Affective responses to music in depressed individuals

Aesthetic judgments, emotions, and the impact of music-evoked autobiographical memories

LAURA STAVROULA SAKKA
Music’s powerful influence on our affective states is often utilized in everyday life for emotion regulation and in music-therapeutic interventions against depression. Given this ability of music to influence emotions and symptoms in depressed people, it appears imperative to understand how these individuals affectively respond to music. The primary aim of this thesis is to explore whether depressed individuals have distinct affective responses to music, in terms of aesthetic judgments, emotional reactions, and emotion regulation. Furthermore, the thesis aims to provide possible explanations for such differences, in terms of underlying psychological processes (e.g., emotion-induction mechanisms) and depressive attributes (e.g., cognitive biases).

Study I involves a music listening experiment exploring the relationship between depression and aesthetic judgments in music. Findings indicate that depression is associated with higher ratings of aesthetic judgment, accompanied by an enhanced reliance on the expressivity criterion. However, this relationship is not accompanied by an association between depression and the Openness to Experience personality factor. Study II investigates emotion regulation with music in depressed individuals, by means of a survey. The study features a novel conceptual framework for studying emotion regulation with music, grounded on the established process model of emotion regulation (Gross, 2008) in combination with the music-specific multi-level GSTM approach (van Goethem & Sloboda, 2011). Results indicate that depressed individuals do not differ from controls in their “active” emotional responding (i.e., emotion regulation) to music. Study III features an experiment comparing depressed to controls’ “passive” emotional responses (i.e., emotional reactions) to musical stimuli designed to activate specific mechanisms (i.e., Brain stem reflex, Contagion, and Episodic memory). Findings suggest that differences in emotional reactions occur with respect to episodic memory, potentially due to cognitive biases. Finally, Study IV follows up on these results and investigates the valence and specificity of music-evoked memories in depressed individuals. The study finds that depressed participants’ memories are negatively biased, but do not differ from controls’ in level of specificity. Together, the findings of this thesis suggest that music listening may have a dual potential for depressed individuals, functioning both as a beneficial resource for alleviating depressive symptoms (due to, e.g., elevated aesthetic appreciation of music) and as a contributing factor to depressive mood (due to, e.g., negatively biased memories).

Keywords: depression, music listening, emotional reactions, emotion regulation, aesthetic judgment, cognitive bias, music-evoked autobiographical memories

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To my father, Nikos Sakkas
This thesis is based on the following papers, which are referred to in the text by their Roman numerals.


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Contributions

The contribution of Laura Sakka to the papers included in this thesis was as follows:

Paper I: Responsible for stimuli preparation and data collection in collaboration with co-authors; Secondary responsibility for data analysis and writing/revising of the manuscript, in collaboration with supervisor and co-authors.

Paper II: Main responsibility for study conception and questionnaire development, in collaboration with supervisor; Main responsibility for data collection; Main responsibility for data analysis, writing, and revising of manuscript, in collaboration with supervisor.

Paper III: Main responsibility for study conception; Designed the experiment in collaboration with supervisor; Main responsibility for data collection; Main responsibility for data analysis, writing, and revising of manuscript, in collaboration with supervisor.

Paper IV: Main responsibility for study conception and design; Main responsibility for participant recruitment, stimuli preparation, and data collection; Main responsibility for data analysis and writing of manuscript.
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### Abbreviations

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<td>BRECVEMA</td>
<td>Multi-mechanism framework developed for explaining music-evoked emotions. Acronym letters correspond to the initials of the eight emotion induction mechanisms</td>
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<td>CaRFAAX</td>
<td>Capture and Rumination, Functional Avoidance, and Executive Control (explanatory model of OAM)</td>
</tr>
<tr>
<td>CBM</td>
<td>Cognitive Bias Modification</td>
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<tr>
<td>ECI</td>
<td>Emotion Context Insensitivity</td>
</tr>
<tr>
<td>EMG</td>
<td>Electromyography</td>
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<tr>
<td>ESM</td>
<td>Event-Sampling Methodology</td>
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<tr>
<td>GSTM</td>
<td>Goal – Strategy – Tactic - Mechanism (abbreviation for multi-level framework for emotion regulation with music)</td>
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<tr>
<td>MDD</td>
<td>Major Depressive Disorder</td>
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<td>MEAM</td>
<td>Music-evoked Episodic Autobiographical Memory</td>
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<tr>
<td>NP</td>
<td>Negative Potentiation</td>
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<tr>
<td>OAM</td>
<td>Overgeneral Autobiographical Memory</td>
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<tr>
<td>PA</td>
<td>Positive Attenuation</td>
</tr>
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<td>WHO</td>
<td>World Health Organization</td>
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</table>
Music has a strong potential to influence our emotions and to alleviate depression (Juslin & Sloboda, 2010a). This potential is evident in the frequent use of music for regulating emotions in everyday life (e.g., van Goethem & Sloboda, 2011) and is utilized in the context of music-therapeutic interventions against depression (Aalbers et al., 2017; Maratos, Gold, Wang, & Crawford, 2008). Given music’s power to influence emotions and symptoms in depressed people it thus appears imperative to understand how these individuals affectively respond to music.

The idea of a strong association between depression and the arts has a long tradition, dating back at least to the times of ancient Greek philosophers, such as Aristotle and Plato (Carreño & Goodnick, 1998). The majority of research today linking depression with art has focused on the “active” involvement of depressed individuals in the creation of art. Such research reflects the prevailing idea of the “mad artist”, according to which artists suffer from increased levels of psychopathology, including depression and suicidal behavior (Jamison, 1993). In music, it has been argued that some of the most renowned composers, such as Rachmaninoff, Schumann, and Tchaikovsky, suffered from depression (Carreño & Goodnick, 1998; Storr, 1992).

The relationship between involvement in the arts and psychopathology has been operationalized as a result of increased creativity in depressed individuals. This research topic has received a considerable amount of attention over the years, creating controversy (Simonton, 2014), and presenting overall inconsistent findings.

On the one hand, a number of studies have provided supporting evidence suggesting increased depression rates amongst creative individuals. For instance, adolescents with depressive symptoms were found more likely to be involved in casual artistic activities (Young, Winner, & Cordes, 2013), while creative writers were found to have significantly higher rates of affective disorders compared to controls, as did their first-degree relatives (Andreasen, 1987). On the other hand several studies have failed to find evidence of such a relationship (e.g., Silvia & Kimbrel, 2010), while a meta-analysis by Baas, Nijstad, Boot, and De Dreu (2016) reported a small negative association between depressive mood and creativity.

The existence of a link between creativity and depression is given several potential explanations. For example, it is argued that personality traits relat-
ed to depression (e.g. Introversion or Openness to Experience) underlie the relationship. In line with this idea are empirical findings by Wolfestein and Trull (1997) indicating that depressed people score high on the Openness to Experience Big Five personality factor (John, Donahue, & Kentle, 1991). This relationship appears to be primarily accounted for by the aesthetics facet of Openness to Experience, which refers to one’s appreciation for art and beauty.

Another suggested explanation for the relationship between depression and creativity regards the self-reflective thinking style that characterizes depressive rumination. In this view, self-reflection can either take a positive form, that of creativity, or a negative form of rumination (Verhaeghen, Joormann, & Aikman, 2014; Verhaeghen, Joormann, & Khan, 2005). Finally, cognitive vulnerabilities (Young et al., 2013) and cognitive distortions (Thomas & Duke, 2007) have also been proposed to underlie both depression and creativity, explaining their association.

While there is thus a significant amount of studies investigating the relationship between depression and “active” artistic involvement, there is a paucity of research exploring depressed individuals’ “receptive” experiences with art, and particularly music (e.g., experiences during music listening). This thesis aspires to provide an initial attempt to fill this gap, by exploring depressed individuals’ affective responses to music.

The thesis investigates two forms of affective responses in relation to music: emotional and aesthetic. These two are linked albeit distinguishable responses, jointly contributing to the uniqueness of affective experiences with music.

In the first part of the introduction I will describe these types of affective experiences with music. I will begin with two forms of emotional responding: emotional reactivity (the “uncontrolled”, “passive” responses to the ever-changing environment) and emotion regulation (the “controlled”, “active” efforts to regulate these emotional reactions). Thereafter, I will describe the other form of affective responding, namely, aesthetic judgments in music.

In the second part of the introduction I will describe depression. Focus is placed on cognitive vulnerability models of depression, in accordance with the general tone of the thesis. The final part of the introduction aims to tie together these different bodies of literature, by presenting the relationship between depression and affective experiences during music listening in the light of prior research and novel hypotheses.

Affective responses to music

Music has important value for us human beings, and a key reason behind this is its powerful influence on our affective states (Juslin & Sloboda, 2010b).
Listening to music may influence our affect in several ways. For instance, it can make us feel happy (emotional reaction) when we choose to listen to our favorite piece of music (preference) which is associated with happy memories (emotion-induction mechanism). For the listener who perceives the music as a piece of art and appreciates its aesthetic value, the music may trigger an aesthetic judgment.

Specific music may also be used deliberately by the person who wants to forget about their worries and be distracted by listening to an engaging piece of music (emotion regulation), or by the teacher who chooses to play relaxing music in the classroom, in order to set a calm atmosphere for their students to work in (mood induction). These related, yet distinct, affective experiences with music contribute to music’s value for humans as emotional beings.

Definitions

Throughout the thesis, including the empirical studies, I use the definitions presented in Table 1 for defining key concepts of interest.

While a unanimous definition of music is challenging and subject to cultural differences, for the purposes of this thesis I adhere to a common definition of music as presented in the Oxford Dictionary, applicable at least to Western cultures. For defining affect, I use the working definition offered by Juslin and Västfjäll (2008), according to which affect refers to an umbrella term covering several evaluative states (e.g., emotion, mood, preference).

Specific affective states such as emotion (emotional reaction), mood, and preference, differ mainly in terms of their intensity and duration, with emotion being the most intense and brief, and preference referring to a longer-lasting and lower-intensity affective disposition. The term musical emotion is used to briefly refer to music-evoked emotions, that is, emotions induced in the individual when listening to music. These emotions are considered to be “mediated” by a number of emotion-induction mechanisms, one of which is episodic memory, also referred to here as MEAM (music-evoked episodic autobiographical memory).

Emotion regulation refers to a relatively “active” effort of the individual to control their emotional reactions. Finally, an aesthetic response refers to any response including an aesthetic judgment, which regards the evaluation of the music’s form and content in terms of their artistic value, based on an individual set of subjective criteria (e.g., beauty, originality, or skill).

An affective response to music therefore refers to the listener’s evaluative response to music, covering anything from preference for the music, to experiencing mood induction, responding with an aesthetic judgment, experiencing an emotional reaction, or using music to regulate emotions.
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<th>Concept</th>
<th>Definition</th>
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<tr>
<td>Music</td>
<td>The art of combining vocal or instrumental sounds (or both) to produce beauty of form, harmony, and expression of emotion (Allen, 1992)</td>
</tr>
<tr>
<td>Affect</td>
<td>Umbrella term that covers all evaluative – or valenced (positive/negative) – states (e.g., emotion, mood, preference, affective traits) (Juslin &amp; Västfjäll, 2008)</td>
</tr>
<tr>
<td>Emotional reaction</td>
<td>A relatively brief, intense, and rapidly changing affective response to potentially important events in the external or internal environment, which involves a number of subcomponents (subjective feelings, physiological arousal, expressive behavior, and action tendencies) that are more or less “synchronized”… focusing on specific objects (here, music), and lasting from minutes to a few hours (Juslin &amp; Västfjäll, 2008; Sloboda &amp; Juslin, 2010)</td>
</tr>
<tr>
<td>Musical emotion</td>
<td>An emotional reaction to music - an emotion induced in the listener by music (Juslin &amp; Sloboda, 2010b)</td>
</tr>
<tr>
<td>Emotion regulation</td>
<td>The process of “shaping which emotions one has, when one has them, and how one experiences or expresses these emotions” (Gross, 2014, p. 6)</td>
</tr>
<tr>
<td>Preference</td>
<td>A relatively long lasting and low intensity affective evaluation of a music piece, also referred to as “liking” for the music (Juslin &amp; Västfjäll, 2008; Sloboda &amp; Juslin, 2010)</td>
</tr>
<tr>
<td>Mood</td>
<td>An affective state of lower felt intensity and higher duration than an emotion, that does not have a clear object (Juslin &amp; Västfjäll, 2008)</td>
</tr>
<tr>
<td>Aesthetic response</td>
<td>“Any response that includes (but is not necessarily limited to) an aesthetic judgment” (Juslin, Säkka, Barradas, &amp; Liljeström, 2016, pp. 157–158)</td>
</tr>
<tr>
<td>Aesthetic judgment</td>
<td>“A subjective evaluation the music’s form and content as art in terms of their artistic value and based on an individual set of subjective criteria” (Juslin, 2013, p.236)</td>
</tr>
<tr>
<td>MEAM</td>
<td>Music-evoked episodic autobiographical memory, that is, a personal memory from a specific event from an individual’s life which is evoked during music listening (Janata, Tomic, &amp; Rakowski, 2007)</td>
</tr>
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Emotional responses

In what follows, I review the two ways of relating to music emotionally, namely, passive (emotional reactions) and active (emotion regulation).

Emotional reactions

The different psychological theoretical approaches to understanding the causes of emotion generation that have been proposed over the years are numerous, and it is beyond the scope of this thesis to cover them all. The general theoretical perspectives adopted in the current thesis stem from a cognitive, information-processing perspective. Of the most prominent cognitive theories of emotion are appraisal theories (e.g., Lazarus, 1991; for a review, see Power & Dalgleish, 2008). The common feature between these theories is the notion that an emotion is generated as a response to an event, as a result of the individual’s appraisal of said event in terms of their goals.

Emotions appear almost as inherent in music, as reflected in the common description of music as the “language of emotions” (Cooke, 1959). The term “musical emotions” is used here to describe emotions induced by music in the listener, and can be differentiated from emotions expressed by music and/or perceived by the listener. This distinction between induced (felt) and perceived emotions is an important one to bear in mind, as it has often remained obscured or undefined in the literature (Gabrielsson, 2002), contributing to conceptual and theoretical arguments in earlier music and emotion research, as I will describe below.

Thus, emotion perception concerns a cognitive process of understanding emotions as they are expressed by others (in this case by music), while emotion induction concerns an affective response (Gabrielsson, 2002). These two emotional phenomena are clearly distinguishable and involve different parts of the brain (Sloboda & Juslin, 2010). Although they may influence each other, they may share anything from a positive, to a negative, a-systematic, or non-existent relationship (Gabrielsson, 2002). The current thesis is interested specifically in the emotions felt by the individual when listening to music (music-induced, or music-evoked, emotions).

