the acoustical conditions (Gabrielsson, 2001).

Musical factors that may influence listeners' emotional reactions to the music are, for instance, rhythm, volume, pitch, tempo, timbre, melody, and harmony (Gabrielsson, 2001; Juslin & Laukka, 2003). Positive emotions are usually expressed with major, high tempo, and high pitch (Västfjäll, 2002), but just because the music express certain emotions does not automatically mean that those emotions are induced in the listener.

Music and stress

Psychological and physiological responses to stress

The term stress refers to an imbalance between environmental demands and resources available for meeting those demands (Steptoe, 1997). The experience of stress is characterized by negative emotions such as fear and tension (e.g., Pelletier, 2004) as well as by heightened levels of physiological parameters such as blood pressure and heart rate (e.g., Lovallo, 2005). Physiological responses to stress begin with perception of stress. The perception leads to activation of the sympathetic divisions of the autonomic nervous system, which stimulate the body's resources to react in stressful situations. Walter Cannon (1932) named this the "fight or flight" response since these reactions prepare the body for either fight or flight. The fight or flight response occurs through two routes: through direct activation of the sympathetic division of the adrenomedullary system which activates adrenal medulla to secrete epinephrine and norepinephrine, and affects the cardiovascular, digestive, and respiratory systems; or through the hypothalamic-pituitary-adrenal (HPA) axis, in which the perception of a threatening event evokes action in the hypothalamus. The hypothalamus response is the release of corticotrophin-releasing hormone, which in turn makes the anterior pituitary to secrete adrenocorticotropic hormone. This hormone stimulates the adrenal cortex to secrete glucocorticoids, including cortisol. The secretion of cortisol raises the level of blood sugar to supply energy for the cells. Cortisol is secreted in irregular pulses at 1-2 hour intervals and it is believed to peak 20-30 minutes after an acute stressor (Ice, Katz-Stein, Himes & Kane, 2004). In adults peak levels of basal cortisol are produced during the last hour of night-time sleep, which leads to high early morning levels that uphold energy levels and stimulate the appetite for carbohydrates. Early morning peak levels decline sharply during the first few hours after sleeping hours (Smyth, Ockenfels, Gorin, Catley, Porter, Kirchbaum, Hellhammer & Stone, 1997). Cortisol appears to be

influenced by sleep and light conditions (Ice, et al, 2004), but also by gender, caffeine intake and smoking (Kudielka, West & Hellhammer, 2009).

Cortisol is essential for life. It is involved in a number of vital functions (e.g. modulating central nervous system and immune function, supporting vascular responsiveness, maintaining glucose production from protein, down-regulating inflammatory responses, and facilitating fat metabolism). It does also have an anti-inflammatory effect (Brannon & Feist, 2007). However, chronically elevated cortisol levels may be harmful. Prolonged glucocorticoid exposure can result in for example immunosuppression, muscle atrophy, decreased sensitivity to insulin, impairment of growth and tissue repair, and hypertension (Smyth, et al, 1997). Studies have shown that cortisol increases in response to laboratory stressors, stressful jobs, stressful activities and daily hassles (Schlotz, Schulz, Hellhammer, Stone & Hellhammer, 2006).

The relation between music listening and stress

Some studies have shown decrease in cortisol levels following positive mood induction or in correlation with trait positive effect (Kemeny & Shestyuk, 2010). Several studies have shown that music reduces stress and cortisol levels before, during and after medical procedures (see Koelsch, Fuermetz, Sack, Baur, Hohenadel, Wiegel, Kaisers & Heinke, 2011). Fast-tempo music has been found to be just as effective in reducing stress as slow-tempo music (McCaffery, 1990). It has been found that fast-tempo music only can reduce stress when the music is the individual's preferred musical taste (Allen & Blascovich, 1994). Listening to preferred music may have the strongest effects on relaxation and stress reduction (Krout, 2007) which points to the importance of considering musical preferences when studying emotional responses to music listening. Perceived control is important for stress reduction (Brannon & Fiest, 2007). Subject-chosen music may be more effective in reducing stress compared to experimenter-chosen music since it give participants some control over the situation by letting them choose music that they find relaxing (Labbé, Schmidt, Babin & Pharr, 2007). Studies have shown that music listening may result in decreased cortisol levels (Hanser, 2010; Khalfa, Bella, Roy, Peretz & Lupien, 2003; Flaten, Åsli & Simonsen, 2006).

Music and health

The World Organization of Health defines health as 'a state of complete physical, mental, and social well-being and not merely the absence of disease, or infirmity' (Hanser, 2010). Research suggests that there is a strong relationship between negative affect and the experience of physical symptoms. To experience high levels of negative mood during a longer period, or suffering from chronic stress, may result in the development of more severe viruses and symptoms of asthma (Hanser, 2010). Research has shown that positive emotions may be fundamental for improving both psychological and physical aspects of well-being (Fredrickson, 2001). Fredrickson suggests that positive emotions do not just enhance well-being in the present but also increase the probability of well-being in the future.

The relationship between music listening and health

Music has been thought to affect health for a long time (e.g. Hanser, 2010). As discussed earlier, evidence shows that music mostly evokes positive emotions in listeners (e.g. Juslin & Zentner, 2002), which can lead to the interpretation that music listening may be beneficial for health. Research has shown that when people listen to music they find pleasant the serotonin level increases and activates the same areas involved in reward (Evers & Suhr, 2000; Menon & Levitin, 2005). Soothing music has been seen to activate the parasympathetic nervous system and thus decreasing blood pressure and heart rate while enhancing blood flow to the vital organs. Studies of coronary heart disease and music show that music therapy may decrease systolic blood pressure (Hanser, 2010). Even though these examples suggest that music listening may improve physical health, the majority of the studies made of the relationship between music and health have been conducted in laboratory settings. This means that the participants listened to music in controlled settings that most likely did not resemble their daily lives.

Only a few studies have focused on the effects of everyday music listening on health. In Mitchell, MacDonald, Knussen and Serpell's (2007) survey study of music and chronic pain it was found that frequency of music listening was positively correlated with having no or less need for medical treatment. The participants' perception of the importance of the music was related to how often they reported to have listened to music to relieve their pain. This stresses the importance of considering the individual differences in musical preferences.

Music and personality

The Big Five personality dimensions

A common way of measuring personality is by using questionnaires that measures the Big Five. The Big Five is a hierarchical model of personality traits in terms of five basic dimensions: Extraversion, Neuroticism, Agreeableness, Conscientiousness, and Openness to experience (McCrae & Costa, 1987). Each bipolar factor summarizes numerous more specific aspects, which in turn include even more specific traits (Gosling, Rentfrow & Swann, 2003). Extraversion refers to being positive, energetic, assertive, warm and social, and Neuroticism refers to being tense, hostile, anxious, impulsive, depressed and self-conscious. Agreeableness refers to a tendency to be kind, generous, forgiving, trustworthy and complaint, Conscientiousness refers to a tendency to be efficient, self-disciplined, organized, rational and reliable, and Openness to experience refers to a tendency to be curious, flexible, intellectual, artistic and insightful (see e.g. Penley & Tomaka, 2002).

Personality and emotions

Research of the relationship between personality and emotions has linked Extraversion with the experience of positive emotions and Neuroticism with the experience of negative emotions (see Wilson & Gullone, 1999; Watson & Clark, 1992). Neuroticism has also been linked to perceived stress (Hemenover & Dienstbier, 1996). Openness to experience has been associated with both positive and negative affect and people scoring high on Openness to experience tend to experience emotions more intensively than those scoring low, due to its amplifying effect on both positive and negative emotions. Agreeableness and Conscientiousness are less studied but seem to be related to more positive affect and well-being and less negative affect (McCrae & Costa, 1991).

Personality and emotional responses to music

In previous research of the relationship between personality and music listening, the main focus has been on musical preferences. Rentfrow and Gosling (2003) found links between their four dimensions of musical preferences (reflective and complex; intense and rebellious; upbeat and conventional; energetic and rhythmic) and different aspects of personality. The impact of personality on emotional responses to music has been less studied. In a study by Juslin, et al (2011) the results showed that overall prevalence of musical emotions was positively correlated with Extraversion and Openness to Experience. Liljeström (2011) found that listeners scoring high on Neuroticism experienced more negative emotions and less positive emotions to music than those scoring low. Further, Extraversion, Openness to experience and Agreeableness were related to more positive and less negative emotions to music, and that Conscientiousness was negatively correlated with several negative emotions. Liljeström proposed that music may be related to Openness to experience because people on the high end of Openness tend to be associated with an appreciation for aesthetic experiences. Ladinig and Schellenberg (2009) found that individuals who scored high on Agreeableness experienced emotions to music more intensively, and they suggested that it was due to high scoring individuals' strong ability to empathize in emotional situations.

Methods for studying responses to everyday music listening

Survey studies

When studying everyday music listening survey studies can provide important background variables that may explain the large individual differences between listeners. One example of the use of survey studies when studying everyday music listening is the one by North, Hargreaves, and Hargreaves (2004). They sent text messages to their participants with mobile phones. When receiving the message, participants had to complete a questionnaire about the music they were listening to or had been listening to since the previous text message. The results showed that music

occurred in about 39 % of the occasions. However, the focus was not primarily on emotional reactions to music. In Laukka's (2007) survey study of everyday music listening and well-being among the elderly it was found that 64 % of the participants listened to music at least once a day, and that positive emotions were among the most frequently felt when listening to music.