Most of us have experienced emotional reactions when listening to music, most probably quite often. Consider, for example, the feeling of excitement when hearing your favorite song being played at a party, or the nostalgia when listening to a piece that reminds you of your teenage years. Research in fact finds that listeners react with an emotional response quite often, in approximately 55-65% of music listening events (Juslin & Laukka, 2004). However, as indisputable as it may seem, music’s capability to evoke emotions has not always been agreed upon in the philosophical and scientific worlds. Rather, music-induced emotions have comprised a mystery of sorts, dating back to antiquity (Budd, 1985).
In the field of psychology, an issue to be solved has been that music is “fictional”, in the sense that, for the biggest part, it does not have any realistic implications on an individual’s life trajectory and goals. Therefore, the basic premises of appraisal emotion theories cannot be applied to a music listening situation. This paradox of music-evoked emotions gave rise to a debate between the cognitivists, who relying on appraisal theoretical assumptions, would argue that music cannot induce but can only express emotions which are perceived by the listener, and the emotivists, who would support the notion that music can indeed induce “real” emotions in the listener (Kivy, 1990).

Today, plenty of empirical evidence exists supporting the notion that music is indeed capable of inducing emotions in the listener. Research thus shows that music activates several different emotional components, such as the subjective feeling (e.g., Juslin, Barradas, &Eerola, 2015; Pike, 1972), the emotional expression (e.g., Witvliet & Vrana, 2007), and the corresponding physiological changes (e.g., Juslin et al., 2015; Krumhansl, 1997), indicating that “real” emotional reactions are evoked, rather than just “cognitive” emotional perceptions. Therefore, the field of music and emotion gradually evolved from contemplating if music arouses emotions at all, to exploring which emotions music arouses, and, importantly, how music evokes emotions.

Regarding the first question, research finds that music is capable of evoking a wide range of emotions in listeners, including simple arousal responses (e.g. chills), basic emotions (e.g. happiness, sadness), but also more complex (e.g. nostalgia) or mixed (e.g. pleasurable sadness) emotions, and, finally, aesthetic (e.g. awe) emotions (Gabrielsson, 2010; Juslin, Liljeström, Laukka, Västfjäll, & Lundqvist, 2011; Juslin, Liljeström, Västfjäll, Barradas, & Silva, 2008; Zentner, Grandjean, & Scherer, 2008).

Perhaps the most intriguing question though in the field of music and emotion regards how music induces emotions. A large majority of emotion theories focuses on the acoustic musical properties and how they can explain emotions in music (e.g., Cooke, 1959). However, although such theories may offer explanations for why listeners perceive the emotions they do in music, they cannot explain how and why they feel emotions when listening to the music.

Juslin and Västfjäll (2008) therefore argue that if we want to offer a psychological explanation to how music evokes emotions, we must seek the answer in the underlying psychological mechanisms that “mediate” between the musical event and the emotional reaction. While the importance of the interaction between the listener, the music, and the situation (termed the “musical event”) for the induction of a music-induced emotion (Gabrielsson, 2010) is recognized, Juslin and colleagues argue that in order to explain why the emotions occur, the analysis has to focus on the psychological mechanisms within the individual (Juslin, 2013; Juslin & Västfjäll, 2008).
Up until then, the scientific field of music and emotions had generally neglected the consideration of psychological mechanisms. There had however been some exceptions, such as Meyer's (1956) pioneering theory of musical expectancy, Baumgartner's (1992) account of music-evoked emotions due to episodic memories, Huron's (2006) ITPRA theory of musical expectancy, Juslin’s account of emotional contagion (Juslin, 2001), and Sloboda and Juslin's (2001) discussion of five emotion-induction mechanisms (i.e., contagion, memory, expectancy, conditioning, and appraisal).

While a number of mechanisms had thus already been proposed, Juslin and colleagues (Juslin, 2005, 2013; Juslin & Västfjäll, 2008) introduced the first attempt of a comprehensive multi-mechanism theoretical framework with a developed set of hypotheses for studying music-induced emotions. This framework is named BRECVEMA, after the initials of each suggested mechanism.

**BRECVEMA**

At its present state the BRECVEMA framework features eight mechanisms (described in detail below), besides the default cognitive appraisal, which are considered to “mediate” the induction of musical emotions. These mechanisms are regarded as information processing devices, with music being the object bearing the information.

The model assumes an evolutionary approach to emotions: The mechanisms are considered to be based on distinct brain functions which have evolved in the human brain at different phylogenetic temporal stages, ranging from simple reflexes and sensations to higher-order cognitive processes and complex judgments. Therefore, they differ in terms of their survival value and their dependency on learning and enculturation, varying from biological “hardwired” responses, to learned information processing devices.

The mechanisms are also assumed to differ in terms of the type of affect that they are able to induce (e.g., plain arousal, or basic, complex, mixed, or aesthetic emotions), the induction speed, the degree of volitional influence, their availability to consciousness, their modularity, and their dependence on the music’s structure. Below follows a description of these eight BRECVEMA mechanisms:

1. **Brain stem reflex** refers to a hard-wired attention response to simple acoustic features, such as extreme or increasing loudness or speed. For example, a loud or sudden sound in the music could result in a brain stem reflex. This process can lead to increased physiological arousal and the subjective feeling of pleasantness – unpleasantness.

2. **Rhythmic entrainment** refers to the process where an internal bodily rhythm in the listener (e.g., their heart rate) is influenced by, and eventually “locked in”, the music’s rhythm. The physiological response (heart-
rate adjustment) can influence other emotional components (e.g., subjective feeling) through proprioceptive feedback. This process can result in increased physiological arousal, but also feelings of communion and emotional bonding.

3. **Evaluative conditioning** (a type of classical/respondent conditioning; Ramnerö & Törneke, 2008) regards the process where a piece of music has co-occurred repeatedly with some other valenced stimulus, resulting in the two stimuli becoming coupled. For example, having listened to a specific piece of music repeatedly during Christmas holidays will eventually afford that piece the emotional valence of the holidays via the activation of conditioning. The sound of the music alone will thus be capable of inducing the emotions associated with the holidays. Through this process of conditioning, the music acquires the coupled stimulus’s valence, and may thus arouse the associated emotion, which could be any sort of basic emotion.

4. **Emotional contagion** refers to the process where the listener perceives the music’s emotional expression, and then “mimics” this emotion internally. For example, an exceptionally sad sounding singing voice may initially be perceived by the listener and thereafter, via contagion, induce sadness in the listener themselves. This would be particularly evident with music expressing intense emotions coming from a human voice or a voice-like sounding instrument, such as a cello or a violin. The process of emotional contagion can lead to the induction of any basic emotion expressed in the music.

5. **Visual imagery** refers to the process whereby mental visual images are evoked in the individual while listening to the music. The mechanism seems to reflect a metaphorical “mapping” of the music’s structure with mental image-schemata which derive from bodily experience. For example, an ascending melody may be perceived as representing an upward movement, conjuring images with similar movement. The type of images can vary in terms of abstractness level, often involve images of nature, and can be influenced by co-occurring episodic memories. These mental images are regarded as emotional triggers and typically evoke pleasure and relaxation, although they are capable of inducing any possible emotion.

6. **Episodic memory** refers to a personal memory of a specific event from the individual’s past. Music has a strong potential to evoke such memories (Baumgartner, 1992; Cady, Harris, & Knappenberger, 2007; Janata et al., 2007; Juslin et al., 2015, 2011, 2008), since it accompanies a many
events in our lives, from ordinary activities (e.g., driving) to emotionally significant occasions (e.g., celebrations). The retrieval of these memories when listening to music will typically evoke the associated emotion (Baumgartner, 1992; Janata et al., 2007). Therefore, the emotion evoked can be any possible emotion associated with the event. In addition, episodic memories with music often evoke nostalgia, which is an emotion attributed to the temporal dissociation between the memory retrieval and the event (Janata et al., 2007; Juslin, Barradas, Ovsiannikow, Limmo, & Thompson, 2016). In the remainder of this thesis, these memories will also be referred to as music-evoked episodic autobiographical memories (MEAMs).

7. Musical expectancy refers to the process whereby the listener has specific expectations regarding the music’s continuation, based on their knowledge of the specific music genre’s rules. An emotion is expected to be evoked when this continuation is violated, delayed, or confirmed. Typically, violation of musical expectancy will result in anxiety, surprise, or thrills. This mechanism was one of the first to be discussed in association to music-evoked emotions by Meyer (1956), while new expectation models have been proposed in recent years (Huron, 2006; Margulis, 2005).

8. The final BRECVEMA mechanism regards aesthetic judgment, which will be extensively described in the following section. Briefly, aesthetic judgment refers to the evaluation of the music’s value as art, based on the individual’s set of subjective criteria. An aesthetic judgment will lead to some sort of preference (liking/disliking), which, if intense, may lead to an emotional reaction. Depending on the criteria used this could be any type of emotion (Juslin, 2013), but typical it would be an emotion such as admiration and awe (for a highly liked piece), or disgust (for a highly disliked piece).

The prevalence of these mechanisms is explored in studies featuring representative samples of music (Juslin, Sakka, Barradas, & Liljeström, 2017), situations (Juslin et al., 2008), and listeners (Juslin, Barradas, et al., 2016; Juslin et al., 2011). Experimental studies have also provided initial evidence of cause and effect for a few of the mechanisms, namely episodic memory (Janata, 2009; Juslin et al., 2015; Juslin, Harmat, & Eerola, 2014), expectancy (Steinbeis, Koelsch, & Sloboda, 2006), contagion, and brain stem reflex (Juslin et al., 2015, 2014).

Specifically, Juslin and colleagues conducted music listening experiments, using manipulated pieces of music (2014) as well as “real music” (2015) as stimuli. The stimuli were manipulated (2014) or selected (2015) in terms of their ability to selectively activate each of the four target mecha-
nisms (i.e., brain stem reflex; emotional contagion; episodic memory; and musical expectancy).

For example, one of the stimuli used to activate episodic memory was the wedding march (2015), while another stimulus was created by introducing an unexpected melodic continuation to the music, in order to activate musical expectancy (2014). Participants’ impressions of mechanism activation and their emotional reactions were measured (the latter by means of self-reported feeling, physiological arousal in terms of skin conductance and pulse rate, and facial expression measured by electromyography: EMG). The results of both studies indicate that the stimuli did indeed activate their corresponding target mechanisms and induce the predicted emotions, providing some initial empirical evidence in support of the BRECVEMA model.

**Implications of the BRECVEMA framework**

It has been said that a competent psychological theory of emotion induction must be able to explain why an emotion is evoked in a given situation (elicitation), and also why the emotion evoked is of a specific kind (differentiation: Juslin, 2013; Moors, 2009). The BRECVEMA framework presents theoretical assumptions which are able to address both why and how an emotion could be aroused, and which emotion could be aroused. Furthermore, as described above, a number of these theoretical assumptions have already received empirical support.

Specifically, regarding elicitation, the BRECVEMA provides a model which is comparable to general emotion-generation models (e.g. appraisal theories), by placing the focus on the underlying mechanisms, providing thus a solution to the years-long “paradox” of musical emotions. Second, regarding differentiation, the model includes multiple mechanisms coupled with theoretical assumptions regarding the associated emotions.

According to these assumptions, BRECVEMA can account for a wide range of emotional reactions, depending on which mechanism(s) is/are activated. These cover any emotional reaction, from mere arousal and thrills (via e.g., brain stem reflect or expectancy), to basic emotions (e.g., sadness via contagion), complex emotions (e.g., nostalgia via memory), mixed emotions (e.g., the “paradoxical” pleasurable sadness, due to an interaction between mechanisms), and aesthetic emotions (e.g., admiration via aesthetic judgment).

Furthermore, an important implication of placing the focus on the induction mechanisms (as opposed to, e.g., musical features) is that it can explain why the same piece of music in a given context can evoke completely different emotional reactions in different people. Therefore, an important contribution of the BRECVEMA framework is its capacity to account for individual differences in emotional reactions to music.

First, certain mechanisms depend on learning and enculturation more than others (e.g., episodic memory, aesthetic judgment, and musical expectancy).
Therefore, depending on the individual’s experience, music may or may not activate these mechanisms (explaining individual differences in elicitation). For example, a certain piece of music may be tightly connected to an episodic memory in one individual but not another, resulting in an emotional reaction due to memory only in the former.

In addition, as I described above, each mechanism is capable of evoking a specific set of emotions. Although these sets are quite broad and overlapping (e.g., visual imagery can evoke any possible emotion, or happiness can be evoked via a number of different mechanisms), activation of a different mechanism in different individuals can also explain why their evoked emotions are of a different kind (explaining individual differences in differentiation).

Individual experiences will also determine the personal relevance of the musical information in terms of the specific mechanisms. In other words, besides the fact that music may trigger a memory only in one participant (elicitation), and that memories tend to evoke different types of emotions than, e.g., brain stem reflexes (differentiation), the content of the memory, which is highly personal, will further determine which emotion is aroused (differentiation).

Finally, all mechanisms, regardless of dependency on learning, are considered as information processing devices. Different people may vary in the way they process information in general. For example, not everybody is able to experience visual imagery to the same extent (Marks, 1973; Nouchi, 2011), while psychopathology has been associated with vivid mental imagery (Holmes & Mathews, 2010). In addition, people with memory disorders will unlikely get an episodic memory with music. Finally, individuals’ selective attention, interpretation, or memory (see, e.g., cognitive biases evident in emotional disorders) will influence which musical information becomes relevant and how this information is being processed.

**Emotion regulation**

In the previous section, I discussed music’s strong potential to elicit emotions in the listener. Consequently, music listening is also often involved in the process of emotion regulation.

*Emotion regulation*

Emotions are malleable and dynamic phenomena, which unfold over time (Gross & Thompson, 2007; John & Gross, 2007). While they unfold, we have the ability to regulate them to an extent according to our goals. For example, when we feel that we have been mistreated by somebody in a public setting and we feel that anger arises, we are able to choose how to handle this anger. Since we are in a public space where social norms dictate appropriate behavior, we may decide to try calming down and reducing the anger, by reappraising the situation or suppressing the emotion. Alternatively, we
may choose to express this anger, despite the potential negative social consequences.

*Emotion regulation* refers to precisely this process of “shaping which emotions one has, when one has them, and how one experiences or expresses these emotions” (Gross, 2014, p. 6). Therefore, emotion regulation implies that we respond to the manifestation of our emotions (Joormann & Stanton, 2016) even if this action is sometimes on a subconscious level (Gross & Thompson, 2007). The process can operate on either point of a continuum from automatic, subconscious, and effortless, to controlled, conscious, and effortful. A further distinction in emotion regulation processes regards intrinsic (regulating one’s own emotions) and extrinsic regulation (regulating someone else’s emotions). Our focus here is on the former, that is, the process by which one regulates their own emotions.

One of the most prominent theoretical models for studying emotion regulation is the *process model* proposed by Gross (2008). Gross based his model of emotion regulation on his *modal model* of emotion (Gross, 1998), according to which the process of emotion generation goes through four temporally successive phases: Initially, there is an *event* (first phase), which captures the individual’s *attention* (second phase), triggering thereafter an *appraisal* of the event (third phase), and resulting finally in an *emotional* reaction (fourth phase).

Accordingly, Gross suggests that an emotion can be regulated during either of these temporal phases, with the process targeting the situation, the attention, the appraisal, or the emotion itself. As can be seen in Figure 1, an emotion can be regulated at five different phases of emotion generation, creating five families of emotion regulation strategies.

![Figure 1. Process model of emotion regulation (Gross & Thompson, 2007)](image-url)
A core feature of this model is thus the concept of emotion regulation strategies. We are all equipped with a “toolbox” of strategies for regulating our emotions, which are mostly learned behaviors. When operating on an implicit level, these learned behaviors may also be described as a form of operant conditioning (Westen & Blagov, 2007), which is defined as the learning of behaviors controlled by consequences (Rammerö & Törneke, 2008), the consequence here being the outcome of emotion regulation (i.e., the maintenance or change of the emotional state).

Strategies are divided into antecedent-focused, which target the emotion-eliciting situation, the attention, or the appraisal, and response-focused, which target the emotion once it has been induced. Examples of the former are distraction (attention focused) or reappraisal (appraisal-focused), while of the latter are emotion expression or suppression.

**Individual differences in emotion regulation**

People differ widely in how they regulate their emotions (John & Gross, 2007). Typically, researchers describe individual differences in emotion regulation in terms of adaptability and effectiveness: people vary in how skillful they are at regulating their emotions.

John and Gross (2007) locate individual differences on the level of the regulation strategies. For example, habitual use of antecedent-focused strategies has been associated with better outcomes than the use of emotion-focused strategies. Two specific strategies that have been studied in this respect are reappraisal, an antecedent-focused strategy aiming to modify the appraisal of the event, and suppression, a response-focused strategy aimed to modify the emotional experience. Gross (1998) found that while reappraisal was effective in reducing negative affect, suppression did not manage to accomplish the regulation on a psychophysiological level. He described the varying outcomes of using different strategies in terms of the strategy adaptability, entailing that certain strategies (e.g., antecedent-focused) are more adaptable than others (e.g., response-focused strategies).

**Music in emotion regulation**

Given music’s powerful effect on our emotional states, listening to music may function as a useful tool for emotion regulation. Research indeed finds that music is a frequently used method for regulation emotions, alongside other activities, such as exercising (Thayer, Newman, & McClain, 1994). The choice of listening to music for the purpose of emotion regulation is furthermore reinforced by music’s ubiquity and easy accessibility, particularly nowadays with the use of portable music players. Therefore, one of music’s most important functions for the listener resides in its ability to regulate emotions.

It is thus not surprising that music as emotion regulation has triggered substantial interest in music psychology research over the last couple of dec-
ades (e.g., Marik & Stegemann, 2016; Miranda & Claes, 2009; Saarikallio, 2008; Saarikallio & Erkkilä, 2007; Tahlier, Miron, & Rauscher, 2013; van Goethem & Sloboda, 2011). Research shows that the process of emotion regulation with music may have beneficial effects for the listener and contribute to adaptive emotion regulation, restoring well-being, enhancing positive and reducing negative emotions, and regulating arousal levels (Juslin et al., 2011; North, Hargreaves, & O’Neill, 2000; Saarikallio & Erkkilä, 2007). The positive potential of music for emotion regulation was also explored in a music listening intervention called Tuned In, designed to improve participants’ emotion recognition and regulation skills (Dingle & Fay, 2017). The efficacy of the intervention was tested in a pilot study, with findings confirming its positive effect on emotion regulation, as reflected in the decreased use of maladaptive strategies after the intervention (Dingle & Fay, 2017).

However, recent research indicates that the effects of listening to music for emotion regulation are not always positive and can also be harmful, contributing to maladaptive emotion regulation, depending on how the individual listener uses the music (Chin & Rickard, 2014; Marik & Stegemann, 2016; Miranda, Gaudreau, Debrosse, Morizot, & Kirmayer, 2012; Thomson, Reece, & Di Benedetto, 2014).

Despite the increase in research, knowledge on the topic of emotion regulation with music remains heterogeneous and lacking an adequate theoretical and conceptual framework (for a review, see Baltazar & Saarikallio, 2016). The heterogeneity of the field is reflected in the choice of research objective, with studies either investigating music’s role in the regulation of affect (e.g., van Goethem & Sloboda, 2011), or of more specific states such as mood (e.g., Saarikallio, 2008; Saarikallio & Erkkilä, 2007; Thomson, Reece, & Di Benedetto, 2014), emotion (e.g., Randall, Rickard, & Vella-Brodrick, 2014), and stress (e.g., Miranda & Claes, 2009).

Although the coexistence of all these different approaches may contribute to a well-rounded knowledge of music’s role in affect-regulation, it has inhibited the advance of specific knowledge in emotion regulation. In addition, it often appears to reflect confusion regarding differential definitions of affective states, that is, interchangeable use of different affective terms for referring to the same phenomenon.

Furthermore, the field is tainted by a number of conceptual issues. Importantly, there is inconsistency between studies regarding the conceptualization of the role of music listening in the process of emotion regulation, the use of generic versus music-specific theory, and the consideration of appropriate regulation strategies (again, music-specific or generic). These are coupled with a lack of clear definitions of core concepts, such as emotion, emotion regulation, strategy, and tactic.

Van Goethem and Sloboda (2011) argue that in order to understand the functional role of music in emotion regulation, the process should be studied
at different levels, one of which is the activity of music listening. They consequently propose that emotion regulation with music should be studied on four levels: the goal, the strategy, the tactic, and the mechanism (known as the GSTM framework). Although the GSTM is not an explanatory model of emotion regulation with music, it is considered one of the most competent of conceptual frameworks for studying the role of music listening in the regulatory process (Baltazar & Saarikallio, 2016). However, this view does not have a strong theoretical foundation. In addition, I believe it still poses conceptual issues, as discussed further below.

To conclude, there is an obvious need for clarification of concepts in the study of emotion regulation with music. Baltazar and Saarikallio (2016) urge researchers to provide precise conceptual definitions of the key phenomena and to explore the process on several levels of analysis.

An integrative multi-level conceptual framework
I propose that the aforementioned conceptual and theoretical inconsistencies which characterize the field of emotion regulation with music may partly stem from a tendency to separate music-related experiences from generic (non-musical) experiences. As a result, some researchers have attempted to apply Gross’s process model to the music listening context (e.g., Randall et al., 2014), while others have preferred to exclusively rely on music-specific approaches (Saarikallio & Erkkilä, 2007). Although emotion regulation with music does present a special case, it should follow the basic principles that the regular (non-musical) emotion regulation process follows.

Therefore, I suggest that in order to study the process, we must utilize the rich theory and research in the generic emotion regulation domain and adapt it to the music situation, thus combing the best of both fields. The conceptual framework presented in this thesis offers such an integrative perspective, grounded on the established process model of emotion regulation (Gross, 2008) in combination with the music-specific multi-level GSTM approach (van Goethem & Sloboda, 2011).

As described earlier, a core feature in the process model regards the emotion regulation strategies. These strategies are classified in five categories, depending on which emotion generation phase they target. As can be seen in Figure 1 (p. 21), the first two families of strategies target the emotion-eliciting situation (situation selection and situation modification strategies). Examples are talking to a friend, or exercising. Another example is, of course, the activity of listening to music, which can be categorized as a situation-targeting strategy.

However, in order to selectively study emotion regulation in the context of music, the music listening activity must be studied as its own entity and on a separate level of analysis (Baltazar & Saarikallio, 2016; van Goethem & Sloboda, 2011). It has thus been suggested that music listening be regarded as a tactic (i.e., an activity facilitating the process), distinguishing it from the
other strategies. In relation to the process model then, a tactic refers to the strategies targeting the situation.

Therefore, in agreement with the GTSM model, this thesis considers four levels of analysis: the goal, the strategy, the tactic, and the mechanism (Table 2). The goal refers to what the regulation process aims to achieve, such as to enhance a positive emotion. The tactic refers to the activity undertaken to facilitate the emotion-regulation process (e.g., music listening, exercising, talking to friends) and used to ‘operationalize’ the strategy. In relation to the process model, a tactic refers to emotion regulation strategies targeting the situation. The strategy then refers to the type of mental process representing the active effort to control the cognitive or emotional response to the situation. Those are strategies included in the three latter families of strategies according to the process model, targeting the attention, appraisal, and emotion response (Figure 1, p. 21). The mechanism, finally, refers to the underlying psychological process “mediating” the induction of musical emotions, described in detail above (BRECVEMA: Juslin, 2013).

Table 2. Definitions and examples of Emotion Regulation levels

<table>
<thead>
<tr>
<th>Level</th>
<th>Definition</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goal</td>
<td>what the regulation process aims to achieve</td>
<td>enhance, reduce, or maintain an emotion</td>
</tr>
<tr>
<td>Tactic</td>
<td>the activity undertaken to facilitate the emotion-regulation process</td>
<td>music listening, exercising, talking to friends</td>
</tr>
<tr>
<td>Strategy</td>
<td>the type of mental process representing the active effort to control the cognitive or emotional response to the situation</td>
<td>reappraisal, suppression, avoidance</td>
</tr>
<tr>
<td>Mechanism</td>
<td>the psychological process “mediating” the induction of musical emotions</td>
<td>memory, imagery, expectancy</td>
</tr>
</tbody>
</table>

To illustrate, a person who has the goal to reduce a negative emotion, may decide to listen to music (tactic), which creates visual imagery (mechanism), which helps the listener to become distracted from negative thoughts (strategy).

Strategies for emotion regulation with music

A number of different strategies have been previously explored in relation to emotion regulation with music. Some of them derive from the general emotion regulation research, such as distraction/avoidance, reflection/introspection, discharge/venting (Miranda & Claes, 2009; Saarikallio,
2011; Saarikallio & Erkkilä, 2007; Thomson et al., 2014; van Goethem & Sloboda, 2011), suppression, and reappraisal (Chin & Rickard, 2014; Randle et al., 2014). Others appear more music-specific, such as relaxation, revival, entertainment, stress reduction, strong sensation, and solace (Saarikallio, 2011; Saarikallio & Erkkilä, 2007).

However, one major issue with previous studies has been the use of a loose definition of the term “strategy”. Therefore, although studies may have provided differential definitions for the “goal” and the “strategy”, it has often been the case that concepts such as stress reduction, entertainment, strong sensation, or happy mood maintenance, which essentially describe either the goal or the outcome of the process, have been studied as emotion regulation strategies (Saarikallio, 2008; Saarikallio & Erkkilä, 2007; Thomson et al., 2014; van Goethem & Sloboda, 2011).

In the present conceptual framework and in the relevant empirical study (Study II) we have aspired to adhere to stricter differential definitions between the different levels of analysis (Table 2). Table 3 presents the strategies and definitions studied here, allocated in the corresponding “process model” categories (besides the two situation-targeting categories, which in the present conceptualization correspond to “tactics”). We selected to study strategies that have been frequently studied in the context of music, under the condition that they fit our differential definition of the term “strategy”.

Therefore, we included three “attention deployment” strategies: distraction (removing attention from the situation); rumination (focusing attention on the situation in a way which confirms and reinforces its negativity); and reflection (focusing on the situation in a way that helps one understand it).

We also included two frequently studied “cognitive change” strategies: reappraisal (changing the way of thinking about the situation), and acceptance and (accepting the situation). These two categories of antecedent-focused strategies (i.e., “attention deployment” and “cognitive change”) were conceptualized as belonging in a broader category describing cognitive processes, as opposed to the following two “response modulation” categories of strategies which target the emotion.

The first two response modulation strategies regarded regulation of the emotional expression, and were discharge (through emotion expression and release) and suppression of emotional expression.

We excluded some music-specific “strategies” such as entertainment, stress reduction, and strong sensation (e.g., Saarikallio & Erkkilä, 2007), because they did not comply with our differential definition of “strategy”, referring rather to the outcome or goal of the process. Relaxation and revival are two such strategies which have been studied often in the context of music listening. They also fail to fit our definition of “strategy”, as they describe the outcome/goal of the process, rather than a strategy per se. However, as they appear highly relevant to the process of emotion regulation with music, relaxation and revival were conceptualized as being governed by a common
strategy described as physical modulation (e.g., a focus on internal bodily signals). This was the third response modulation strategy, and the final of the eight strategies included in the framework.

Table 3. Typology of Emotion Regulation Strategies

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub-category</th>
<th>Strategy</th>
<th>Example from the literature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cognitive processes</td>
<td>Attention deployment</td>
<td>Distraction</td>
<td>“[focusing] attention on different aspects of the situation or moving [attention] away from the situation altogether” (Gross &amp; Thompson, 2007, p. 13)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ruminaton</td>
<td>“directing attention repetitively to one’s feelings and their consequences” (Gross &amp; Thompson, 2007, p. 13)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reflection</td>
<td>“directing attention to one’s feelings in order to clarify and understand them” (Saarikallio &amp; Erkkilä, 2007, p. 104; van Goethem &amp; Sloboda, 2011, p. 213)</td>
</tr>
<tr>
<td>Cognitive change</td>
<td>Reappraisal</td>
<td></td>
<td>“changing a situation’s meaning in a way that alters its emotional impact” (Gross &amp; Thompson, 2007, p. 14)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Acceptance</td>
<td>“thoughts of accepting what [one] has experienced and resigning [oneself] to what has happened” (Garnefski, Kraaij, &amp; Spinhoven, 2001, p. 1314)</td>
</tr>
<tr>
<td>Response modulation</td>
<td>Emotional expression</td>
<td>Discharge</td>
<td>“letting out a feeling, releasing an emotion” (van Goethem &amp; Sloboda, 2011, p. 213)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Suppression</td>
<td>“inhibition of ongoing emotion-expressive behavior” (Gross, 1998, p. 226)</td>
</tr>
<tr>
<td>Physical modulation</td>
<td>Physical modification</td>
<td>Physical modulation</td>
<td>modulating the physiological/bodily experience of the emotion (introduced in the current framework)</td>
</tr>
</tbody>
</table>

Conclusions
Thus far, I have discussed how music can act a source of affective experiences by influencing our emotions. This can either be achieved in a more “passive” manner (emotional reactions), when, for instance, the radio suddenly plays a favorite song from one’s youth, bringing up a strong feeling of
nostalgia; or in a more “active” manner (emotion regulation), when, for example, one tries to reduce their stress by choosing to listen to relaxing music.

One of the mechanisms that can lead to an emotional reaction is aesthetic judgment. However, an aesthetic judgment to music does not necessarily entail an emotional response. Aesthetic judgments to music constitute a unique type of affective experiences, which will be described in the following section.

Aesthetic judgments

An important source of music’s value for people stems from its classification as a form of art and, consequently, its capacity as an object of aesthetic appreciation. Listening to music does not always result in an aesthetic judgment; it is often the case that music listening may not have any influence on our affective states, or may influence, for instance, our emotions, without triggering any aesthetic judgment. However, in the situation where the listener perceives the music as a piece of art, the music becomes an object of aesthetic judgment. As such, a way in which music may influence our affective states is by inducing an aesthetic judgment of the music.

The study of aesthetics has been a topic of interest for centuries, dating back at least to the times of ancient Greek philosophers, such as Plato and Aristotle. In psychology, the scientific study of aesthetics, art, and beauty is addressed by one of the oldest fields of psychological research (Berlyne, 1971), the field of empirical aesthetics. The field is said to be founded by Fechner in the 19th century, who proposed the notion of the “aesthetic mean”, according to which beauty is found in the absence of extremes (Fechner, 1876).