Survey studies are useful because they offer the opportunity to use large samples of participants which makes it more relevant to generalize the results to the population. Survey studies may be conducted in several ways. Postal surveys can be useful in terms of sample size, but it might be a time consuming process. Bringing the participants to the same place (e.g. the university) to complete the survey on a researcher's watch, make it possible to gather a great deal of information at one time, although the presence of the researcher may affect the participants' answers (i.e. demand characteristics). Additionally, surveys usually involve retrospective accounts, which are biased because they reflect reconstructive memory (Barrett & Barrett, 2001).

Field studies

Field study method refers to the observation and recording of what happens in a naturalistic setting. A major advantage with this method, if conducted correctly, is that one gets to explore participants' 'true' behaviour. It is important to study emotions and behaviour in their natural setting. North, Tarrant and Hargreaves (2004) conducted a field study where they studied the effects of music on helping behaviour during people's workout sessions in gyms. They suggested that since mood can influence the probability of the occurrence of helpful behaviour, and since music can be used to change moods, music would affect participants' willingness to complete a demanding task. The results showed that gym members who had listened to uplifting music during their workout were more willing to help out by doing a high-cost task, compared to those who listened to annoying music. A disadvantage with field studies is, however, that they might jeopardize the validity of causal inferences (Vissner, Krosnick, & Lavrakas, 2000).

Experience Sampling Method

One solution to the problem with retrospective accounts when using survey studies may be the Experience Sampling Method (ESM) (Conner Christensen, Barrett, Bliss-Moreau, Lebo & Kaschub, 2003). When frequency estimates of specific emotions are needed, the ESM can give more reliable data than the estimates obtained in survey studies (Ready, Weinberger, & Jones, 2007). The ESM usually means that participants get small, handheld computers or palmtops to carry with them at all waking hours for some time (e.g. during a week). The palmtop will emit several sound signals at certain programmed or randomized intervals. Each time the participants hear the signals, they should immediately answer questions administered by the palmtop about their latest experience (e.g. music experience). Slododa, O'Neill and Ivaldi (2001) found in their ESM study that music occurred in 44 % of all the episodes, and that the music evoked mostly positive emotions in the participants.

A great advantage of the ESM is that it permits one to study events as they unfold in their natural environment. But the ESM is an expensive method, it does not

provide information about every single event in the participants' lives and it places a high burden on the participants (Kahneman, Krueger, Schkade, Schwarz & Stone, 2004).

Day Reconstruction Method

A middle way between a survey study and an ESM study is the Day Reconstruction Method (DRM). DRM is a method developed by Kahneman et al. (2004). The aim with the DRM is that participants should be able to reproduce the information that normally would be collected by probing experiences as they happen. Kahneman provide ample evidence that psychological constructs such as emotion are equally well-captured with the DRM as with the ESM. The DRM consists of two parts. In the first section of the DRM participants are asked to recall what they did the previous day by writing down every activity in a diary, in terms of episodes (activities, time of day, and emotions felt). In the next section they are describing each episode by answering questions about the situation and the emotions (e.g. being alone or together with others, experienced emotions, level of stress and feelings of control). The DRM imposes less participant burden than ESM, and it does not disrupt the participants' normal activities. The DRM makes it possible to gather information about a whole day in one single setting from large samples. Studies have indicated that methods like DRM gives patterns that are equivalent to those gathered by real-time experience sampling (Kahneman, et al, 2004). Miron-Shatz, Kahneman and Stone (2009) found that when participants recall how they feel overall the previous day, the recollection seems to consist of a summarized version of all the episodes, rather than the moderate levels of the actual experienced emotions during each episode. So it is easier to detect an extreme negative emotion episode when each episode is studied. By using the DRM when studying emotional responses to music will provide information about music listening as it occurs in daily life, as well as information about emotions and perceived feelings of stress as they unfold in daily life.

Quasi-experimental field study

Research has shown that music listening may improve physical health (see e.g. Hanser, 2010), although the majority of the studies have been conducted in laboratory settings where the participants listen to pieces of music (either chosen by the experimenter or by the participants themselves) in a controlled setting that most likely does not resemble their everyday lives. One way to explore the emotional responses and health beneficial effects of music listening in people's everyday lives is by quasi-experimental field studies. Quasi-experiments include treatments (e.g. music listening), but in contrast to a true experiment, the participants are not randomly assigned to the experiment group or the control group (Mitchell & Jolley, 2004). By gathering information about responses to music in the participants' home environment will provide data from a setting that is more close to their everyday lives than data assessed in a laboratory setting. Despite the increasing threat to the internal validity, a quasi-experimental field study of the impact of music listening on everyday emotional responses is a step in right direction in exploring the health beneficial effects of everyday music listening.

Rationale for the investigations

The overall aim with the four papers in this thesis was to investigate the impact of everyday[1] music listening on emotions, stress and health. The studies were meant to broaden the knowledge about the health beneficial effects of everyday music listening and to explore the impact of different individual and situational factors on emotional responses to music.

The present investigations

Introduction

Two hundred and seven participants took part in a DRM study about how everyday music listening affects emotions and stress and to what extent the participants used different emotion regulation strategies in their daily lives. 41 women participated in a quasi-experimental study where the experiment group listened to their own chosen music on mp3-players for half an hour every day when arriving home from work for two weeks' time. They were compared to a baseline week when they relaxed without music for half an hour each day and to a control group who relaxed without music during all three weeks. Study I reports data based on participants' recollections of the previous day in a total of 2297 episodes. Study II reports the 262 episodes that were reported as particularly stressful. Study III reports data from the quasi-experimental study of the impact of self-chosen music on emotions, stress levels and cortisol levels. Finally, study IV reports the associations between personality and the data from study I and study III.

Study I

Aim

The aim with study I was to, by using the DRM, explore the prevalence of musical emotions in everyday life, the use of music as emotion regulation strategy, and which factors situations, places, and activities musical emotions are more likely to occur. Another aim was to study the health beneficial effects of everyday music listening.

Instruments

The questionnaire was based on the Day Reconstruction Method (Kahneman, et al., 2004). The questionnaire was divided into four different parts. The first part consisted of questions about life satisfaction, overall well-being, subjective well-being

[1] Everyday is here used to refer to emotion and music listening as they occur in people's lives unconstrained by the boundaries often imposed in laboratory experiments.

(Satisfaction With Life Scale, Diener, 1985), self-perceived health (a shortened version of DUKE health profile, Parkerson, Broadhead & Tse, 1990), and background variables (e.g. age, gender, life situation, and education). In the second part the participants were asked to recall the previous day and write down what happened, in terms of episodes, in a diary (activities, time of day, experienced emotions). The third part of the questionnaire contained questions about every single episode (e.g. what they did, if anyone else was present, how stressed they felt). Experienced emotions during each episode were measures by a list of twenty emotions which could be rated from 0 (not at all) to 6 (very much). The use of emotion regulation in the episodes was measured by a scale containing a few statements from the Emotion Regulation Questionnaire (Gross & John, 2003) (e.g. "To feel more positive, I changed the way I was thinking"), some from the Self-Regulating Strategies of Mood Questionnaire (Thayer, et al., 1994) (e.g. "I took a shower, bath, or splashed water on my face" and "I went shopping"), and a couple of strategies concerning music listening (e.g. "I tried to enhance my emotions by listening to music"). Participants were instructed to estimate to what degree they had used each strategy in an episode. The scale ranged from 0 (not at all) to 6 (very much), and the question was: "Did you do anything to improve/enhance the emotions you were feeling in this episode? If you did do anything to change your emotions, what did you do?". The participants were thus able to choose several emotion regulation strategies and rate them with different intensity (i.e. to what degree they agreed with the statements). Part three did also consist ofquestions about music listening (e.g. if music occurred in the episode or not, and if so, if the music affected them, how much they liked the music, and reasons for listening to the music). The fourth part of the questionnaire included the Positive And Negative Affect Schedule (PANAS) (Watson, Clark & Tellegen, 1988).

Procedure

Participants were recruited partly from the Psychology department of the University of Gothenburg, and partly from advertisements that were placed in different university departments in Gothenburg. The study was performed at the psychology department in Gothenburg. All participants did not participate at the same time. An envelope containing all the four parts of the questionnaire was given to them and they were told to follow the written instructions. The author was present at all times.

Statistics

The matched pair t test was used to analyse the differences between musical and non musical episodes (e.g. experienced emotions), and to distinguish emotional differences within musical episodes dependent on certain variables (e.g. choice of music and listening motive). The matched pair t-test was also applied when exploring the use of different emotion regulation strategies in musical episodes. An exploratory factor analysis with varimax rotation was used to downsize the 25 emotion regulation strategies into more comprehensible regulation factors. Correlational statistics (Pearson's r) were used to examine experienced emotions when using different emotion regulation strategy factors, and to explore the connection between stress, emotions, subjective well-being, and self-perceived health (DUKE). Regression analyses were performed to examine the relationship between music and stress and between music and health.