There was however about a century of neglect until a revival of the field with Berlyne’s introduction of the New Empirical Aesthetics (1971, 1974). Berlyne argued that preference for art is associated in terms of an inverted-U relationship with the art’s arousal potential, which is in turn determined by properties within the art itself, such as familiarity and complexity.

Since then, there have been a few attempts to study aesthetic responses to music. Konečni (1982), for instance, adopted an approach to study aesthetic responses to music that emphasized ecological validity. He proposed a theoretical model which accounted for the interaction between the listener’s social environment, emotional state, and musical preference. Based on the findings from his studies, he conceptualized aesthetic preference as a function of arousal moderation, serving the goal of regulating arousal levels, all within the context of social influence. Hargreaves, Miell, and MacDonald (2005) also acknowledge the importance of an ecological approach to the study of aesthetic responses to music. They proposed the reciprocal feedback model, which considers the interactions between the music, listener, and situation for understanding music preferences.
Despite such attempts though, empirical aesthetics is still a relatively understudied subject (Augustin, Wagemans, & Carbon, 2012), and particularly in the case of music (Juslin, 2013). This is apparent in the inconsistencies in use of terminology and theory between researchers. As evident in the aforementioned views of Berlyne, Konečni, and Hargreaves and colleagues, it has often been the case that aesthetic responses are studied in terms of preference for the music.

Juslin (2013) highlighted the problematic nature of such a conceptualization. How can the sophisticated aesthetic judgment of a piece of art be reduced to a simple “liking” of the music? And, on the other hand, how is it that we often like music despite acknowledging its poor artistic value (e.g., the experience of “guilty pleasures”)? Preference thus does not necessarily reflect aesthetic judgments; there is a number of reasons for liking music, of which aesthetic judgment is only one (Juslin, 2013). Therefore, preference and aesthetic appreciation must refer to two partly separate phenomena.

Aesthetic responses to music have also often been studied in terms of emotion responses. One school of thought has advocated that music evokes a special kind of emotions, namely aesthetic emotions, distinguishable from our everyday “utilitarian” emotional reactions (Scherer & Zentner, 2008). The concept of “aesthetic emotions”, though, implies that an aesthetic response constitutes an emotional reaction. However, as Juslin (2013) argues, one can have an emotional reaction to a piece of music without any aesthetic judgment (e.g., by mere conditioning) and vice versa (i.e., an aesthetic judgment that does not lead to or co-occur with an emotional reaction).

In light of these conceptual and theoretical inconsistencies, Juslin (2013) proposed a novel theoretical framework for studying aesthetic responses to music, in terms of aesthetic judgments. Importantly, this model distinguishes between preference, emotion, and aesthetic judgment.

A starting point of this theory was thus the conceptualization of preference, emotional reaction, and aesthetic judgment as unique. There is of course a common thread between these three phenomena, as they each regard some sort of affective reaction to music, involving an evaluation of the music. They are also related phenomena: For example, a positive aesthetic judgment may induce liking (preference) and/or an emotion of admiration, while preference for music may result in an emotion. Nevertheless, though, these three phenomena are distinguishable and do differ. What makes the aesthetic judgment unique, according to this view, is that the evaluation of the music’s form and content is conducted in terms of their artistic value.

The process of aesthetic judgment

An aesthetic response to music thus derives from a judgment of the music’s value as art. Figure 2 depicts the process of an aesthetic judgment when listening to music. As can be seen in the figure, a necessary requirement for an aesthetic judgment to occur is the preclassification of the music as art, which
may occur either implicitly or explicitly. The music listener will only begin the process of an aesthetic judgment, if s/he has adopted an aesthetic attitude towards the music. This aesthetic attitude can be triggered by aspects of the music, such as listening to a masterpiece of a well renowned classical composer, by situational factors, such as attending the opera, and so on. Only once the listener has classified the music as art, will s/he begin judging its artistic value.

**Figure 2.** Schematic outline of aesthetic judgment in music experience (Juslin, 2013, p. 248)

The listener will thus analyze the musical information which is channeled through perception (based on low level characteristics of the music, such as symmetry, order etc.) and cognition (based on domain-specific knowledge about the music, such as music style, composer etc.). While the former is more biologically based, the latter is largely influenced by culture, experiences, and music expertise. Finally, in the case that an emotion is induced by some other mechanisms (e.g., by a MEAM), the musical information may also be channeled through emotion.

All this information about the music will be judged in terms of aesthetic value according to the listener’s subjective set of *criteria*. The model assumes that there are large individual differences in which criteria listeners use to judge music’s aesthetic value, as well as how many criteria they use, and how these are weighted.

To illustrate, listener A may equate aesthetic value solely with *beauty*, while listener B may equate it predominately with artistic *skill* and secondar-
ily with expressivity and originality, while s/he may not think that beauty is all that important for music to be of artistic value. The outcome of the aesthetic judgment for these two listeners, depending on the weighted function of each criterion, will thus probably be very different.

Aesthetic criteria

Research on aesthetic judgments has often focused on single aesthetic criteria, such as beauty. These criteria have typically been selected based on researchers’, musicians’, or aesthetic philosophers’ decisions of which criteria people (must) use. However, the reality is that music listeners are often people who are neither professional musicians, nor scientists or philosophers. Therefore, Juslin (2013) argues that in order to provide a psychological theory of aesthetic judgments in music, researchers must consider the criteria that both musicians and regular (non-musicians) listeners use. To this end, Juslin and Isaksson (2014) conducted a survey study which aimed to identify aesthetic criteria for music commonly used by both experts and “lay” music listeners.

Based on the survey’s results, Juslin (2013) composed a preliminary set of criteria considered to largely explain listeners’ judgments, featuring seven criteria: (1) beauty (how beautiful the music is); (2) skill (the skill of the composer or the performer); (3) originality/novelty (how original the music is); (4) typicality/style (how typical/coherent the piece is for the style/genre in which it belongs); (5) message (the music’s ability to convey an important idea/message); (6) expression (the music’s ability to express something beyond itself, typically, an emotion); and (7) emotion (the ability of the music to evoke an emotion in the listener).

This model assumes that individuals have quite systematic judgment strategies. These strategies are reflected in the use of specific criteria, applied in a relatively stable manner across time and in a variety of contexts and music listening situations. To illustrate, it is assumed that each individual uses a specific configuration of criteria to judge music (for example, judges music’s artistic value based on its beauty and expression), regardless of time, context (e.g., opera house or bar), or music genre (e.g., preferred or not preferred genre – classical music or pop, etc.)

The judgment outcome may either be positive or negative. That is, the listener may judge the music to be “good art” or “bad art”. This judgment will influence the listener’s preference for the music, resulting in either liking or disliking. If, however, the judgment outcome is very intense (e.g., judging a piece as a masterpiece or as extremely bad), the process may also lead to the induction of an emotion (such as awe or disgust). Therefore, the model assumes that emotion, aesthetic judgment, and preference are interrelated albeit distinguishable and partly independent phenomena (Hargreaves, Messerschmidt, & Rubert, 1980; Thompson, 2006).
A fundamental assumption of this view is that aesthetic judgments are highly personal. Examining Figure 2, we can assume that individuals may differ on several levels of the process, leading to different aesthetic judgments: from the very first adoption of an aesthetic attitude that sets the listener to pre-classify the music as art; to the input to the judgment; and, of course, to their judgment strategy, that is, the configuration of specific, differentially weighted criteria.

To conclude, this framework offers a model for studying individual differences in aesthetic judgments in music. This is particularly important for the scope of this thesis, which focuses on responses of a specific population, namely, depressed individuals.

Conclusions

The views presented above to explain emotional responses and aesthetic judgments to music share an important commonality: they consider the role of the underlying psychological mechanisms, in terms of information-processing (cognition). These processes are emotion-induction mechanisms (such as memories), emotion regulation strategies (such as distraction), and judgment strategies (aesthetic judgment).

This consideration is important considering that in the field of music psychology there has been a tendency to focus the analysis of musical experiences solely on the level of the music. The acoustical features of the music are then studied as the defining factor in listeners’ affective experiences. However, although such theories are good for predicting how people perceive music’s emotional expression and aesthetic form and content, they are not so good at explaining variations in affective responses. If music were indeed the defining factor, we would all respond to a certain music piece in the same way every time. Clearly, that is not the case (e.g., Vuoskoski, 2012).

Experiences with music are thus considered to be influenced by an interaction between the listener, the music, and the situation (Gabrielsson, 2010). However, in order to explore differences in responses between individuals, one must focus on the level of the listener and the psychological mechanisms within them that are at play.

An important feature of the theoretical approaches outlined above is thus their capacity to explain individual differences. Therefore, these views concur with the reality of empirical findings, assuming individual differences in affective responses to music due to, for instance, past experiences, emotionality, cognition, and personality. One area to explore individual differences would be psychopathology, and particularly depression, which is characterized by distinctive emotionality, cognition, and personality characteristics.
Depression

Major depressive disorder (MDD) is among the most prevalent psychiatric disorders. According to the World Health Organization (WHO), depression is the leading cause of disability worldwide (World Health Organization [WHO], 2017). Lifetime prevalence across nations varies, with higher prevalence in high income countries (14.6% on average) compared to middle and low income (11.1% on average) countries (Kessler & Bromet, 2013). The typical age of depression onset is in early adulthood, yet the disorder occurs across a variety of age groups, with approximately double prevalence in women compared to men.

The disorder is highly burdensome for the individual. Besides its debilitating symptoms, depression is associated with termination of education, marital problems and divorce, impaired role performance, work disability, and unemployment. Therefore there are negative effects on the individual’s quality of personal, interpersonal, and social life. Depression is also associated with medical and physical illness, chronic pain, and secondary morbidity, while occasionally it may lead to suicide (Freedland & Carney, 2014; Kessler et al., 2014). Finally, MDD is associated with high societal costs (Kessler et al., 2014; Kessler & Bromet, 2013). Therefore, the investigation of the causes and potential treatments for depression is of crucial importance.

Vulnerability for depression: the cognitive perspective

The line of research investigating the causes of depression seeks to identify the vulnerability and risk factors for the development and maintenance of the disorder. There is a number of complementing approaches for investigating contributing factors, such as models looking at genetic and neurobiological underpinnings of the disorder (for reviews, see: Lau, Lester, Hodgson, & Eley, 2014; Thase, Hahn, & Berton, 2014), theories focusing on the social, interpersonal, and psychosocial factors (for reviews, see: Hammen & Shih, 2014; Monroe, Slavich, & Georgiades, 2014), and cognitive vulnerability models (for a review, see Joormann & Arditte, 2014). In line with the current thesis’s perspective, below follows a description of the cognitive approach to depression.

Cognitive models of depression advocate that cognitions play a key role in the trajectory of the disorder (Joormann & Arditte, 2014). For example, the content of thoughts (e.g. “helplessness-hopelessness theory”: Abramson, Metalsky, & Alloy, 1989), the style of responses (e.g., ruminative style: Nolen-Hoeksema, 1991), and the depressive cognitive schemas (see “schema theory of depression”: Beck, 1976) have all been considered by supporters of the corresponding theories to offer an explanation for the development and maintenance of depressive disorders. These all belong in the family of diath-
esis-stress models, presuming that there is a vulnerability which, when stress is triggered, may lead to depression (Joormann & Arditte, 2014; Power & Dalgleish, 2008).

**Cognitive biases**

The aforementioned cognitive theories of depression assume a preferential processing of mood-congruent information. A central position in these theories is thus occupied by the concept of cognitive biases, assuming that depressed individuals demonstrate a mood-congruent bias when processing information.

Initial research on cognitive biases in emotional disorders was partly inspired by Bower’s associative networks (1981) and Beck’s schema theory of depression (1976). The assumption was that networks or depression-related mental schemata would lead to cognitive biases, and these biases would be uniform and global, in the sense that they would be common for all emotional disorders (e.g., depression, anxiety), and would cover all domains of cognition (including, e.g., attention, interpretation, and memory).

**Attention**

While initial theoretical assumptions claimed uniform and global biases, research on attentional biases for depression has not always provided affirmative evidence (Joormann & Arditte, 2014). This inconsistency may be partly due to the use of paradigms which were originally designed for measuring anxiety-related attentional biases, stemming from the conceptualization of common biases for all emotional disorders. Therefore, while individuals suffering from anxiety disorders would consistently demonstrate a bias in detecting threat-related information with tasks, depressed individuals would not respond similarly for depression related information.

However, studies using different experimental paradigms featuring extended duration of stimulus exposure have indeed demonstrated a mood-congruent attentional bias in depression (Koster, De Raedt, Goeleven, Franck, & Crombez, 2005). Based on such studies it appears that, in depression, the bias is evident when attention to the information is elaborated.

Depressed individuals appear therefore no more likely than non-depressed to detect and attend to negative information, but once they do, they are less likely to disengage from it (Sanchez, Vazquez, Marker, LeMoult, & Joormann, 2013). While they spend more time attending to negative information, they also spend less time attending to positive information. Such findings have been replicated for both dysphoric and clinically depressed individuals (for reviews, see: Armstrong & Olatunji, 2012; Gotlib & Joormann, 2010; Joormann & Arditte, 2014; Joormann & Stanton, 2016; Mathews & MacLeod, 2005). In conclusion, while attention biases in depression are not consistently evident in potentiated detection of negative information, they are evident in a difficulty in disengaging from negative information.
Interpretation and appraisal

Cognitive theories assume that depressed compared to non-depressed individuals will be more likely to interpret ambiguous information in a negative and less likely in a positive way. This has typically been studied either in the form of “offline” interpretation (explicit self-report measured of past or future interpretations; e.g., Cane & Gotlib, 1985), or “online” interpretation (implicit measured of ongoing interpretations; e.g., Lawson & MacLeod, 1999).

While evidence for the former is quite robust, findings regarding a biased online interpretation are inconsistent (Mathews & MacLeod, 2005). Online interpretation is measured indirectly, often using the proxy of response time, meaning that a faster reaction to negative compared to positive information reflects a negative bias. While such studies find anxious individuals to confirm to this pattern, similar results in depressed are inconsistent, with a couple of studies failing to find an effect (Lawson & MacLeod, 1999; Mogg, Bradbury, & Bradley, 2006).

It has been argued though that the inconsistency may again be due to the use of a paradigm originally designed for anxious individuals. Thus, the use of reaction time may not be a suitable and valid proxy for the depressed population, whose reduced motivation may lead to a general overall slower response. In line with this argument, a study using eye-blink instead of reaction time did indeed find an effect (Lawson, MacLeod, & Hammond, 2002).

To conclude, depressed individuals appear to interpret ambiguous information in a negatively biased manner, although different measures yield diverging results. Importantly, this interpretation bias appears to contribute as a risk factor to depression.

Emotion recognition

A particular manifestation of cognitive bias is reflected in the processing of emotions expressed from an external social agent, e.g. a face or voice of another person (for a review, see Bistricky, Ingram, & Atchley, 2011). This includes negatively biased attention, memory, and interpretation of facial and/or prosodic affect. The latter is typically tested in emotion recognition tasks.

Research shows that depressed individuals have increased sensitivity towards subtle negative emotions, such as subtle sadness, and are negatively biased in their interpretations of neutral/ambiguous emotions (Bistricky et al., 2011). A study using both prosodic (voices) and visual (moving faces) stimuli reported that depressed participants interpreted surprise (a “neutral-ly” valenced emotion) expressed in voices negatively, confusing it with sadness, anger, disgust, or fear (Kan, Mimura, Kamijima, & Kawamura, 2004). These findings indicate that depressed individuals’ recognition of neutral, ambiguous emotions in prosodic stimuli is negatively biased. Besides recog-
nition of emotions from facial expressions and voices, comparable findings of biases have been reported in recognition of music-expressed emotions (Punkanen, Eerola, & Erkkilä, 2011). Therefore, depressed individuals tend to interpret emotions expressed in faces, voices, or music in a negatively biased manner.

Memory
The most robust finding of cognitive bias in the depression literature regards the domain of memory. Depression has been, after all, characterized as the “disorder of the past” (compared to anxiety, the “disorder of the future”), reflected in depressive preoccupation with past events (e.g., Eysenck, Payne, & Santos, 2006). The ability to remember personal events from our lives is important for our sense of identity and of a coherent self throughout time, our ability to envision ourselves in the future, and our emotions (e.g., Conway & Pleydell-Pearce, 2000). An impaired autobiographical memory is therefore detrimental for mental health.

One type of memory alteration evident in the depressed population regards negative bias. Findings that depressed individuals tend to be biased towards retrieving negative over positive information are quite robust (Joormann & Arditte, 2014; Mathews & MacLeod, 2005). This preferential recall of mood-congruent information is in line with the previously described cognitive bias theories of emotional disorders evident in a wide range of cognitive domains.

Negative memory bias is found for retrieval of words (for a meta-analysis, see Matt, Vázquez, & Campbell, 1992) but also of autobiographical memories (Whalley, Rugg, & Brewin, 2012). Regarding the former, implicit memory appears to be unaffected (Watkins, 2002), suggesting that the bias is due to the elaborative processing involved in explicit retrieval (Gotlib & Joormann, 2010; Mathews & MacLeod, 2005). Importantly, the negative memory bias appears to remain even after depression has remitted, suggesting that it contributes to the disorder as a vulnerability factor (Joormann & Arditte, 2014).

Another type of memory alteration associated with depression, besides the negative bias, concerns overgeneral autobiographical memory (OAM; for a review, see Williams et al., 2007). The phenomenon of OAM refers to a difficulty in retrieving specific autobiographical memories. Typically, when depressed individuals are instructed to describe a specific memory (e.g., a memory of a specific conversation with a friend, which occurred once, at a specific time and place) they instead retrieve categorical summaries of repeated events (e.g., memories of conversations with a friend that occurred repeatedly).

OAM has a number of negative consequences for depressed people, as it has been linked to defective problem solving skills, hopelessness in experiencing the future, and delayed recovery from affective disorders (e.g., Healy
& Williams, 1999; for a review: Williams et al., 2007). It has thus been suggested that OAM is a vulnerability factor for depression, contributing to the onset and maintenance of the disorder (Söderlund et al., 2014; Sumner et al., 2014; Watkins, 2015; Williams et al., 2007).

A wealth of studies have provided evidence that patients suffering from depression show reduced autobiographical memory specificity, even when these individuals are not currently experiencing a depressive episode (Williams et al., 2007). While most studies have focused on clinically depressed people (MDD patients), there have also been reports of OAM in dysphoric (sub-clinically depressed) individuals (Williams et al., 2007). The impairment appears to be specific to episodic but not semantic memory and is evident for memories across different lifetime periods (Söderlund et al., 2014).

Conway and Pleydell-Pearce (2000) offer an explanation of OAM, based on their model of autobiographical memory, which considers memories as “transitory mental constructions within a self-memory system” (p. 261). Here, autobiographical knowledge is represented in three hierarchically successive levels: lifetime periods, general events, and event-specific knowledge. According to this model, retrieval of a specific autobiographical memory can either occur after a strategic, voluntary retrieval (generative retrieval), in which case the search of the memory will go through each successive representation level, or automatically (direct retrieval), in which case the specific memory will occur without having undergone the hierarchical search. The latter “involuntary” memories are often referred to as “intrusive” memories in the depression literature (Moulds & Krans, 2015). Conway and Pleydell-Pearce (2000) suggest that OAM occurs during generative retrieval when the hierarchical search is discontinued, failing to reach the lower representational level of specific memories.

Williams and colleagues (2007) elaborate on Conway and Pleydell-Pearce's (2000) view in order to explain OAM in the case of emotional disorders, with their Capture and Rumination, Functional Avoidance, and Executive (CaRFAX) model. The CaRFAX model proposes that the discontinuation of the hierarchical search can occur as a result of three interacting underlying mechanisms: (1) capture and rumination (self-focused ruminative processes activated by the initial retrieval of the higher level “lifetime-period” memories, which lead to becoming “captured” in this level), (2) functional avoidance (the process of avoiding the experience of affect induced by a specific memory), and (3) executive control (limited executive resources prohibiting the hierarchical search process).

Theories of OAM in depression would thus assume that the phenomenon is specific to voluntary (generative) memory retrieval, suggesting that OAM would be absent for involuntary memories. However, while there is empirical evidence of OAM in voluntary memories, there is not much data suggesting a lack of OAM in involuntary memories. To the best of my knowledge, there is only one study to date comparing specificity for voluntary and in-
voluntary retrieval in depressed individuals (Watson, Berntsen, Kuyken, & Watkins, 2013), and whose findings confirm this theoretical assumption.

On the other hand, a study comparing depressed and control participants’ memory specificity during a word-cue task and a picture-cue task found that specificity in the picture-task, which is presumed to trigger involuntary memories, was only enhanced in the control group (Ridout, Dritschel, Matthews, & O’Carroll, 2016). A possible explanation of this result is that OAM generalized to involuntary memory retrieval for the depressed participants. To conclude, although it appears theoretically plausible that OAM is specific to voluntary retrieval, evidence suggesting a lack of OAM during involuntary memory retrieval in depressed individuals is rather limited and inconclusive.

The role of cognitive biases in depression

Cognitive vulnerability models of depression assume that information-processing biases are not merely symptoms of depression, but rather play an important role in the development and maintenance of the disorder.

To test the assumption that cognitive biases contribute as a vulnerability factor for depression, researchers have investigated these biases in at-risk for depression and in recovered depressed individuals. A negative interpretation bias was found for non-depressed daughters of depressed mothers, suggesting that the bias is a risk factor (Dearing & Gotlib, 2009). Attention biases have also been found for at-risk daughters of mothers suffering from depression (Joormann, Talbot, & Gotlib, 2007) and in recovered depressed individuals (Joormann & Gotlib, 2007). Similarly, studies find that the overgeneral memory remains in remitted depressed and can also predict future depressive states in currently non-depressed individuals, indicating OAM as another vulnerability factor for depression (Williams et al., 2007). Therefore, it appears that these biases are relatively stable attributes and function as vulnerability factors for depression.

Another line of research focuses on the effect of cognitive bias modification (CBM; Joormann & Arditte, 2014) on depressive symptomatology, in order to delineate the causal role of biases for the disorder. CBM paradigms directly manipulate cognitive biases and measure biases and symptoms after depressed individuals have been implicitly trained in reducing selective processing of negative information. Evidence of symptom reduction after CBM training would imply a causal role of biases for depression.

Indeed, findings from a growing body of literature on the effect of CBM indicate that cognitive biases demonstrate good predictive value for the course of depression. Studies show that modifying biased attention in depressed individuals leads to a decrease in depressive symptomatology (Browning, Holmes, Charles, Cowen, & Harmer, 2012; Wells & Beevers, 2010; Yang, Ding, Dai, Peng, & Zhang, 2015; Yang, Zhang, Ding, & Xiao, 2016). Similarly, modifying depressed individuals’ negative interpretations
has been found to result in more positive interpretations, reduction of depressive symptoms, and decreased negative memory biases (Joormann, Waugh, & Gotlib, 2015; Pictet, Jermann, & Ceschi, 2016; Williams, Blackwell, Mackenzie, Holmes, & Andrews, 2013; Yiend et al., 2014).

To conclude, research shows that cognitive biases contribute as vulnerability factors for depression, while CBM evidence is emerging in support of the important causal role of biases for the development and maintenance of depression. This relationship between biases and depressive trajectory is thought to be mediated by emotional responses (Joormann & Stanton, 2016).

**The effect of biases on emotions**

*Biases and emotional reactivity*

Cognitive biases are considered to underlie depressed individuals’ emotional responses (Joormann & Stanton, 2016) and to contribute to the sustained negative affect, which is a core characteristic of the disorder (Sanchez et al., 2013). In fact, according to cognitive theories of emotion, an emotion is evoked due to the individual’s appraisal of the emotion-eliciting event. Therefore, biased interpretation or appraisal of events should result in differential emotion reactivity in depressed individuals.

Although this is a rational hypothesis, it is not clear whether the interpretation bias does indeed affect emotion reactivity (Joormann & Stanton, 2016). This is partly because the majority of research focuses on effects on mood, rather than on emotion reactivity. An exception is the study by Joormann and colleagues (2015), who found evidence that CBM for interpretation reduced heart rate during stress response in MDD individuals, indicating that interpretation influences the physiological aspect of emotion reactivity. Research also finds a relationship between attention bias and emotional responding (Joormann & Stanton, 2016). For example, depressed individuals’ difficulty to disengage their attention from mood-congruent information has been associated with heightened stress reactivity (Sanchez et al., 2013).

*Biases and emotion regulation*

Findings from CBM research suggest that cognitive biases impede emotion regulation. For instance, negative appraisal biases are considered to underlie inflexible emotional responding and difficulty to employ reappraisal, although there is a lack of empirical data to support this hypothesis (Joormann & Stanton, 2016).

Furthermore, attention biases in clinically depressed individuals appear to be related to ineffective use of regulation strategies (Joormann & Stanton, 2016; Sanchez et al., 2013). Specifically, a difficulty to disengage attention from mood-congruent information may prohibit the use of distraction or reappraisal to reduce negative affect, or may promote the use of rumination (Joormann & Stanton, 2016; Koster, De Lissnyder, Derakshan, & De Raedt,
2011; Sanchez et al., 2013), which is “maladaptive” emotion regulation strategy common in depression. In fact, it has been suggested that the beneficial effect of modifying biased attention in depressed individuals is mediated by a reduction in rumination (Yang et al., 2015).

Memory biases are also considered to contribute to emotion dysregulation. On the one hand, mood-congruency memory biases may influence depressed individuals’ perception and appraisal of a current event, and may hinder the processing of mood-incongruent information, impeding the selection of appropriate regulation strategies. On the other hand, the retrieval of overgeneral memories may be associated with rumination (Joormann & Stanton, 2016; Watkins, 2015).

To conclude, there is a strong relationship between cognitive biases and emotional responding in depression, highlighting the link between cognition and emotion which is promoted by the cognitive models of depression. In what follows, I describe theories and empirical findings of emotional responding in depression.

Emotional responses in depression

Emotion reactivity
Depression is classified as a mood disorder, characterized by excessive negative and diminished positive affect (i.e., anhedonia). These affective experiences constitute part of the diagnostic symptoms and are also consistent with depressed individuals’ self-reports. Given this exceeded negative and diminished positive affect, one may logically assume emotion reactivity to follow the same pattern. However, empirical data provide a more complex and inconsistent picture.

Cognitive theories of emotion based on the ideas of mental schemata and memory networks would predict that mood potentiates an emotional reaction, leading to a matched emotion. According to such theories the negative mood, which is central to the disorder, leads to a preferential processing of negative information (Rottenberg & Bylsma, 2014). In addition, cognitive appraisal theories in combination with findings on negative bias in appraisal would predict that depressed individuals’ emotion reactivity would be negatively potent (Gotlib & Joormann, 2010). Cognitive theories therefore predict what has been called the negative potentiation hypothesis for emotion reactivity in depression (Rottenberg, Gross, & Gotlib, 2005), that is, exceeded negative emotional reactions.

Another view on emotional reactions in depression, termed the positive attenuation hypothesis (Rottenberg et al., 2005), stems from a psychobiological perspective of depression, which considers impaired hedonic functions as the core of the disorder (Depue & Iacono, 1989). This view predicts that the difference between depressed and non-depressed individuals’ emotional
reactions is reflected in anhedonia, that is, reduction of positive emotion reactivity.

Rottenberg and colleagues (2005) reviewed empirical data on emotion reactivity in depressed samples and concluded that neither the negative potentiation, nor the positive attenuation hypotheses could explain the findings adequately. What they found was that the pattern of emotion reactivity in depression was characterized by reduced reactivity, regardless of valence. The authors therefore proposed a third alternative view, namely the Emotion Context Insensitivity hypothesis (ECI). The ECI is based on an evolutionary account of depression, which views the disorder as a defensive motivational state leading to disengagement and withdrawal from the environment, thus reflecting deficient adaptation.

While empirical findings generally provide support for the ECI above all three hypotheses (for a meta-analysis, see Bylsma, Morris, & Rottenberg, 2008), there are some factors to consider which may influence conclusions: The first factor regards the severity of depression, as studies on dysphoric (as opposed to MDD) individuals provide the strongest support of the negative potentiation hypothesis (Rottenberg et al., 2005); Second, while the ECI has received a lot of empirical support from studies using normative stimuli, results are not consistent from studies using personally meaningful stimuli (also termed idiographic, and whose valence is “subjectively” attributed); Finally, studies focusing on emotional response duration, as opposed to magnitude, find that depressed individuals exhibit a prolonged negative emotional reaction, instead of a more intense initial negative reaction (Rottenberg & Bylsma, 2014).

While depressed individuals may not always display exceeded negative emotional reactions, their mood is generally more negative than non-depressed. This inconsistency brings up the question of the relationship between mood and emotion, to which the answer may lie in emotion regulation. That is, emotional reactions may be regulated in a way that leads to more negative moods (Rottenberg & Bylsma, 2014)

Emotion regulation

Dysfunctional emotional regulation is considered to be an important contributing factor in depression, promoting the sustained negative affect experienced in depression and predicting development of the disorder (Campbell-Sills & Barlow, 2007; Joormann & Gotlib, 2010). In fact, it has been argued that it is the ability to regulate negative emotions in an effective way that will determine if an individual will be at risk for depression (Koster et al., 2011).

There are large individual differences in emotion regulation, which are associated with emotional and consequently psychological well-being. John and Gross (2007) investigate individual differences in emotion regulation in terms of the habitual use of “maladaptive” or “adaptive” strategies (such as
suppression and reappraisal respectively). Campbell-Sills and Barlow (2007) define ineffective emotion regulation as an unsuccessful attempt to achieve the regulation goal, while ineffective mood regulation as the emotion regulation habits that bear long-term negative consequences for the individual. They hypothesize that psychopathology is related to both: inability to reduce unwanted emotions, which contributes to a persistence of negative mood.

Joormann and Stanton (2016) attribute emotion regulation difficulties in depression to either (1) the habitual use of “maladaptive” strategies, (2) difficulty in employing “adaptive” strategies, (3) reduced repertoire of available strategies, and/or (4) inflexibility in switching between strategies in a context-appropriate manner. Nevertheless, most research on emotion regulation in depression has focused on the types of strategies used or not used.