Results

Music occurred in 30 % of all the 2297 episodes. In 67 % of the episodes that contained music (i.e. musical episodes) the participants reported that the music had affected their emotions. The majority of the emotions experienced to music were positive. The emotions that were more commonly felt in musical episodes compared to non-musical episodes were love-tenderness, pleasure-enjoyment, nostalgia-longing, interest-expectancy, strong-energized, and inspired-stimulated. Further, happiness-elation, pleasure-enjoyment, nostalgia-longing, strong-energized and inspired-stimulated was experienced with more intensity during musical episodes than during non-musical episodes. Musical listening, "other activity" and having a meal were the most three most frequently reported main activities during musical episodes. In a little bit over half of all the musical episodes occurred when participants were at home. In 53 % of the musical episodes, someone else was present. The most frequently reported motives for music listening were to get energized, to relax, and to affect one's emotions. The participants chose the music themselves in 63 % of the musical episodes. An exploratory factor analysis with varimax rotation of the 25 items for emotion regulation strategies resulted in seven factors ('Reappraisal', 'Suppression', 'Music specific regulation', 'Distraction by activity', 'Changing circumstances', 'Social coping', and 'Other regulation'). The seventh factor, 'Other regulation', was not used because of its diverse nature. The most frequently used emotion regulation strategy factors in musical episodes were 'Reappraisal', 'Music specific regulation', and 'Social coping'. 'Music specific regulation' was significantly more often used in musical episodes than all the other regulation factors, except from 'Reappraisal'. However, Music specific regulation was used with more intensity than all the other factors in musical episodes. The results showed a significant positive correlation between how often 'Music specific regulation' was used and how intensively participants experienced positive emotions. How often 'Music specific regulation' had been used was negatively related to stress frequency and positively related to subjective well-being, but not significantly related to health. Frequency of music occurrence was negatively related to how often and how intensively stress was experienced. When the music was liked and self-chosen the effect was even stronger. Music occurrence was significantly related to the general and social health aspects of the DUKE, but not to the physical and mental health. Self-chosen and liked music was related to higher social and general health scores. The ten most commonly experienced emotions (happiness-elation, calm-contentment, interest-expectancy, attention-alert, inspired-stimulated, strong-energized, love-tenderness, pleasure-enjoyment, competent-skilled and tired-low energy) did all, independent of music or not, correlate positively with general health, except for competent-skilled and tired-low energy.

Study II

Aim

The main purpose of study II was to investigate the impact of everyday music on self-reported stress and emotions after particularly stressful everyday events. The following hypotheses were tested: 1) If music occurs in the episodes after the stress episode, the stress level will decrease more compared to if music does not occur; 2) If music occurs

participants will experience more positive emotions compared to if music does not occur; 3) The emotions experienced to music will mediate the level of stress; and 4) The use of "Music specific regulation" after the stress episode will be more or as effective as the other emotion regulation strategies.

Instruments

The study was based on the DRM questionnaire collected for study I (see Instruments Study I).

Procedure

To distinguish participants' particularly stressful events during their previous day, the complete set of the 2297 episodes from all participants were examined. The focus was on the question "How much stress did you experience during this episode?", which was asked in every episode. The response scale ranged from 0 (not at all) to 6 (very much), and a stressful episode (from here on referred to as the stress episode) was defined by scores of 5 or 6. For every stress episode (episode 2), the three following episodes (episodes 3, 4 and 5) were also taken into account to be able to study what happened after the stress episode. The episode before the stress episode (episode 1) was not used in any analyses.

Statistics

The independent-samples t test was used to examine differences in stress level after the stress episode dependent on music occurrence. It was also used to investigate the effect of using different emotion regulation strategy factors on stress. Matched pair t test were applied when exploring the differences of experienced emotions between musical and non musical episodes. A mediation analysis, in terms of a series of linear regression analyses, was made to examine the hypothesis that emotions evoked by music are mediating music's effect on stress. One-way analyses of variance and independent-samples t tests were applied when investigating other factors (i.e. liking of music, location, and feelings of control) that could influence the stress level when music occurred after the stress episode.

Results

Results of the independent-samples t tests showed that participants who listened to music during the episode after the stress episode (i.e. episode 3) reported lower levels of stress in both that particular episode and the next one (i.e. episode 4), compared to those who did not listen to music. The same pattern was seen when music occurred in the second episode after the stress episode (i.e. episode 4) and in the third episode after the stress episode (i.e. episode 5). This provides support for hypothesis 1. Positive emotions were experienced more frequently and intensively in the episodes after the stress episode when music occurred, compared to when music did not occur, which supports hypothesis 2. Location and feelings of control during the music listening situation seemed to affect the response to music in terms of stress. The participants' reported degree of liking of the music they were listening to in the episode after the

stress episode did also contribute to the level of stress in that episode and the next one. The more the liked the music the less stress they experienced. A mediation analysis showed that the effect of music on stress, when emotions are controlled for, is less than the effect of music alone on stress. Thus, the emotions experienced to music mediated the effect of music on stress. This gives support for hypothesis 3. Results showed that "Music specific regulation" was the second most frequently and the most intensively used emotion regulation strategy among those who listened to music in the episode after the stress episode. Further, although Music specific regulation was not the most effective emotion regulation strategy factors in regards to stress reduction, it did affect the stress level in episode 4 as much as the other emotion regulation factors did. This provides partial support for hypothesis 4.

Study III

Aim

The main aim with study III was to examine whether listening to preferred music is an effective way of reducing stress in everyday life and to compare the emotional responses, perceived levels of stress and cortisol levels to a control group who relaxed without music.

Instruments

The participants were instructed to fill out a daily questionnaire for three weeks' time (including weekends). The questionnaires involved ratings of current emotions (an eight item scale based on the Positive Affect Negative Affect Scale), perceived feelings of stress and control, the Perceived Stress Scale (PSS) (Cohen, 1983), and the impact part of the Symptoms of Illness Checklist (SIC) (Stowell, Hedges, Ghambaryan, Key & Block, 2009). To measure cortisol levels, saliva was collected using the Salivette system (Sarstedt, Newton, NC).

Procedure

The participants were recruited through an advertisement in a local paper (in swedish: Göteborgsposten), an advertisement in the Swedish union of teachers' newspaper (in Swedish: Lärarnas), and through contact with schools and other workplaces in the Gothenburg area. Since cortisol would be measured it was decided to solely use female participants due to the known gender differences in cortisol. The screening process excluded those who worked night shifts, did not work full time, would not work three weeks in a row during the study, smoked, consumed large amounts of coffee or other drinks high in caffeine, were pregnant, and those who took some prescription medicine (e.g. antidepressants). The selected participants were randomly assigned groups. Both groups received an email which said that they should contact the experimenter for a meeting at the Department of Psychology in Gothenburg. The participants in the experiment group were instructed to choose 20 pieces of music that they like to listen to – ten relaxing pieces and ten energizing pieces – and bring the music to the meeting (on a USB memory or CDs, or write a list so the experimenter could download the music from Itunes Store). At the meeting they were informed about the study and asked to fill

out the background questionnaire. The music that the participants in the experiment group had brought with them was transferred to the experimenter's computer. The music was later transferred onto two mp3-players (one with the relaxing music and one with the energizing music) after being reduced to approximately 30 minutes per mp3-player. The participants in the experiment group were informed that they were supposed to relax for half an hour every day when coming home from work, during the first week. At the end of that week they would receive an mp3-player by mail, with their own chosen music, which they would start listening to the following Monday. At the end of the second week of the study the second mp3-player would arrive by mail. The experiment group was told that they should listen to the music for 30 minutes per day, including weekends, when arriving home from work. They were instructed to preferably just sit down and listen to the music, but it was also acceptable to do some light housework (e.g. doing the dishes or preparing dinner). They were not allowed to watch TV during this time. The experiment group was randomly divided into two groups: one half of the group got to listen to their relaxing music the first music intervention week (i.e. week 2) and the energizing music the second music intervention week (i.e. week 3), and the other way around for the other half of the group. The participants in the control group were instructed to sit down and relax for half an hour every day when arriving home from work (including weekends) for three weeks' time. They were given instructions of how they could relax (e.g. knit, read a paper, meditate, or pet the cat) and of what they should not to do during the relaxation (e.g. listen to music, watch TV, play computer games, or lay down).

Both groups were instructed to leave samples of saliva each Thursday afternoon and evening and Friday morning to measure cortisol levels. Salivary cortisol was collected using the Salivette system (Sarstedt, Newton, NC) which involves chewing on a cotton role for about a minute. This was done six times each week: 1) before music listening/relaxation, 2) after the music listening/relaxation, 3) in the evening (before going to bed), 4) just as they woke up the next day (preferably still laying down in bed), 5) when getting out of bed, and 6) 45 minutes after getting out of bed. All the 18 plastic tubes containing the cotton roles were pre-labelled and placed in three labelled plastic zipper bags, one for each week, and the bags were placed in a cover along with the daily questionnaires. The saliva samples were stored in the participants' freezers until retrieved when the study had ended and thereafter stored in a freezer at the Department of Psychology in Gothenburg and later shipped to a laboratory in for analysis. Text messages were sent to the participants every Thursday morning and evening to remind them to leave cortisol samples.