**Emotion regulation strategies associated with depression**

Depression has been associated both with habitual use of “maladaptive” strategies and difficulty in employment of “adaptive” strategies (for a meta-analysis, see Aldao, Nolen-Hoeksema, & Schweizer, 2010). Specifically, depression has been associated with high levels of suppression (Joormann & Stanton, 2016) and experiential avoidance (Hayes et al., 2004). Suppression, which is evident for both negative and positive emotions, has been attributed to a general “fear of emotions” (Werner-Seidler, Banks, Dunn, & Moulds, 2013), explaining the evidently experienced anhedonia (Joormann & Stanton, 2016). In addition, depressed individuals are less likely to regulate their emotions using reappraisal, which is considered an “adaptive” strategy (Aldao et al., 2010; Garnefski, Teerds, Kraaij, Legerstee, & van den Kommer, 2004; Joormann & Stanton, 2016)

One of the most studied emotion regulation strategies in relation to depression is rumination. Nolen-Hoeksema (1991) proposed in her response-style theory that a ruminative style of responding to negative affect could explain individual differences in the duration and persistence of depression. In this view, rumination is defined as “behaviors and thoughts that focus one’s attention on one’s depressive symptoms and the implications of these symptoms” (Nolen-Hoeksema, 1991, p. 569), but can be extended to ruminating over events that accompany depression (Nolen-Hoeksema, 1991).

People suffering from depression are thus more likely to handle a negative emotion with rumination, and this seems to be a relatively stable trait (Nolen-Hoeksema, Wisco, & Lyubomirsky, 2008). Although these individuals report that ruminating helps them understand themselves and their feelings, rumination has actually been associated with mood deterioration (Aldao et al., 2010; Joormann & Stanton, 2016). Notably, rumination is used both as a response to negative and positive affect, acting as a “dampener” in the latter case (Joormann & Stanton, 2016).
Rumination leads to excessive negative thinking and increases overgeneral autobiographical memory (for reviews, see Joormann & Stanton, 2016; Nolen-Hoeksema et al., 2008). Furthermore, it interferes with problem solving and contributes to indecisiveness (Aldao et al., 2010). Habitual rumination is thus related to increased depression vulnerability and predicts the onset of the disorder, depressive symptoms, decreased positive mood, and increased distress in both dysphoric and clinically depressed individuals (Aldao et al., 2010; Joormann & Stanton, 2016; Koster et al., 2011).

To conclude, depression is associated with impaired ability for emotion regulation. Most research has focused on which strategies are used, and specifically, if “maladaptive” are preferred over “adaptive” strategies. This emotion dysregulation is considered to be an important contributing factor for depression.

Personality

Depressive cognition and depressive emotionality are core features of depression. However, depression, being an affective disorder, is also associated with specific personality characteristics. Research investigating personality differences in psychopathology have led to a number of models that differ in their view of the etiological relationship between the two, with some viewing personality as the cause of depression, others depression as the cause of personality, and, finally, others as depression and personality being caused by a shared external factor (Klein, Kotov, & Bufferd, 2011).

Regarding specific traits, as described by the Big Five personality factors (e.g., John, Naumann, & Soto, 2008), a robust finding is the association of depression with high levels of Neuroticism (referring to negative emotionality as opposed to emotional stability: John et al., 2008), low Extraversion (referring to “an energetic approach towards the social and material world”: John et al., 2008, p. 120), and low Conscientiousness (referring to “social prescribed impulse control that facilitates task- and goal- directed behavior”: John et al., 2008, p. 120; Bienvenu et al., 2004; Klein et al., 2011; Kotov, Gamez, Schmidt, & Watson, 2010).

Finally, the Openness to Experience personality trait, which is associated with being “imaginative, cultured, curious, original, broad-minded, intelligent, and artistically sensitive” (Barrick & Mount, 1991, p. 5), and particularly the “aesthetics” facet of the trait, has also been associated with depression (Bagby, Schuller, Levitt, Joffe, & Harkness, 1996; Bienvenu et al., 2001; Carrillo, Rojo, Sanchez-Bernardos, & Avia, 2001; Wolfestein & Trull, 1997). However, a meta-analysis on studies on the Big Five personality factors and psychopathology, including depression, failed to find a strong association between depression and Openness (Kotov et al., 2010). In conclusion, there’s evidence suggesting an association between Openness and depression, although findings are inconsistent.
Affective responses to music in depression

In the first part of the introduction I reviewed theoretical and empirical research on emotional and aesthetic responses during music listening. The theoretical perspectives presented consider the role of the underlying psychological processes (emotion induction mechanisms, emotion regulation strategies, and aesthetic judgments) in explaining individual differences. Therefore, this thesis posits that people differ in how they respond to music based on their particular emotionality, cognition, and personality characteristics.

In the second section of the introduction I described the disorder of depression. Specifically, I demonstrated that individuals suffering from depression are characterized by particular affective dispositions. These individuals also appear to have distinctive cognitive functioning and personality characteristics. It is therefore possible that these characteristics could lead to different affective responses to music.

Previous research on depressed individuals’ affective responses during music listening is limited. The relatively small body of literature on the topic offers scattered knowledge regarding music preferences, perception of emotions in music, and uses of music for emotion regulation. The following and final part of the introduction aims therefore to discuss affective experiences with music in depressed individuals, in view of previous research and novel hypotheses.

Emotional responses

Emotion perception

With regards to emotions with music, there are a couple of studies investigating the processing of music-expressed emotions in depressed individuals. Punkanen and colleagues (2011) investigated the perception of emotions conveyed by music segments, which were designed to express five basic emotions. The authors found that depressed patients, compared to healthy controls, gave significantly higher ratings of perceived anger and sadness, indicating a negative bias.

Negatively biased perception of music-expressed emotions in depressed individuals is also reported by Naranjo et al. (2011), who studied the processing of emotional information in faces, voices, and music. The authors found a negative emotion recognition bias in MDD patients across all modalities, which appeared to be underlain by a hyperactive amygdala. Specifically for music, depressed participants gave higher ratings of emotion intensity for sad and frightening music segments, were less accurate in recognizing peacefulness and happiness in music, and gave lower intensity ratings to peaceful musical excerpts. These results are also similar to their ratings for perceived emotions in voices and faces, showing that the impairment is not
limited to the interpersonal nature of the emotion-expressing agent (voices and faces), but rather reflects a general perception bias in emotion processing.

**Emotional reactions**

There is hardly any research studying how depressed individuals react emotionally to music. To the best of my knowledge, the only study to date that has investigated induced (rather than perceived) emotions to music in depressed people is a study by Bodner and colleagues (2007). This study found that MDD patients chose more emotional labels for describing their felt emotions in response to sad, compared to angry, happy, or scary, music. This may indicate that they responded stronger to sad music, although it could also just reflect a decreased ability to describe positive emotions. Besides this one study, emotion reactivity to music in depressed people has remained unexplored.

The ECI hypothesis on emotion reactivity (Rottenberg et al., 2005) predicts that depressed individuals will show lower reactivity to all stimuli, regardless of their valence (positive, neutral, or negative). Importantly, this hypothesis appears to stand especially for “normative” stimuli, which are objectively valence.

However, music in itself is rarely objectively positive or negative. In contrast, music is loaded with personal meaning which determines its “valence”. For example, the same piece of music may be positive, negative, or neutral in valence for different people, based on their different associations to the music. Therefore, it may be said that music is a type of “personally meaningful” stimulus. Research in fact finds that emotional reactions for personally meaningful stimuli support the NP hypothesis for depressed individuals. For example, one study found that negative memories (which may be regarded as a personally meaningful stimulus) did induce higher sadness in depressed compared to control participants (Rottenberg & Bylsma, 2014).

One way of exploring individual differences in emotional responses to music is by focusing on the underlying psychological mechanisms “mediating” these reactions (BRECVEMA: Juslin, 2013). These mechanisms are information processing devices, and therefore particularities in how individuals process information may have an impact on the overall emotion-induction process. As I have described in previous sections, depressed individuals are a population with particular information processing biases and cognitive deficits, such as OAM. With these particularities in mind, the BRECVEMA framework is a useful starting point for exploring emotion reactivity in music.

This thesis and the corresponding empirical study (Study III) focus on three such mechanisms (besides aesthetic judgment, which will be described next). Those are brain stem reflex, emotion contagion, and episodic memory. The idea is that cognitive biases may affect the activation of such mecha-
nisms, affecting the outcome emotion (e.g., a negative memory bias may be evident in episodic memories with music and result in the induction of a negative emotion). The reasons for studying the specific mechanisms were both theoretical and methodological (i.e., they have been successfully manipulated in previous experiments: Juslin et al., 2015, 2014). Nevertheless, information processing biases in depression could technically be studied in association with any of the BRECVEMA mechanisms.

Music-evoked Episodic Autobiographical Memories
Studies investigating MEAMs in healthy listeners find that these memories are emotional in nature (Janata et al., 2007; Juslin et al., 2015, 2014), and highly specific and vivid (Baumgartner, 1992; Belfi, Karlan, & Tranel, 2016; Ferreri, Bigand, & Bugaiska, 2015). In fact, research investigating MEAMs in Alzheimer’s Disease (AD) patients, who show OAM, find that memories retrieved with music tend to be more specific than their typical memories, suggesting a beneficial effect of music on memory retrieval (for reviews, see Baird & Samson, 2015; Peck, Girard, Russo, & Fiocco, 2016). To the best of my knowledge, no research to date has investigated the quality of MEAMs in depressed individuals. This thesis and the corresponding study (Study IV) explore how negative memory bias and OAM may influence the quality of MEAMs in depressed people.

Emotional regulation
Listening to music can offer an easy and effective tool for regulating emotions in everyday life. However, as with any object exercising emotional influence, the outcome of this process can be both beneficial and harmful for mental health.

The effect of music-associated emotion regulation on well-being appears to be mediated by individual differences in the use of strategies. For example, one study found that the use of reappraisal with music listening predicted better well-being outcomes compared to the use suppression (Chin & Rickard, 2014). In addition, Carlson and colleagues (2015) reported that using music for discharging negative emotions may have harmful effects, while instead employing the strategies solace (i.e., “searching for feelings of being accepted and understood when feeling sad or troubled”; Saarikallio, 2008, p. 293) or diversion (i.e., distraction from the unwanted thoughts) may be more beneficial.

The use of music in emotion regulation is thus suggested to be influenced by individual differences such as differences in anxiety or depression (Carlson et al., 2015). Garrido and Schubert (2015b) conducted an online survey and found that individuals with tendencies for depression were more likely to prefer to listen to sad music, although this music listening habit could have a negative impact on their emotional state.
The majority of research on depressed individuals’ use of music for emotion regulation has focused on adolescents or young adults (approximately 17-25 years of age). Depressed adolescents are reported to be more likely to engage in ruminating behavior with music (McFerran & Saarikallio, 2014). In addition, venting negative emotions during music listening was reported to predict psychopathology in adolescents (Thomson et al., 2014). Finally, another study of adolescents’ use of music listening for coping with emotions and stress found that certain coping styles, such as avoidance, were predictive of levels of depression, particularly in girls (Miranda & Claes, 2009).

In adult samples, a mobile experience sampling study found a positive correlation between using music for distraction and level of depression (Randall et al., 2014). One qualitative study found that depressed individuals listen to music to express their emotions more often than non-depressed individuals (Wilhelm, Gillis, Schubert, & Whittle, 2013). Finally, a study on war veterans who commonly suffer from affective disturbances, found that they often use music intentionally for dealing with their emotions, while there was an association between level of depression and the use of diversion, mental work (i.e., “using music as a framework for mental contemplation and reappraisal of emotional preoccupations”; Saarikallio, 2008, p. 293), and discharge (Zoteyeva, Forbes, & Rickard, 2016). Overall, however, there is little research on depressed adults’ use of music for regulating their emotions.

The current thesis and the corresponding study (Study II) adopt an integrative conceptual framework to explore depressed individuals’ use of music for emotion regulation on three levels: the goal, the mechanism, and the strategy. It is possible that the emotion dysregulation, which is typical in depression (Aldao et al., 2010), is also evident in the context of music listening. For example, it is possible that individuals who tend to ruminate will also choose to listen to music associated with sad memories in order to ruminate. However, given music’s unique power to influence emotions, it is also possible that music contributes to beneficial emotion regulation in depression. Because of the scarcity of relevant research, the thesis studies these research questions predominantly in an exploratory manner.

Aesthetic judgments
As I discussed in a previous section, the topic of aesthetic responses to music is still relatively understudied and characterized by conceptual and theoretical inconsistencies. This thesis follows Juslin’s (2013) theoretical framework, according to which an aesthetic response derives from an aesthetic judgment, which is the judgment of the music’s artistic quality in terms of subjective criteria. To the best of my knowledge, no research has investigated depressed individuals’ aesthetic responses to music under this definition.
A basic premise of Juslin’s framework is that aesthetic judgments are highly personal. Therefore, this approach offers an explanation of individual differences in aesthetic judgments. As can be seen in Figure 2 (p. 30), the process of an aesthetic judgment goes through several stages. I would like to argue that individual differences in personality, emotionality, cognition, and prior experiences can influence the judgment outcome on any of these stages.

The process of an aesthetic judgment begins with the adoption of an aesthetic attitude, which is a prerequisite for the judgment to occur. Whether the listener will adopt an aesthetic attitude depends on situational factors (e.g., an “aesthetic framing” such as an opera house), musical factors (e.g., extraordinarily beautiful music), and individual factors (Juslin, 2013). Regarding the individual factors, the arousal of an emotion may trigger the adoption of an aesthetic attitude. As we have seen in the previous sections, emotional reactions to music present large individual differences (e.g., Juslin & Laukka, 2004; Juslin et al., 2008), and depression is characterized by distinct emotionality, which may influence emotional reactions to music. If a listener considers the ability of music to evoke an emotion as an important artistic attribute, the induction of a strong emotion may trigger an aesthetic attitude (Juslin, 2013).

Personality factors associated with depression could also influence the likelihood of adopting an aesthetic attitude. For instance, as mentioned earlier, depression is associated with high levels of Openness to Experience, and particularly the “aesthetics” facet, which could render depressed individuals prone to appreciate the artistic value of music and to adopt an aesthetic attitude. Similarly, Young and colleagues proposed that depressed individuals may be drawn towards solitary art because of their introvert personality characteristics (Young et al., 2013).

Individual differences in aesthetic judgments can also be located in the following stage, pertaining to the input to the aesthetic judgment. As seen in Figure 2, perceptual, cognitive, and potentially emotional sources of input will inform the judgment process. While the perceptual sources are largely biologically based and universal (Juslin, 2013), the cognitive and emotional are subject to individual differences. For example, depressive emotional disposition may influence the occurrence of an emotional reaction and the quality of the emotion in terms of valence and intensity. In addition, differences in cognitive processing, such as depression-related negative biases in attention, interpretation, and memory (Mathews & MacLeod, 2005) may affect how the musical information is evaluated on a higher cognitive level.

Finally, the framework assumes differences in the overall judgment strategy, that is, the configuration of an individualized set of subjective, differently weighted criteria. The choice of which and how many criteria to use for judging music’s artistic value depends on several individual factors, such as expertise, personality, and music preferences (Juslin, 2013). With regard
to depression, personality, emotional disposition, and cognitive biases may influence this criteria-configuration.

For instance, high levels of Openness to Experience are associated with appreciation for novelty in art (Fayn, MacCann, Tiliopoulos, & Silvia, 2015). Therefore, depressed individuals may rely more heavily on the originality/novelty criterion for judging music’s aesthetic value. Furthermore, individual differences in personality may also influence preference for specific music genres (Rentfrow & Gosling, 2003), which could in turn influence the judgment on the style/typicality criterion (Juslin, 2013), which refers to how typical/coherent the piece is for the style/genre in which it belongs.

In addition, differential emotion reactivity can influence the judgment outcome, at least for the listeners who regard emotion as an important criterion for aesthetic value. Finally, cognitive biases related to depression could also affect the evaluation of specific criteria. For instance, impaired processing of emotional expression in music (Punkanen et al., 2011) could affect the evaluation of the music on the expressivity criterion.

Therefore, individual differences associated with depression may influence the judgment process on several levels, from the initial and required adoption of an aesthetic attitude, to the emotional and cognitive input, and finally, to the judgment strategy and the criteria used. These differences may be due to the particular cognitive, emotional, and personality attributes, characteristic in depression. This research question is empirically explored in Study I of the current thesis.

Conclusions

To conclude, there are a number of characteristics related to depression that lead to the assumption that depressed individuals may show distinct affective responses to music listening. These responses include aesthetic judgments, emotion reactivity, and emotion regulation with music. Depressed individuals’ distinctive emotionality, cognition, and personality may each affect how musical information is being processed, leading to affective responses that differ from those of non-depressed listeners.
Aims

The primary aim of this thesis is to investigate whether depressed individuals differ in their affective responses to music, when compared to non-depressed. In particular, two types of affective responding are explored in relation to depression: emotional responses to music, including emotional reactions and emotion regulation, and aesthetic judgments.

The research questions and study designs are driven by theoretical predictions concerning the underlying psychological processes which could lead to potential differences. These psychological processes concern information processing (in terms of emotion-induction mechanisms, emotion regulation strategies, and aesthetic judgment strategies), which are expected to be influenced by depressive characteristics (such as emotionality, cognition, and personality), leading to different affective responding.

Therefore, the aim of the thesis is threefold:

1. To explore whether depressed individuals differ from non-depressed in their affective responses to music. This issue is studied with respect to aesthetic judgments (Study I), emotion regulation (Study II), and emotion reactivity (Study III)

2. To provide possible explanations for potentially different responses, in terms of underlying psychological processes. Specifically, aesthetic judgment criteria (Study I), emotion regulation strategies (Study II), and (c) emotion-induction mechanisms (Studies III and IV) are studied.

3. To provide possible explanations for the differential functioning of psychological processes, in terms of depressive attributes, such as personality (Study I) and cognitive biases (Studies III and IV).

Table 4 presents the three objectives which this thesis explores. Marked in italics are the phenomena that are studied empirically.
Table 4. Objectives of thesis

<table>
<thead>
<tr>
<th>Affective Response</th>
<th>Psychological Process (mediating the response)</th>
<th>Depressive Characteristic (influencing the process)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aesthetic judgment</td>
<td>Judgment strategy, specifically aesthetic judgment criteria</td>
<td>Cognitive biases, emotionality, and personality</td>
</tr>
<tr>
<td>Emotional reaction</td>
<td>BRECVEMA underlying psychological mechanisms, including MEAMs</td>
<td>Cognitive biases, OAM</td>
</tr>
<tr>
<td>Emotion regulation</td>
<td>Goals, mechanisms, and strategies</td>
<td>Depressive cognition and emotionality</td>
</tr>
</tbody>
</table>

Study I explores the relationship between depression and aesthetic judgments to music. The study involves a music listening experiment in which participants with varying levels of depression judged several music pieces in terms of eight aesthetic criteria and the overall aesthetic value. Personality, in terms of the Big Five model, was also measured. Findings indicate that depression is associated with higher ratings of aesthetic judgment. This relationship is not accompanied by an association between depression and the Openness to Experience personality factor, suggesting that it may be influenced by emotional responding to music.

Study II features a survey measuring depressed and non-depressed individuals’ use of music for emotion regulation. The survey measures emotion regulation on three levels: the goal, the strategy, and the mechanism. The study explores whether the use of “maladaptive” over “adaptive” strategies, which is commonly evident in depression, generalize to the context of emotion regulation with music. No group difference was found, indicating that depressed do not differ from controls in their “active” emotional responding to music, at least in terms of regulation intention. What remained unanswered by Study II was which emotions these individuals “passively” experience and regulate during music listening.

Study III thus features an experiment measuring such “passive” emotional reactions to music, comparing depressed to control individuals. The participants listened to music stimuli designed to target specific induction mechanisms (Brain stem reflex, Contagion, Episodic memory), and were asked to rate their felt emotions. Cognitive biases in memory, attention, and interpretation, which are common in depression, were expected to influence depressed individuals’ emotional reactions to music, via their effect on the mechanisms. Results suggest that differences in emotional reactions may occur with respect to the Episodic memory mechanism.

Finally, Study IV follows up on the findings of Study III, and further explores the quality of MEAMs in depressed individuals compared to non-
depressed controls. A music-listening experiment was conducted on the Internet, measuring the specificity and valence of spontaneous MEAMs. The results suggest that depressed individuals’ MEAMs are negatively biased, yet not characterized by OAM.
Study I

Background and aims

The aim of Study I was to explore aesthetic responses to music, in terms of aesthetic judgments. Music has been defined as “the art of combining […] sounds […] to produce beauty of form, harmony, and expression of emotion” (Allen, 1992). While over the last decades there has been an increase of research on affective experiences with music in terms of the emotional response (for an overview, see Juslin & Sloboda, 2010), the field of music psychology has largely neglected the study of the “beauty” aspect, that is, the aesthetic response.

Furthermore, the body of research on aesthetic responses to music is defined by conceptual and theoretical inconsistencies, evident, for instance, in the interchangeable use of the terms preference, emotional response, and aesthetic response. Theoretical limitations in the field are ultimately evident in the lack of an established psychological model for studying aesthetic responses in music. Study I contributes to the field with an empirical investigation of aesthetic responses in music, founded on a novel theoretical psychological model of aesthetic judgment in music proposed recently by Juslin (2013).

The model, which is described in detail in the Introduction of this thesis, proposes that preference, emotion, and aesthetic judgments to music are partly distinguishable phenomena that deserve to be studied separately. It further assumes that the aesthetic response is the result of a judgment process: The listener, having assumed an aesthetic attitude towards the music, judges it in terms of its aesthetic value. The musical information, channeled through the listener’s perception, cognition, and potentially emotion, is judged according to the listener’s subjective set of differently weighted criteria.

The main aim of this study was to empirically investigate the process of aesthetic judgments in music, testing the theoretical assumptions of Juslin’s model (2013), and to examine whether level of depression might influence the process. Specifically, it was predicted that: (1) listeners’ aesthetic judgments would be systematic, at least at the individual level; (2) between them, listeners would use all of the criteria rated in the experiment; (3) each listener would use only a small number of criteria (between one and four); (4) there would be large individual differences between listeners regarding
which criteria they used; (5) some criteria would be more important than others, overall; (6) the ratings of preference, aesthetic judgment, and emotion intensity would be partly independent; (7) aesthetic judgments would be correlated with the personality trait Openness to Experience; and (8) aesthetic judgments would be correlated with level of depression.

In order to address these questions we used the tools of judgment analysis (Cooksey, 1996), according to which individual judges combine multiple differentially weighted elements of information in order to arrive at a judgment. Given the large individual variability assumed in aesthetic judgments, it was crucial to initially focus on individual judges, instead of merely describing the “average” judge. This was done by adopting an idiographic approach (Brunswik, 1956), in which judgments are first modeled at the individual level, before they are aggregated. Finally, in order to obtain a relatively representative and ecologically valid sample of musical stimuli we randomly selected pieces covering a wide range of musical genres.

Method

Participants
A total of 44 participants (22 females and 22 males, age range: 19-66 years) took part in a music listening experiment. Participants were recruited from the general population.

Stimuli
In order to feature a representative sample of musical pieces covering a wide range of musical genres, 72 stimuli were selected via a stratified random sampling procedure, with strata reflecting 12 musical genres corresponding to Rentfrow and Gosling's (2003) STOMP factors of musical preferences. These were divided into two groups of 36 stimuli. In addition, four pieces from each stimuli-group were added to the other, resulting in two groups of 40 stimuli each, sharing eight common pieces. (See Appendix of Study I for a complete list of genres and musical pieces.)

Procedure and measures
Participants were randomly divided into either stimuli-group, and listened to 40 60-sec musical pieces, which they rated on seven aesthetic criteria (i.e., beauty, originality, expressivity, skill, emotion, message, and typicality) and on the piece’s overall aesthetic value. In addition, participants rated their preference and the intensity of their emotions for each piece.

Personality traits were measured with the Big Five Inventory (BFI: John et al., 1991). This includes 44 items that measure Neuroticism Extraversion, Openness to Experience, Agreeableness, and Conscientiousness. The domain
scales of BFI have shown good internal consistency, clear factor structure, adequate convergent-discriminant validity coefficients, and substantial self-peer agreement (Fossati, Borroni, Marchione, & Maffei, 2011).

Depression level was measured with a short 13-item version of the Beck Depression Inventory (BDI: Beck, Ward, Mendelson, Mock, & Erbaugh, 1961), which features an integrated positive-mood scale (Kaltiala-Heino, Rimpelä, Rantanen, & Laippala, 1999). This version shows Pearson correlation of .96 with the standard BDI and high internal consistency reliability.

Results

Multiple regression models
Intraclass correlation coefficients confirmed that there were large individual differences between listeners. Therefore, listeners’ judgments were first analyzed at the individual level.

Multiple correlations were significant for the ratings of all but one listener, and mean variance accounted for was $R^2 = 76\%$, indicating that linear regression models provided a good fit to listeners’ aesthetic judgments of music. All of the predictors included (i.e., criteria) received significant beta weights ($\beta$), at least in some cases. However, some (e.g., originality) were generally larger than others (e.g., expressivity). The average number of significant beta weights for the predictors (criteria) was 2.38, indicating that most listeners relied on only a few criteria in their judgments. Between participants, there were large individual differences in beta weights of the criteria, showing that participants differed considerably on their judgment strategies, that is, on which criteria they used, and how heavily they relied on each.

Listeners’ aesthetic judgments were thereafter analyzed on the group level. A nomothetic multiple regression model across the means of listeners ratings on all pieces of music revealed that the model provided a good fit to the data $R = .96$, $F(7, 61) = 91.18$, $p < .001$, $R^2 = 92\%$. However, the judgment strategy represented by the nomothetic model did not correctly describe the judgment strategies of the individual listeners (the idiographic model of only one of the 44 listeners involved the same significant beta weights as the nomothetic model).

Correlations between aesthetic judgment, preference, and emotion
Ratings of overall aesthetic value (indicating aesthetic judgment outcome), emotion intensity, and preference were correlated (Pearson correlations: $r$) at the individual level. Mean shared variance ($r^2$) across all listeners between the variables was 39%, indicating that the three measures (aesthetic judgment, emotion, and preference) were partly independent.
Correlations with personality and depression

Pearson correlations ($r$) between BFI and aesthetic ratings revealed no significant correlation between personality and overall aesthetic judgment. Depression was, however, positively correlated with overall aesthetic judgment ratings, $r = .40, p = .006$, suggesting that the higher the listener’s depression level was, the higher s/he judged the music’s aesthetic value. Depression scores were also positively correlated with ratings of expressivity ($r = .40, p = .008$) and negatively with skill ($r = -.45, p = .002$), indicating that the higher the listener’s depression level was, the higher s/he would rate music’s expressivity and the lower s/he would rate the skill.

Finally, depression levels were positively correlated with Neuroticism ($r = .60, p < .001$), negatively with Extraversion ($r = -.31, p = .037$), Agreeableness ($r = -.50, p < .001$), and Conscientiousness ($r = -.45, p = .002$), while there was no correlation between depression and Openness to Experience.

Conclusions

The findings of this empirical study support the main assumptions of the model proposed by Juslin (2013). Specifically, the results from the idiographic multiple linear regression models indicated that the process of aesthetic judgment is, indeed, systematic, as shown by the high multiple correlations. A whole range of criteria were used across different listeners, with some (e.g., originality) appearing overall more influential than others (e.g., expressivity). Individual listeners themselves appear to use a fairly small number of criteria, as expected. Importantly, the idiographic models showed that there are large individual differences regarding judgment strategies, that is, which criteria are used and how these are weighted. In addition, correlation analyses confirmed that preference, aesthetic judgment, and emotion intensity are partly independent phenomena.

Finally, the results indicated that depression is associated with higher ratings of overall aesthetic value and with ratings of expressivity. Therefore, it appears that depression is related with appreciation of aesthetics, possibly due to a particular emphasis on the emotional expressivity of the music. However, these associations were not accompanied by a significant relationship between depression and Openness to Experience. One possible interpretation of the positive relationship between depression and appreciation of aesthetic value in music may be that a “hypersensitive” idiosyncrasy underlies both depression and the propensity towards beauty, the arts, and aesthetic responses (Wolfenstein & Trull, 1997). The relationship between depression and higher ratings of aesthetic value and expressivity could be mediated by emotional responding to music. The following two studies explore the
role of depression in two types of emotional responses to music: emotion regulation (Study II) and emotion reactivity (Study III).
Study II

**Background and aims**

Study I focused on the aesthetic aspect of affective experiences with music. Findings suggested a positive relationship between aesthetic appreciation of music and level of depression, even though the sample was drawn from a non-clinical population. Appreciation of aesthetic value in music may influence, and be influenced by, the way the listener responds to music emotionally (Juslin, 2013). The next step was thus to explore the emotional experiences with music in depressed individuals. In particular, Study II compared depressed and control participants’ use of music for emotion regulation.

Music has a powerful potential to evoke strong emotions in listeners (Gabrielsson, 2010). Consequently, music listening is a common tactic used for regulating emotions (Thayer et al., 1994). However, the effect of this process is not always beneficial and, depending on how this tactic is used, may be counterproductive for well-being outcomes (Marik & Stegemann, 2016; Miranda et al., 2012).

This dual potential of music as an emotion regulation tactic is important when considering depressed individuals. Depression is characterized by persistent experience of negative affect (Rottenberg & Bylsma, 2014) and impaired emotion regulation skills (Campbell-Sills, Barlow, Brown, & Hofmann, 2006), reflected in the use of “maladaptive” over “adaptive” strategies (Aldao et al., 2010). Therefore, while music listening may serve as a useful resource for alleviating depressive symptoms, it could also contribute to depressive emotion dysregulation.