Statistics

The independent-samples t test was used to examine differences in experienced emotions, perceived stress, reported SIC scores and different measures of cortisol between the groups. Matched pair t test was used to examine time changes within each group. Cortisol levels were analyzed in three ways: 1) area under the curve with respect to ground (AUCg) (Preussner, Kirschbaum, Meinlschmid & Hellhammer, 2003), 2) awakening cortisol (i.e. the mean value of the three morning samples), and 3) intervention effect (i.e. the value of the difference between the sample before music listening/relaxation and the sample after music listening/relaxation). A base 10

logarithmic transformation was used on the raw cortisol data prior to analysis. A 2 (week) x 2 (group) ANOVA was applied to examine the cortisol AUC change between groups. Correlational analyses (Pearson's r) were made to explore the associations between experienced emotions, perceived stress, SIC scores and cortisol level during music listening and relaxation. Fisher's Z-tests were used to compare the magnitude of the correlations between conditions. Two-way analysis of variance was applied when investigating

Results

Although no significant differences were found between the experiment group and the control group in either frequency or intensity of positive emotions during any week, a significant increase in intensity of positive emotions was found within the experiment group from the baseline week to both intervention weeks. No such increase was found within the control group. Although the experiment group scored significantly higher on the PSS than the control group during the baseline week, there was a significant decrease in PSS scores within the experiment group from the baseline week to the second intervention week. The control group's PSS scores did not decrease over time. The experiment group's cortisol AUC decreased significantly from the baseline week to the third week whereas the control group's cortisol AUC was relatively stable over time. No significant changes in intervention effect within the groups were found, nor were any significant differences in intervention effect between groups found. No significant changes in awakening cortisol were found between groups, however, the experiment group's awakening cortisol levels were significantly higher compared to the control group during the first intervention week.

Study IV

Aim

The main purpose of study IV was to explore the associations between personality and emotional responses to music and to examine whether there are any differences in these associations between musical and non-musical contexts. An additional aim was to explore the associations between personality and the use of different emotion regulation strategies and to examine whether any differences between musical and non-musical contexts exist. A final aim was to explore the associations between personality and perceived stress in musical contexts and compare them to the associations in non-musical contexts.

Instruments

Data from study I and study III were reanalyzed (see Instruments study I and study III). Personality was measured by the Ten Item Personality Inventory (TIPI) (Gosling, Rentfrow & Swann, 2003) in both studies.

Procedure

Data from study I and study III were reanalyzed with the focus on the associations between personality (i.e. scores on the TIPI) and emotional responses in musical and non-musical contexts. Dataset 1 consists of data from study I and dataset 2 consists of data from study III.

Statistics

Correlations were made separately for the musical and non-musical episodes (dataset 1) and for the music group (i.e. experiment group) and the control group (dataset 2) to explore the relationships between personality and experienced emotions, the relationships between personality and the use of emotion regulation strategies, and the relationship between personality and perceived stress levels. Fisher's Z-tests were computed to compare the magnitude of the correlations between episodes (dataset 1) and groups (dataset 2). Linear regression analyses were separately for musical and non-musical episodes (dataset 1) and for the experiment group and control group (dataset 2) to see whether personality could predict the intensity level of experienced emotions, the use of different emotion regulation strategies and perceived stress levels, and to see whether any differences in these relationships existed between episodes and between groups.

Results

As found in previous studies, positive emotions were positively correlated with Extraversion and Agreeableness in both datasets. There were no significant differences in the magnitude of the correlations between musical and non-musical episodes in dataset 1. In dataset 2, the only significant difference in the magnitude of the correlations between personality and emotions between groups was found between Neuroticism and intensity of positive emotions, where the control group's correlation coefficient was strongly negative whereas the experiment group's correlation was close to null. In terms of specific emotions, the correlation between Agreeableness and strong-energized was stronger in magnitude for the music group compared to the control group. Regression analyses in dataset 1 showed that intensity of positive emotions during musical episodes could not be predicted by personality. Regression analyses in dataset 2 showed that Extraversion and Agreeableness was positively related to how intensively the music group experienced positive and activational emotions during the intervention weeks.

In regards to the association between personality and emotion regulation strategies, there were no differences found in the magnitude of the correlations between musical and non-musical episodes. However, in dataset 2, the music group's positive correlation between Reappraisal and Neuroticism differed significantly from the control group's negative correlation. The results from regression analyses in dataset 1 showed that how intensively Music specific regulation had been used in musical episodes was negatively related to scores on Extraversion. In contrast, in dataset 2, regardless of group, personality could only explain a small part of the variance in how intensively of Music specific regulation ad been used during the intervention weeks. The results in dataset 2 did also show that scores on Agreeableness and Neuroticism increased the music group's use of Reappraisal and Suppression. The magnitude of the correlations

between stress intensity and personality did not differ between musical and non-musical episodes in dataset 1 nor did they differ between groups in dataset 2. Results from regression analyses in dataset 1 showed that Neuroticism increased stress intensity in both musical and non-musical episodes. In dataset 2, results from regression analyses showed that Neuroticism did only increase the music group's ratings on 'stress right now', whereas the control group's ratings on 'stress right now' did not seem to be affected by scores on Neuroticism.

Discussion

Implications of findings

Emotional responses to music

Results from study I showed that music occurred in about a third of all the 2297 episodes, which is in line with previous research of everyday music listening (Juslin, et al, 2008). This shows that music listening is a big part of the people's everyday lives. The participants reported to have experienced primarily positive emotions when music occurred in both study I and study II, which has been seen in previous studies (e.g. Juslin & Zentner, 2002; Gabrielsson, 2001). A few of the emotions more commonly felt in musical episodes than in non musical episodes were pleasure-enjoyment, nostalgia-longing, and inspired-stimulated. The same emotions, together with happiness-elation, were experienced more intensively when music occurred than when music did not occur. These emotions, among others, have been reported as frequent in previous studies of prevalence musical emotions (e.g. Juslin, et al, 2011).

In study III we hypothesized that music listening would evoke more positive emotions than relaxation and this was partially true. The experiment group and the control group did not differ in the experience of either frequency or intensity of positive emotions during any of the three weeks. However, a significant increase in intensity of positive emotions was found within the experiment group from the baseline week to both intervention weeks. Most importantly, no such increase of intensity of positive emotions was found for the control group. This indicated that listening to preferred music evokes more intense positive emotions than relaxation without music over time.

It is important to note that the relaxation without music was not based on any particular relaxation technique. The instructions were simply to sit down and relax for 30 minutes and not to listen to music, watch TV or play computer games during this time. The mere opportunity for the participants to take half an hour to relax, with or without music, every day for three weeks' time may have resulted in more positive emotions since it provided them with a break from everyday demands. However, since the results showed that the experiment group reported to have experienced more intense positive emotions during the weeks when they listened to their own chosen music compared to the baseline week when they relaxed without music, whereas the control group reported to have experienced positive emotions with the same intensity during all three weeks, points to that it probably was not just the mere opportunity to get some time alone that made them experience positive emotions more intensively – it was the music.

Emotion regulation

In study I the most common motives for music listening were to get energized, to relax, and to affect one's emotions. Using music to get energized or relaxed has been seen as common motives in previous research (e.g. Saariokallio & Erkkilä, 2007). The motive 'to affect one's emotions' is related to intentional emotion regulation. Studies have shown that using music to regulate emotions is one of the most important reasons why people listen to music (e.g. DeNora, 2000; Juslin & Laukka, 2004; Laukka, 2007; North et al., 2000; Saarikallo & Erkkilä, 2007; Sloboda & O'Neill, 2001; Wells & Hakanen, 1991). Saarikallio and Erkkilä (2007) showed that emotion regulation through music can be made in different ways (e.g. listen to music to evoke positive emotions, listen to music to distract oneself from undesirable thoughts, or listen to music to release anger).

To investigate if the participants in study I actively used music listening in their everyday lives to regulate their emotions, they were instructed to report how much they had used different emotion regulation strategies in every episode. An exploratory factor analysis of 25 emotion regulation strategies resulted in seven factors: 'Reappraisal', 'Suppression', 'Music specific regulation', 'Distraction by activity', 'Changing circumstances', 'Social support', and 'Other regulation'. 'Other regulation' was excluded because of its diverse nature. 'Music specific regulation' consisted of two strategies: 'I tried to enhance my emotions by listening to music' and 'I listened to music to improve my mood'. The first music-related strategy can be linked to Saarikallio and Erkillä's (2007) music-related strategies 'discharge' and 'strong sensation', and the second one is associated with their strategies 'entertainment' and 'solace'. The results from study I showed that 'Music specific regulation' was the second most frequently used emotion regulation strategy factor in musical episodes after 'Reappraisal' (refers here to trying to see things in a different way) which indicates that music listening was a common way to regulate emotions among the participants. Interestingly, the results showed that although 'Music specific regulation' was less often used compared to 'Reappraisal' in musical episodes, it was used with more intensity compared to all the other strategies. This may be a result of misinterpretation of the instructions which made the participants to report the occurrence of music in that particular episode (i.e. that a 6 on the scale that ranged from 0-6 was interpreted as 'yes' to occurrence of music), rather than their actual degree of active use of music for regulating purposes. Further, it can be discussed whether people actually are aware of which emotion regulation strategies they use since emotion regulation strategies can be both conscious and unconscious (Gross, 1998). The strategies involved in 'Reappraisal' (e.g. 'To feel more positive emotions I changed the way I was thinking') and 'Suppression' (e.g. 'I tried to distract myself') are more abstract than some of the other strategies (e.g. 'I went out to get some fresh air'). The question is therefore, is it even possible to measure unconscious emotion regulation strategies? Music listening as an emotion regulation strategy can be both conscious and unconscious. It is an active choice to listen to a piece of music that you think will cheer you up, but music may also have effects on emotions without being a conscious motive. The motive is unconscious, but the experience is conscious, which makes it possible for people to report their experiences. Saarikallio (2011) proposed that music may affect several phases of Gross's (2007) process model of emotion regulation (situation selection, situation modification, attention deployment, cognitive change, and response modulation) and that certain music-related emotion regulation strategies are related to certain phases. The

two strategies included in 'Music specific regulation' occurred late in the process since they involved improving or enhancing already existing emotions. Although more research on this area is needed, it seems plausible to place music-related strategies five phases. Situation selection might be choosing to go to places where certain music is being played (e.g. going to a concert with a favourite band). Situation modification could be immediately changing the song on the music device because it did not match the listener's motive for listening. Attention deployment might be listening to music to distract oneself from undesirable thoughts or tedious activities (e.g. listening to music while doing housework). Cognitive change could include what Saarikallio and Erkkilä (2007) called 'mental work', where music promotes insights and reappraisal of experiences. Response modulation may include listening to music to relax, to get energized or to release emotions.

How often participants in study I reported to have used "Music specific regulation" correlated positively with how often, and how intensively, they experienced positive emotions. As seen in both study I and II, and in previous research, music induces primarily positive emotions in listeners. The positive correlations between 'Music specific regulation' and positive emotions can be interpreted as the more the participants listened to music to regulate their emotions, the more positive emotions they experienced. On the other hand, there is also a possibility that it was the experience of positive emotions that influenced the preference for 'Music specific regulation' over of the other emotion regulation strategies, thus that the positive emotions resulted in a desire to keep that positive emotional state, or enhance it, by listening to music.

Perceived stress

The results from study I showed that music was negatively related to both frequency and intensity of perceived stress. The more often music occurred the less stress was experienced. When the music was liked and the participants' own choice, the effect of music on stress was even stronger, which is in line with previous research that has shown that it is important to consider musical preferences when studying responses to music (e.g. MacDonald, Mitchell, Dillon, Serpell, Davies & Ashley, 2003). Results from study II showed lower stress levels in the episodes after the stress episode when music occurred compared to when music did not occur. This means that everyday music listening may function as a stress relief after particularly stressful daily events. However, the interpretation might be affected of the use of one-tailed significant tests.

The results from study II revealed connections between music and stress, and between music and positive emotions. It is known that the experience of positive emotions have health beneficial effects (Fredrickson, 2001). The question of interest was therefore: do the positive emotions induced by the music mediate the effect of music on stress? A series of regression analysis confirmed that they did. This means that music evokes mostly positive emotions in listeners, which in turn have a positive effect on stress. Thus, it is the positive emotions experienced to music that leads to less stress.

In study III, a time change was found within the experiment group as their scores on the PSS decreased significantly from the baseline week to the second intervention week (but not to the first intervention week). And most importantly, this decrease in PSS scores was not found within the control group. This might indicate that by actively listen to one's own chosen music when arriving home from work every day for a few minutes will eventually lead to experiencing less stress. However, it is crucial to

consider the possibility that the time effect is a result of regression to the mean since the experiment group's PSS scores were significantly higher compared to the control group during the baseline week.

Cortisol

In study III, cortisol levels were analyzed in three ways: cortisol AUC, awakening cortisol and intervention effect. The results showed that the experiment group's cortisol AUC decreased significantly from the baseline week to the second intervention week whereas the control group's cortisol AUC remained at the same level throughout the study. While there was no changes in awakening cortisol levels within the groups there was a significant difference between the groups during the first intervention week, where the experiment group's awakening cortisol level was higher than the control group. There were no significant differences in cortisol intervention effect between the groups or within groups. The experiment group's decrease of cortisol AUC may be a result of regression to the mean because of their high levels of cortisol AUC during the baseline week. However, since there was a decrease in both PSS scores and cortisol AUC from the baseline week to the second intervention week, and no such change was observed within the control group, this indicates that listening to one's preferred music is a more effective way of decreasing cortisol levels than to relax without music.

Even though the experiment group's cortisol AUC seemed to decrease over time, as well as their scores on the PSS, there was no such change over time in awakening cortisol and intervention effect. This could be explained by the fact that the association between salivary cortisol and perceived stress is not always clear. Several factors (biological, psychological and methodological) contribute to the limited covariance between psychological stress and salivary cortisol (see Hellhammer, Wüst & Kudielka, 2008). However, according to Hellhammer at al salivary cortisol is a useful measure of stress as long as the sources of variance are considered. Finally, it is worth noting that although salivary cortisol is a widely used biomarker of psychological stress there are other ways of measuring the physiological aspects of stress (e.g. blood pressure, heart rate, pulse wave velocity, respiration rate, catecholamine levels) (see Baum, Grunberg & Singer, 1982).

Health

In study I, music was related to higher general health scores (the sum of the physical, mental, and social health scores), and to the social aspect of the DUKE, but not to the physical and mental health aspects. General health was measured by a shortened version of the DUKE (Parkerson, et al., 1990). The removed questions from the original DUKE were "Today would you have any physical trouble or difficulty: 8) Walking up a flight of stairs?; and 9) Running the length of a football field?" which are supposed to be a part of the physical health score of the DUKE. However, the author believed that those two questions involved speculation of health rather than actual perception of physical health. People's beliefs about their physical fitness may differ from actual fitness. The three remaining questions involved in the physical health score concerned perception of real life experiences during the past week: sleep quality, pain perception, and feelings of fatigue. The DUKE's general health score consists of sum of the physical, the mental,

and the social health scores, which indicates that the general health score measures health as it is defined by the WHO[2].

In study III, health was measured by the impact version of the Symptoms of Illness Checklist (SIC) and it was included in the daily questionnaire. The impact version of the SIC is supposed to measure to what extent different physical complaints (e.g. sore throat, back problems, abdominal pain, fever) affect the daily activities. People do not experience physical complaints in the exact same way. Even though the SIC is not intended to be used on a daily basis, it is a good indicator of how the participants perceived their physical health each day. The results showed a decrease in SIC scores within the experiment group from the baseline week to the intervention weeks. While this is an interesting result, the same decrease was seen for the control group, which indicates that it might not have been the music in itself that caused the decreased SIC scores but the relaxation incorporated with the intervention. Not everyone is able to take half an hour to themselves after work to relax, so just the mere opportunity to escape the daily demands (e.g. housework, child care, problems with spouse, or work related stress) for a while could have led to the experience of less stress and more positive emotions and thereby having more resources for coping with physical health problems.

Individual and situational factors

The results from study II revealed some factors that influenced the responses to the music: location, amount of perceived feelings of control during the music listening situation, and degree of liking of the music. In terms of stress reduction, it was more effective to listen to music "somewhere else" than "at home" after the stress episode. This might seem surprising since previous research has shown that people listen to music mostly at home (e.g. North, Hargreaves & Hargreaves, 2004). It could be explained by the fact that the question of the participants' location in the episodes only had three response alternatives ('at home', 'at work', and 'somewhere else'), and therefore can 'somewhere else' involve a variety of locations. This result might also be explained by that other factors in the home environment may have interrupted the music's stress reducing effect (e.g. a fight with one's partner, or stressful preparations for the next day). However, due to the availability of portable music devices it does not seem surprising that people use music in all kinds of situation in their everyday lives (e.g. while shopping or commuting) which can result in more positive emotions and thereby less feelings of stress in situations that ordinarily would have been stressful or tedious.

The stress reduction due to high levels of control when listening to music may have been a result of the high levels of perceived control alone and had little to do with the music. Another possible explanation is that it was the positive emotions, evoked by the music, that together with the high feelings of control that lead to lower levels of stress.

---

[2] 'a state of complete physical, mental, and social well-being and not merely the absence of disease, or infirmity'.

The fact that the degree of liking of the music affected the level of stress after music listening was not all that surprising since previous studies have found that music preferences are of great importance when looking at responses to music (e.g. Mitchell, MacDonald, Knussen & Serpell 2007). Additionally, in study I, self-chosen and liked music was related to less stress but also to higher social and general health scores on the DUKE, which further points to the importance of being able to choose the music yourself and to listen to music that you prefer. Studies have shown that listening to preferred music gives other results than listening to music selected by the experimenter (e.g. Juslin, et al, 2008; Labbé, 2007). The importance of considering musical preferences when studying emotional responses to music is the reason why the experiment group in study III got to choose their own preferred music.

Personality and emotions

Some of the findings in study IV replicated results found in previous studies of the relationship between personality and emotions in musical and non-musical contexts. In dataset 1 there were no significant differences in the magnitude of the correlations between personality and positive emotions between musical and non-musical episodes. The only significant difference in magnitude of the correlation in dataset 2 was found between Neuroticism and intensity of positive emotions, where the control group's correlation coefficient was strongly negative whereas the experiment group's was close to null. This result indicates that there is a possibility that Neuroticism is more related to emotions in non-musical contexts than in musical contexts. Regression analyses showed that, in dataset 1, Neuroticism was positively related to how intensively negative emotions were experienced in both musical non-musical episodes, which is in line with previous research in both musical contexts (Liljeström, 2011) and non-musical contexts (McCrae & Costa, 1991). However, intensity of positive emotions during musical episodes could not be predicted by personality. This could be explained by that there are other factors that have a greater impact on the variance in positive emotions experienced in musical episodes than personality. In dataset 2, regression analyses showed that Extraversion and Agreeableness was positively related to how intensively the experiment group experienced positive and activational emotions during the intervention weeks. This may be linked to Ladinig and Schellenberg's (2011) suggestion that people high on Agreeableness experience emotions to music more strongly because of their ability to emphasize in emotional situations.

Personality and emotion regulation

In dataset 1, the magnitude of the correlations between personality and reported use of different emotion regulation strategies did not differ between musical and non-musical episodes. In dataset 2, however, the music group's positive correlation between Reappraisal and Neuroticism differ significantly from the control group's negative correlation between Reappraisal and Neuroticism, which could be interpreted as that participants scoring high on Neuroticism who listened to music were more likely to use Reappraisal to regulate their emotions, whereas participants scoring high on Neuroticism but did not listened to music were less likely to use Reappraisal. The music listening may have made them rethink things, in other words, reappraise the situation.

This can be linked to Saarikallio and Erkkilä's (2007) music-related emotion regulation strategy 'mental work' in which music is believed to promote insights and reappraisal of experiences. How intensively Music specific regulation had been used in musical episodes was negatively related to scores on Extraversion in dataset 1. This means that the more introverted a participant perceive him or herself to be the more likely he or she was to use the music he or she listened to in the episode to enhance or improve his or her emotions, or to deliberately choose to listen to music for the purpose of regulating his or her emotions. It is probably more likely for people on the high end of Extraversion to regulate their emotions by involving themselves in social situations (which of course can include music listening but the music listening may be a part of the main activity), whereas it is probably more likely for people on low end of Extraversion to listen to music in their own privacy to regulate their emotions because of their tendency to prefer to spend time alone. However, more research is needed to be able to make any further assumptions regarding this. It is important to note is that personality did not seem to influence the use of Music specific regulation in dataset 2. How intensively the participants, regardless of group, used music to improve or enhance their emotions during the intervention weeks did not seem to have anything to do with their personalities. This inclines that there are other factors besides personality that influence why people use music listening to regulate their emotions.

Personality and stress

There were no significant differences in the magnitude of the correlations between personality and stress intensity between the music group and the control group or between musical and non-musical episodes which can be interpreted as that the relationship between stress and personality does not differ in musical and non-musical contexts. Neuroticism increased the stress intensity in both musical and non-musical episodes in dataset 1, which has been found in previous research (Hemenover & Dienstbier, 1996), but in dataset 2 Neuroticism did only increase the music group's stress intensity. It possible that the mere situation of being forced listen to music – that may not fit their current mood at that particular moment although the music was their own choice – for 30 minutes every day may have caused the participants to experience less positive emotions than they usually experience to that music, or even that it evoked negative emotions because of the situation, and thereby increased the perceived stress level. When adding this unusual situation of being forced to listen to music every day to a tendency of being tense, hostile and anxious, as individuals on the high end of Neuroticism tend to be, it may very well cause more stress.

Limitations

In study I and II perceived level of stress consisted of one single question: "How stressed did you feel during this episode?". We are aware of the risk of missing out on some aspects of the term stress by not using more than one question. Another disadvantage in this way of measuring stress is that the participants' definition of stress may differ from each other and/or differ from the researchers' definition of stress and

thereby is it not clear if stress really is the measured variable. However, since the participants were asked to fill out one questionnaire per episode (the number of episodes per participant ranged from 3 to 21) in the DRM questionnaire the amount of questions would have been overbearing if even more questions would have been added, and that could have resulted in less attentive participation. Moreover, in study I, a shortened version of the DUKE health profile was used. There are disadvantages with not using the original DUKE health profile. First, the results may not be comparable to other studies using the DUKE as a measure of health. Second, by removing two of the questions involving physical health some aspects of physical health might have been ignored.

In study III the participants got to choose their own preferred music. This does not automatically mean that the music they chose always will evoke the exact same emotions in them. There are other individual factors, as well as situational factors, to be considered when studying responses to music. Moreover, there is also a risk that the participants got tired of listening to the same playlist seven days in a row and that might have caused them to experience less positive emotions or even negative emotions to the music. The non-significant time effect of positive emotions and perceived stress for the control group might be a result of their negative reaction to being forced to sit down and relax for half an hour everyday which may have caused them to experience more stress. Another issue with study III is that the participants in the experiment group were told to bring music that made them relaxed and this may have resulted in that they reported lower levels of stress and more intense positive emotions during the week they listened to their relaxing music due to demand characteristics. However, the energizing music was used to control for this.

In study IV, the main focus was on the associations between personality and emotional responses to music. Data from study I and III was used and personality had been measured by the Ten Item Personality Inventory (TIPI) (Gosling, et al, 2003) in both studies. There are more reliable ways of measuring personality (e.g. NEO-Pi-R, BFI), although the TIPI it is supposed to be a good short measure of the Big Five personality traits (Gosling, et al, 2003) when the time is limited.

Finally, it is important to note that the sampling of participants may limit the generalizability of the studies. Study I, II and IV were based on 207 participants' reported musical and non-musical episodes. The majority of the participants were students which makes it difficult to generalize the results to the Swedish population. In study III (and partly study IV) the participants were all women in the ages of 25-45 and 39 % were teachers. The reason why only female participants were included in the study was to avoid the known gender differences in cortisol. However, since contraceptives and menstrual cycles affect the cortisol level it is possible that it would have been better to only include male participants. The choice to advertise in the Swedish union of teachers' newspaper (Lärarnas) and to contact schools in the Gothenburg area was made because the author believed that teaching is a stressful occupation and that it would be fruitful to include those who could need ways of reducing stress in their everyday lives. However, these choices make it difficult to generalize the results to the whole population.

Final conclusion

In brief, study I showed that music occurred in a third of all the episodes and that the majority of the emotions experienced to music were positive. Music was related to lower stress and higher general and social health scores. Liked and self-chosen music was linked to both stress and health. Study II showed that when music occurred after the stress episode, positive emotions were more frequently and intensively experienced and stress levels was lower, compared to when music did not occur. A mediation analysis showed that the emotions experienced to music mediated the effect of music on stress. Study III showed that listening to one's preferred music increases the experience of positive emotions, and decreases the perceived level of stress and cortisol levels (AUC) over time, whereas relaxation without music did not have the same effect. Study IV showed that the association between personality and positive emotions, personality and stress, and personality and the use of emotion regulation in musical contexts differed between the two datasets and that only few differences in these associations were found between musical and non-musical contexts.

Overall, the results from this thesis indicate that everyday music listening is an effective and easy way to improve well-being and health by its ability to evoke positive emotions and thereby reduce stress. But not just any music will do, it is more effective when the music is liked and self-chosen. It seems like self-rated personality (i.e. the Big Five personality dimensions measured by the TIPI) is not the main contributor to the emotional responses to music and that other individual factors, as well as situational factors, may be better predictors.

References

Allen, K., & Blascovich, J. (1994). Effects of music on cardiovascular reactivity among surgeons. *Journal of Applied Social Psychology, 21,* 156-171. doi: 10.1001/jama.1994.03520110062030.

Barrett, L. F., & Barrett, D. J. (2001). An introduction to computerized experience sampling in psychology. *Social Science Computer Review, 19,* 175-185. doi: 10.1177/089443930101900204.

Baum, A., Grunberg, N. E., & Singer, J. E. (1982). The use of psychological and neuroendocrinological measurements in the study of stress. Health Psychology, 1(3), 217-236. doi: 10.1037/0278-6133.1.3.217.

Baumgartner, H. (1992). Remembrance of things past: Music, autobiographical memory, and emotion. *Advances in Consumer Research, 19,* 613-620.

Behne, K. E. (1997). The development of 'musikerleben' in adolescence: How and why young people listen to music. In I. Deliége & J. A. Sloboda (Eds.), *Perception and cognition of music* (pp. 143-159). Hove, UK: Psychology Press.

Berlyne, D. E. (1971). *Aesthetics and psychobiology.* New York: Appleton Century Crofts.

Blood, A. J., & Zatorre, R. J. (2001). Intensely pleasurable responses to music correlate with activity in brain regions implicated in reward and emotion. *Proceedings of National Academy of Sciences, 98,* 11818-11823. doi: 10.1073/pnas.191355898.

Brannon, L., & Feist, P. (2010). *Health Psychology: An Introduction to Behaviour and Health*. Belmont, Calif: Wadsworth.

Carlsen, J. C. (1981). Some factors which influence melodic expectancy. *Psychomusicology, 1,* 12-29.

Cohen, S., Kamarck, t., & Mermelstein, R (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24,* 388-396. doi: 10.2307/2136404.

Conner Christensen, T., Barrett, L. F., Bliss-Moreau, E., Lebo, K., & Kaschub, C. (2003). A practical guide to experience-sampling procedures. *Journal of Happiness Studies, 4,* 53-78. doi: 10.1023/A:1023609306024.

DeNora, T. (2000). *Music in everyday life.* Cambridge: Cambridge University Press. doi: 10.1017/CBO9780511489433.

Diener, E. (1985). The satisfaction with life scale. *Journal of Personality Assessment.49*(1). doi: 71-75. 10.1207/s15327752jpa4901_13.

Ekman, P. (1992). An argument for basic emotions. *Cognition & Emotion, 6,* 169-200. doi: 10.1080/02699939208411068.

Evers, S., & Suhr, B. (2000). Changes of the neurotransmitter serotonin but not of hormones during short time music perception. *European Archives of Psychiatry and Clinical Neuroscience, 250,* 144-7. doi: 10.1007/s004060070031

Flaten, M. A., Åsli, O., & Simonsen, T. (2006). The effects of stress on absorption of acetaminophen. *Psychopharmacology, 185,* 471-478. doi: 10.1007/s00213-006-0324-4.

Fredrickson, B. L. (2001). The role of positive emotions in positive psychology: the broaden-and build theory of positive emotions. *American Psychologist, 56,* 218-226. doi: 10.1037/0003-066X.56.3.218.

Fried, R., & Berkowitz, L. (1979). Music that charms…and can influence helpfulness. *Journal of Applied Social Psychology, 9,* 199-208. doi:10.1111/j.1559-1816.1979.tb02706.x.

Frijda, N. H. (1999). Emotions and hedonic experience. In D. Kahneman, E. Diener, & N. Schwarz (Eds.), *Well-being: The foundations of hedonic psychology* (pp. 190-210). New York: Sage.

Gabrielsson, A. (2001). Emotions in strong experiences with music. In P. N. Juslin & J. A. Sloboda (Eds.), *Music and emotion: Theory and research* (pp. 431-449). New York: Oxford University Press.

Gabrielsson, A. (2002). Emotion perceived and emotion felt: same or different? *Musicae Scientiae. Special Issue 2001-2002,* 123-147.

Gomez, P., & Danuser, B. (2007). Relationships between musical structure and psychophysiological measures of emotion. *Emotion, 7,* 377-387. doi: 10.1037/1528-3542.7.2.377

Gosling, S. D., Rentfrow, P. J., & Swann, W. B. (2003). A very brief measure of the Big-Five personality domains. *Journal of Research in Personality, 37*, 504-528. *Research in Personality 37*(6), 504-528. doi: 10.1016/S0092-6566(03)00046-1.

Gross, J. J. (1998). Antecedent- and response-focused emotion regulation. Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology, 74,* 224-237. doi: 10.1037/0022-3514.74.1.224.

Gross, J. J. (2008). Emotion regulation. In M. Lewis, J. M. Haviland-Jones, & L.F. Barrett (Eds.), *Handbook of emotions* (3rd ed.) (pp. 497-512). New York: The Guilford Press.

Gross J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology, 85*(2), 348–362. doi: 10.1037/0022-3514.85.2.348.

Hanser, S. B. (2010). Music, health and well-being. In P. N. Juslin & Sloboda, J. (Eds.), *Handbook of Music and Emotion: Theory, Research, Applications* (pp. 849-877). New York: Oxford University Press.

Hemenover, S. H., & Dienstbier, R. A. (1996). Prediction of stress appraisals from mastery, extraversion, neuroticism, and general appraisal tendencies. *Motivation and Emotion, 20*(4), 299-317. doi: 10.1007/BF02856520.

Ice, G. H., Katz-Stein, A., Himes, J., & Kane, R. L. (2004). Diurnal cycles of salivary cortisol in older adults. P*sychoneuroendocrinology, 29*(3), 355-370. doi: 10.1016/S0306-4530(03)00034-9.

Iwanaga, M., & Moroki, Y. (1999). Subjective and physiological responses to music stimuli controlled over activity and preference. *Journal of Music Therapy, 36,* 26-38.

John, O. P. & Gross, J. J. (2004). Healthy and unhealthy emotion regulation: personality processes, individual differences, and life-span development. *Journal of Personality, 72*(6), 1301-1333. doi: 10.1111/j.1467-6494.2004.00298.x.

Johnson-Laird, P. N., & Oatley, K. (1992). Basic emotions, rationality, and folk theory. *Cognition & Emotion, 6,* 201-223. doi: 10.1080/02699939208411069.

Juslin, P. N. (2001). Communicating emotion in music performance: A review and a theoretical framework. In P. N. Juslin & J. A. Sloboda (Eds.), *Music and emotion: Theory and research* (pp. 309-337). New York: Oxford University Press.

Juslin, P. N., & Laukka, P. (2003). Communication of emotions in vocal expression and music performance: Different channels, same code? *Psychological Bulletin, 129,* 770-814. doi: 10.1037/0033-2909.129.5.770.

Juslin, P. N., & 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,* 217-238. doi: 10.1080/0929821042000317813.

Juslin, P. N., Laukka, P., Liljeström, S., Västfjäll, D., & Lundqvist, L.-O. (in press). *A survey study of emotional reactions to music in everyday life*. Manuscript submitted for publication.

Juslin, P. N., & Västfjäll, D. (2008). Emotional responses to music: The need to consider underlying mechanisms. *Behavioral and Brain Sciences, 31,* 559-575.

Juslin, P. N., & Zentner, M. R. (2002). Current trends in the study of music and emotion: Overture. *Musicae Scientiae, Special Issue 2001-2002,* 3-21.

Jørgensen, H. (1988). *Musikkopplevelsens psykologi* [*The psychology of music experience*].Oslo: Norsk Musikforlag.

Kahneman, D., Krueger, A. B., Schkade, D., Schwarz, N., & Stone, A. A. (2004). A Survey method for characterizing daily life experience: the day reconstruction method. *Science, 306*(5702), 1776-1780. doi: 10.1126/science.1103572.

Kemeny, M. E., & Shestyuk, A. (2010). Emotions, the neuroendocrine and immune systems, and health. In M. Lewis, J. M. Haviland-Jones & L. Feldman Barrett

(Eds.), *Handbook of Emotions* (3rd ed.) (pp. 661-675). New York: The Guilford Press.

Khalfa, S., Bella, S. D., Roy, M., Peretz, I., & Lupien, S. I. (2003). Effects of relaxing music on salivary cortisol level after psychological stress, *Annals New York Academy of Sciences, 999*, 374-376. doi: 10.1196/annals.1284.045.

Koelsch, S., Fuermetz, J., Sack, U., Baur, K., Hohenadel, M., Wiegel, M., Kaisers, U. X., & Heinke, W. (2011). Effects of music listening on cortisol levels and propofol consumption during spinal anesthesia. *Frontiers in Psychology, 58*(2). doi: 10.3389/fpsyg.2011.00058.

Konecni, V. J. (2003). Review of P. N. Juslin and J. A. Sloboda (Eds.), 'Music and Emotion: Theory and Research.' *Music Perception, 20*, 332-341.

Krout, R. E. (2007). Music listening to facilitate relaxation and promote wellness: integrated aspects of our neurophysiological responses to music. *The Arts in Psychotherapy, 34*, 134-141. doi: 10.1016/j.aip.2006.11.001.

Krumhansl, C., Louhivuori, J., Toiviainen, P., Järvinen, T., & Eerola, T. (1999). Melodic expectation in Finnish spiritual folk hymns: Convergence of statistical, behavioral, and computational approaches. *Music Perception, 17*, 151-195.

Kudielka, B. M., Hellhammer, D. H., & Wust, S. (2009). Why do we respond so differently? Reviewing determinants of salivary cortisol responses to challenge. *Psychoneuroendocrinology, 34*, 2-18. doi: 10.1016/j.psyneuen.2008.10.004.

Labbé, E., Schmidt, N., Babin, J., & Pharr, M. (2007). Coping with stress: the effectiveness with different types of music. *Applied Psychophysiology and Biofeedback, 32*, 163-168. doi: 10.1007/s10484-007-9043-9.

Ladinig, O., & Schellenberg, G. E. (2011, July). Liking unfamiliar music: effects of felt emotion and individual differences. *Psychology of Aesthetics, Creativity and the Arts*. Advanced online publication. doi: 10.1037/a0024671.

Laukka, Petri (2007). Uses of music and psychological well-being among the elderly. *Journal of Happiness Studies, 8*, 215-241. doi: 10.1007/s10902-006-9024-3.

Lehmann, A. C. (1997). Affective responses to everyday life and music listening. *Psychology of Music, 25*, 84-90. doi: 10.1177/0305735697251007.

Lerdahl, F., & Jackendoff, R. (1983). *A generative theory of tonal music.* Cambridge, MA: MIT Press.

Liljeström, S. (2011). Emotional reactions to music: prevalence and contributing factors. Dissertation. Uppsala University. Department of Psychology.

Lovallo, W. R. (2005). *Stress and Health: Biological and psychological interactions* (2nd ed.). Thousand Oaks, CA, US: Sage Publications, Inc.

Lovibond, S.H., & Lovibond, P.F. (1995). *Manual for the Depression Anxiety Stress Scales.* Sydney: Psychology Foundation.

MacDonald, R. A. R., Mitchell, L. A., Dillon, T., Serpell, M. G., Davies, J. B., & Ashley, E. A. (2003). An empirical investigation of the anxiolytic and pain reducing effects of music. *Psychology of Music, 31*(2), 187-203. doi: 10.1177/0305735603031002294.

McCaffery, M. (1990). Nursing approaches to nonpharmacological pain control. *International Journal of Nursing Studies, 27*, 1-5. doi: 10.1016/0020-7489(90)90018-E.

McCrae, R. R., & Costa, P. T. (1987). Validation of the five-factor model of personality across instruments and observers. *Journal of Personality and Social Psychology, 52*(1), 81-90. doi: 10.1037/0022-3514.52.1.81.

McCrae, R. R., & Costa, P. T. (1991). Adding liebe and arbeit: the full five-factor model and well-being. *Personality and Social Psychology Bulletin 17*(2), 227-232. doi: 10.1177/014616729101700217.

Menon, V., Levitin, D. (2005). The rewards of music listening: response and physiological connectivity of mesolimbic system. *Neuroimage, 28*, 175-184. doi: 10.1016/j.neuroimage.2005.05.053.

Miron-Shatz, T., Stone, A., & Kahneman, D. (2009). Memories of yesterday's emotions: Does the valence of experience affect the memory-experience gap? *Emotion. 9*(6), 885-891. doi: 10.1037/a0017823.

Mitchell, L. A., MacDonald, R. A. R., Knussen, C., & Serpell, M. G. (2007). A survey investigation of the effects of music listening on chronic pain. *Psychology of Music, 35*(1), 37-57. doi: 10.1177/0305735607068887.

Mitchell & Jolley (2004) *Research Design Explained* (5th ed). Belmont, CA: Wadsworth Publishing Company.

Neumann, R., & Strack, F. (2000). Mood contagion: The automatic transfer of mood between persons. *Journal of Personality and Social Psychology, 79*, 211-223. doi: 10.1037/0022-3514.79.2.211.

North, A. C., & Hargreaves, D. J. (1997). Experimental aesthetics and everyday music listening. In A. C. North & D. J. Hargreaves (Eds.), *The Social Psychology of Music* (pp. 84-103). New York: Oxford University Press.

North, A. C., Hargreaves, D. J., & Hargreaves, J. J. (2004). Uses of music in everyday life. *Music Perception, 22*(1), 41-77. doi: 10.1525/mp.2004.22.1.41.

North, A. C., Hargreaves, D. J., & O'Neill, S. A. (2000). The importance of music to adolescents. *British Journal of Educational Psychology, 70*, 255-272. doi: 10.1348/000709900158083.

North, A. C., Tarrant, M., & Hargreaves, D. J. (2004). The effects of music on helping behavior: A field study. *Environment and Behavior, 36*, 266-275. doi: 10.1177/0013916503256263.

Oatley, K. & Jenkins, J. M. (1996). *Understanding emotions*. Cambridge, MA: Blackwell.

Parkerson, Broadhead & Tse, (1990). The Duke Health Profile: A 17-item measure of health and dysfunction. *Medical care, 28*(11). 1056 -1072. doi: 10.1097/00005650-199011000-00007.

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

Penley, J. A., & Tomaka, J. (2002). Associations among the big-five, emotional responses, and coping with acute stress. *Personality and Individual Differences 32*(7), 1215-1228. doi: 10.1016/S0191-8869(01)00087-3.

Preussner, J. C., Kirschbaum, C., Meinlschmid, G., & Hellhammer, D. H. (2003). Two formulas for computation of the area under the curve represent measures of total hormone concentration versus time-dependent change. *Psychoendocrinology, 28*, 916-931. doi: 10.1016/S0306-4530(02)00108-7.

Ready, R. E., Weinberger, M. I., & Jones, K. M. (2007). How happy have you felt lately? Two diary studies of emotion recall in older and younger adults. *Cognition & Emotion, 21*, 728-757. doi: 10.1080/02699930600948269.

Rentfrow & Gosling (2003). The do re mi's of everyday life: the structure and personality correlates of music preferences. *Journal of Personality and Social Psychology, 84*(6), 1236-1256. doi: 10.1037/0022-3514.84.6.1236.

Roe, K. (1985). Swedish youth and music: Listening patterns and motivations. *Communication Research, 12*, 353-362. doi: 10.1177/009365085012003007.
Saarikallo, S., & Erkkilä, J. (2007). The role of music in adolescents' mood regulation. *Psychology of Music, 35*(1), 88-109. doi: 10.1177/0305735607068889
Scherer, K. R. (2000). Psychological models of emotion. In J. Borod (Ed.), *The neuropsychology of emotion* (pp. 137-162). New York: Oxford University Press.
Schlotz, W., Schulz, P., Hellhammer, J., Stone, A., & Hellhammer, D. H. (2006). Trait anxiety moderates the impact of performance pressure on salivary cortisol in everyday life. *Psychoneuroendocrinology, 31*, 459-472. doi: 10.1016/j.psyneuen.2005.11.003.
Sloboda, J. A. (1992). Empirical studies of emotional response to music. In M. Riess-Jones, & S. Holleran (Eds.), *Cognitive bases of musical communication* (pp. 33-46). Washington, DC: American Psychological Association. doi: 10.1037/10104-003.
Sloboda, J. A., & O'Neill, S. A. (2001). Emotions in everyday listening to music. In P. N. Juslin & J. A. Sloboda (Eds.), *Music and emotion: Theory and research* (pp. 415-430). New York: Oxford University Press.
Sloboda, J. A., O'Neill, S. A., & Ivaldi, A. (2001). Functions of music in everyday life: an exploratory study using the Experience Sampling Method. *Musicae scientiae, 5*, 9-32.
Smyth, J. M., Ockenfels, M. C., Gorin, A. A., Catley, D., Porter, L. S., Kirchbaum, C., Hellhammer, D. H., & Stone, A. A. (1997). Individual differences in the diurnal cycle of cortisol. *Psychoneuroendocrinology, 22*(2), 89-115. doi: 10.1016/S0306-4530(96)00039-X.
Sonnentaug, S. (2007). The recovery experience questionnaire: development and validation of a measure for assessing recuperation and unwinding from work. *Journal of Occupational Health Psychology, 12*(3), 204-221. doi: 10.1037/1076-8998.12.3.204.
Steinbeis, N., Koelsch, S., & Sloboda, J. A. (2006). The role of harmonic expectancy violations in musical emotions: Evidence from subjective, physiological, and neural responses. *Journal of Cognitive Neuroscience, 18*, 1380-1393. doi: 10.1162/jocn.2006.18.8.1380.
Steptoe, A (1997) Stress and disease. In Baum, A. and Newman, S. and Weinman, J. & West, RAM, C. (Eds.) *Cambridge Handbook of Psychology, Health and Medicine* (pp. 174-177). Cambridge University Press: Cambridge
Stowell, J. R., Hedges, D. W., Ghambaryan, A., Key, C., & Bloch, G. J. (2009). Validation of the symptoms of illness checklist (SIC) as a tool for health psychology research. *Journal of Health Psychology, 14*(1), 68-77. doi: 10.1177/1359105308097947.
Thayer, R. E., Newman, R., & McClain, M. E. (1994). Self-regulation of mood: strategies for changing a bad mood, raising energy, and reducing tension. *Journal of Personality and Social Psychology, 67*(5), 910-925. doi: 10.1037/0022-3514.67.5.910
Vissner, P. S., Krosnick, J. A., & Lavrakas, P. J. (2000). Survey research. In H. T. Reis & C. M. Judd (Eds.), *Handbook of research methods in social and personality psychology* (pp. 223-252). Cambridge, UK: Cambridge University Press.
Västfjäll, D. (2002). A review of the musical mood induction procedure. *Musicae Scientiae Special Issue 2001-2002,* 173-211.

Watson, D. & Clark, L. A. (1992). On traits and temperament: general and specific factors of emotional experience and their relation to the five-factor model. *Journal of Personality, 60*(2), 441-476. doi: 10.1111/j.1467-6494.1992.tb00980.x

Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: the PANAS scales. *Journal of Personality and Social Psychology, 54*(6), 1063-1070. doi: 10.1037/0022-3514.54.6.1063.

Wells, A., & Hakanen, E. A. (1991). The emotional uses of popular music by adolescents. *Journalism Quarterly, 68,* 445-454.

Wheeler, B. (1985). Relationship of personal characteristics to mood and enjoyment after hearing live and recorded music and to musical taste. *Psychology of Music, 13,* 81-92. doi: 10.1177/0305735685132002.

Wilson, K., & Gullone, E. (1999). The relationship between personality and affect over the lifespan. *Personality and Individual Differences 27*(6), 1141-1156. doi: 10.1016/S0191-8869(99)00058-6.

Witvliet, C. V. O, & Vrana, S. R. (2007). Play it again Sam: Repeated exposure to emotionally evocative music polarises liking and smiling responses, and influences other affective reports, facial EMG, and heart rate. *Cognition and Emotion, 21,* 3-25. doi: 10.1080/02699930601000672.

Zentner, M. R., Grandjean, D., Scherer, K. R. (2008). Emotions evoked by the sound of music: Differentiation, classification, and measurement. *Emotion, 8,* 494-521. doi: 10.1037/1528-3542.8.4.494.

Zentner, M. R., Meylan, S., & Scherer, K. R. (2000). Exploring musical emotions across five genres of music. In P. N. Juslin & M. R. Zentner (Eds.), Current trends in the study of music and emotion: Overture. *Musicae Scientiae, Special Issue 2001-2002,* 3-21.