In relation to music, studies have found that levels of depression in young people could be predicted by specific emotion regulation strategies such as venting negative emotions with music (Thomson et al., 2014), as well as by using music to facilitate avoidance (Miranda & Claes, 2009). In addition, depressed individuals were found to engage in music listening for the purpose of expressing their emotions more often than non-depressed individuals (Wilhelm et al., 2013), while another study noted a correlation between depression and the use music for distraction (Randall et al., 2014). Although there are indications that depressed individuals might employ music listening in a maladaptive emotion regulation manner, the topic still remains relatively understudied.
The purpose of this study was thus to explore how depressed individuals use music for regulating their emotions, by means of a survey. Emotion regulation was conceptualized and measured according to our integrative multi-level conceptual framework, which is described in detail in the Introduction of this thesis. Briefly, this framework attempts to integrate well-established generic emotion regulation theory (Gross’s process model of emotion regulation) with music-specific theory (GSTM approach: van Goethem & Sloboda, 2011). The process of emotion regulation with music is hence analyzed on four levels: the goal, the strategy, the tactic, and the mechanism.

Based on previous studies of emotion regulation in depression (e.g., Al-dao et al., 2010), we predicted that depressed participants would report more frequent use of “maladaptive” strategies (rumination, suppression and avoidance), and less frequent use of “adaptive” strategies (reappraisal and acceptance). The remaining regulation strategies, goals, and mechanisms were analyzed in an exploratory manner.

Method

Participants

Seventy-seven participants (38 females and 39 males, 19-65 years old, $M = 32.7, SD = 13.1$) took part in the study. Thirty-seven of them formed the depressed group, defined as individuals with mild, moderate, or severe depression, as indicated by their scores on the Beck Depression Inventory-II (BDI-II; Beck et al., 1996). The control group consisted of the remaining 40 participants (defined as individuals with minimal depression, based on their BDI-II scores).

Measures

Emotion regulation

Emotion regulation was measured by means of a self-report survey targeting three levels of the regulation process: (1) the goal, (2) the strategy, and (3) the mechanism. (The fourth level, i.e. the tactic, was omitted because “music listening” is considered the tactic of interest.)

The levels studied and the specific strategies measured are based on our conceptual framework. In sum, four items measured the goal of emotion regulation with music. Specifically, listeners were asked how often they listen to music in order to: (1) reduce a negative emotion (R-NE); (2) reduce a positive emotion (R-PE); (3) enhance a negative emotion (E-NE); and (4) enhance a positive emotion (E-PE).

Eight items measured the regulation strategies. In particular, participants were asked how often listening to music influences their emotions because it facilitates: (1) distraction, (2) rumination, (3) reflection, (4) reappraisal, (5)
acceptance, (6) discharge, (7) suppression of expression, and (8) physical modulation. Finally, the survey measured the activation of the eight BRECVEMA mechanisms. Respondents were asked to estimate how often music influences their emotions due to the activation of: (1) brain stem reflex, (2) entrainment, (3) episodic memory, (4) evaluative conditioning, (5) visual imagery, (6) contagion, (7) musical expectancy, and (8) aesthetic judgment. All 20 items were rated by participants on 5-point scales, ranging from 0 (never) to 4 (always). (The survey items are presented in the Appendix of Study II.)

Depression
Levels of depression were measured using the Beck Depression Inventory-II (BDI-II; Beck, Steer, & Brown, 1996), which has good internal-consistency reliability and test-retest reliability (Arnau, Meagher, Norris, & Bramson, 2001). Cronbach’s alpha in the present sample was $\alpha = .94$.

Results
Three mixed Analyses of Variance (ANOVAs) were performed with group as the between-subjects factor (2 levels: depressed and controls), and (1) goal (4 levels: R-PE, R-NE, E-PE, E-NE), (2) strategy (8 levels: distraction, rumination, reflection, acceptance, reappraisal, discharge, suppression, physical modulation), and (3) mechanism (8 levels: brain stem reflex, rhythmic entrainment, episodic memory, evaluative conditioning, visual imagery, contagion, musical expectancy, aesthetic judgment) as the within-subjects factors, respectively.

Figure 3 presents mean ratings for the four regulation goals, over the whole participant sample. The mixed ANOVA yielded a significant main effect of goal, $F(2.03, 152.32) = 107.40, p < .001$, partial $\eta^2 = .59$. As can be seen in Figure 3, participants reported listening to music predominately for hedonic purposes, that is, with the goal to “enhance a positive emotion”, or to “reduce a negative emotion”. Ratings of goals did not differ significantly between depressed and control group, $F(1, 75) = 1.48, p = .23$, partial $\eta^2 = .02$, nor was there a significant interaction between goal and group, $F(2.03, 152.32) = 1.11, p = .37$, partial $\eta^2 = .01$.

Figure 4 shows the mean ratings of all participants for each strategy. The mixed ANOVA yielded a significant main effect of strategy, $F(6.36, 476.63) = 32.50, p < .001$, partial $\eta^2 = .30$. As can be seen, listeners reported employing a number of different emotion regulation strategies with music. The most commonly reported strategy was discharge, while rumination and suppression were the least. Similarly to the regulation goals, there were no significant differences in strategy ratings between groups, $F(1, 75) = .58, p = .45$, .
partial $\eta^2 = .01$, nor any interaction between strategy and group, $F(6.36, 476.63) = 1.44, p = .19$, partial $\eta^2 = .02$.

Figure 3. Mean ratings of prevalence for emotion regulation goals. (R-NE: reduce a negative emotion; R-PE: reduce a positive emotion; E-NE: enhance a negative emotion; E-PE: enhance a positive emotion. Error bars indicate 95% confidence intervals.)

Figure 4. Mean ratings of prevalence for emotion regulation strategies. (Error bars indicate 95% confidence intervals.)
Finally, Figure 5 displays the mean ratings for each mechanism, across all participants. There was a significant main effect of mechanism, $F(5.80, 434.87) = 63.61, p < .001$, partial $\eta^2 = .46$. Again, a number of different emotion-induction mechanisms were reported being activated during the regulation process, although brain stem reflex and musical expectancy received the lowest ratings. However, and similarly to the goals and strategies, ratings of mechanisms did not differ significantly between groups, $F(1, 75) = .02, p = .88$, partial $\eta^2 = .01$, nor was there any significant interaction between mechanism and group, $F(5.80, 434.87) = .66, p = .68$, partial $\eta^2 = .01$.

![Figure 5](image.png)

**Figure 5.** Mean ratings of prevalence for emotion regulation mechanisms. (Error bars indicate 95% confidence intervals.)

**Conclusions**

Over the whole sample, participants appear to listen to music predominately with the goal to enhance a positive emotion or to reduce a negative emotion. This “hedonic” function of music is in line with findings suggesting that people listen to music primarily in order to feel positive (e.g., Juslin & Laukka, 2004). Surprisingly, however, a few listeners also did report listening to music in order to enhance a negative emotion. This could be linked to research showing that some people actively choose to listen to music that makes them feel sad (Garrido & Schubert, 2015a, b; Vuoskoski, Thompson, McIlwain, & Eerola, 2012; cf. van Goethem & Sloboda, 2011). The most commonly reported strategy was discharge, while rumination and suppression, which are considered “maladaptive” (Aldao et al., 2010), were the most
uncommon strategies. Regarding mechanisms, a whole range of different mechanisms appear to be activated in the process, although brain stem reflex and expectancy received significantly lower ratings than the rest.

The main aim of this survey was to explore differences between depressed and controls in emotion regulation habits with music. Interestingly, no significant differences were found on either level (goal, strategy, or mechanism), indicating that depressive emotion dysregulation does not generalize to the context of music listening.

However, the finding that depressed listeners do not differ from controls in their emotion regulation goals, strategies, and mechanisms does not necessarily suggest that depressed listeners’ use of music for emotion regulation is as efficient. In order to delineate this, the outcome of emotion regulation with music must be studied, preferably in a dynamic, real-time, and context-sensitive study. In addition, emotional reactions to music in depressed individuals should be studied, in order to understand which emotions individuals are “passively” experiencing, and regulating, when listening to music. This was consequently studied in Study III.
Study III

Background and aims

Study II indicated that depressed individuals do not differ from controls in the way they “actively” use music for regulating their emotions. However, which emotions it is that they “passively” experience while listening to music remains largely unexplored. The focus of Study III was thus to investigate depressed individuals’ emotional reactions to music.

Cognitive vulnerability theories propose that depression is associated with information processing biases. These biases are found in several domains: First, depressed individuals are negatively biased when interpreting ambiguous events (Mathews & MacLeod, 2005). Second, depressed individuals are shown to have a negative attention bias, specifically manifested in their difficulty to disengage from negative information, once having attended to it (Gotlib & Joormann, 2010; Joormann & Arditte, 2014; Mathews & MacLeod, 2005; Power & Dalgleish, 2008). Third, depressed people are impaired in perceiving and recognizing emotions in faces (Bistričky et al., 2011), voices (Naranjo et al., 2011), and music (Naranjo et al., 2011; Punkanen et al., 2011).

Finally, the most robust cognitive bias related to depression regards memory: Depressed individuals are more likely to remember negative events (Joormann & Gotlib, 2008) and have an impaired ability to recall positive events (e.g., Werner-Seidler et al., 2013). Besides this negative bias, they are also found to have difficulties recalling specific autobiographical memories (termed overgeneral autobiographical memory – OAM; Williams et al., 2007).

Depressed individuals’ emotional reactions to music have hardly been studied previously. Bodner et al. (2007) reported that major depressive disorder (MDD) patients selected a larger number of emotional labels to describe their emotions in response to sad music, as compared to angry, happy, and scary music. Besides this single study however, there is no research comparing emotional reactions to music in depressed listeners compared to a control group.

In this study, we argue that depressed listeners may differ in their emotional reactions due to cognitive biases affecting the emotion-induction mechanisms. We adopt the BRECHEMA framework (Juslin, 2013; Juslin & Västfjäll, 2008) of music-evoked emotions, which currently features eight
mechanisms that are considered to “mediate” the induction of musical emotions. (For a detailed description of the model, refer to the Introduction of this thesis.)

**Aims and hypotheses**

The aim of the present study was therefore to investigate whether depressed listeners show different patterns of emotional responding to music from those of non-depressed controls, as expected if the cognitive biases linked to depression also influence mechanisms active during music listening. This was studied by means of a music listening experiment, which employed an experimental paradigm featuring music stimuli designed to activate specific mechanisms (i.e., brain stem reflex, contagion, and episodic memory; Juslin et al., 2015, 2014).

*Brain stem reflexes* are assumed to increase arousal, and have been frequently found to evoke surprise, an ambiguous emotion, during music listening (e.g., Juslin et al., 2014, 2015). Depressed people are negatively biased in their interpretations of ambiguous stimuli (Mathews & MacLeod, 2005) and show increased negative responses towards surprising events (Kan et al., 2004). Therefore, it was hypothesized that they would experience brain stem reflexes in a more negative way than non-depressed, resulting in higher anxiety ratings.

*Emotion contagion* with music requires that the listener first perceives the emotion expressed in the music, which s/he then contagiously feels (Juslin, 2000). Depressed people show negative biases in perception of emotions, including those expressed by music (Punkanen et al., 2011), and have difficulty disengaging their attention from negative information. The piece used in this experiment to activate contagion is characterized by a particularly sad emotional expression. It was therefore hypothesized that biases would influence depressed individuals’ emotional reactions induced via contagion, leading to higher sadness.

Finally, the most prominent information processing bias in depressed individuals relates to episodic memory, as evident in a tendency towards recalling negative memories, difficulties in recalling positive memories, and impaired ability to recall specific episodic autobiographical memories. For activating episodic memories, the present experiment featured a piece which is typically associated with pleasant events. It was therefore hypothesized that depressed participants’ reactions to this stimulus would be characterized by lower happiness.
Method

Participants
The study included the same sample of participants as Study II. (See summary of Study II for participant information.)

Musical stimuli
The music listening test included four instrumental pieces of music, which have been previously tested and found to successfully activate intended target mechanisms (Juslin et al., 2015, 2014).

Brain stem reflex piece
To activate the brain stem reflex mechanism, we included a manipulated version of a digital rendition by Jay Bacal of a short composition entitled Prayer (written by Ernest Bloch). This piece has been edited with the insertion of a sudden loud chord at the beginning of the 10th bar of the piece.

Contagion piece
For activating contagion in the listeners, an excerpt featuring the beginning of Concerto for Two Violins in A minor, Op. 3, No. 8, II was used: Larghetto e Spiritoso, written by A. Vivaldi and performed by Accademia Ziliniana. This piece can be described as conveying a particularly sad expression, which is reflected in the slow tempo, the minor mode, the slow tone attacks, and the subtle dynamics.

Episodic memory piece
In order to evoke episodic memories in the listeners, we used another a music piece entitled Sommar, Sommar, Sommar, written by Sten Carlberg and Erik Sandström, and performed by Åke Jelving’s orchestra. This piece is highly familiar to most people in Sweden, and is usually associated with summer holidays and pleasant memories.

Control piece
Finally, we also included a “neutral” stimulus as a control piece. The stimulus featured a piece titled minimalist music, composed by Mihangeliago. According to Juslin et al.’s (2015) findings, this piece appears to lack the information which would be needed for activating any of the BRECVEEMA mechanisms, and appears incapable of arousing strong emotions in most of the listeners.

Measures and procedure
Our hypotheses were tested with a music listening experiment that took place in the music psychology laboratory at Uppsala University. Participants
listened to the four stimuli and after each piece rated their induced emotions and their impressions of mechanism activation. (All items can be found in the Appendices A and B of Study III.)

**Emotions**
Participants first rated their felt emotions on 12 scales, each featuring one emotion. The 12 emotions cover all four quadrants of the circumplex model in terms of valence and arousal and include emotions that have been reported as most commonly occurring with music prevalence studies (Juslin et al., 2011, 2008). In addition, participants rated the overall intensity of their emotions, the familiarity, and their liking for the music. Each item was rated on a scale from 0 (not at all) to 4 (a lot).

**Mechanisms**
Participants’ personal impressions of occurrence for each of the eight BRECVEMA mechanisms were measured with “yes-no” questions. These measures were included for manipulation checks. Finally, participants who responded affirmatively to the occurrence of an Episodic memory or Evaluative conditioning were asked to indicate if the valence of the memory/association was negative, positive, or mixed.

**Results**
In order to test our three hypotheses, planned comparisons were conducted between depressed and controls for each of the predicted emotions (happiness for the Episodic memory stimulus, anxiety for the Brain stem reflex stimulus, and sadness for the Contagion stimulus). Our hypotheses were partly confirmed.

First, as hypothesized, happiness ratings for the Episodic memory condition were significantly lower for depressed ($M = 2.41, SD = 1.28$) compared to the control participants ($M = 2.95, SD = 1.06$), $t(70.16) = 2.02, p = .04$, BCa 95% CI [.03, 1.09], $d = .46$. In addition, follow-up analyses suggested that this effect was mainly attributable to the severely depressed sub-group (Figure 6).

Second, also in the predicted direction, ratings of anxiety for the Brain stem condition were higher for the depressed participants ($M = 1.65, SD = 1.23$) compared to the controls ($M = 1.25, SD = 1.35$), $d = .31$. However this result was not statistically significant, $t(75) = -1.35, p = .18$, BCa 95% CI [-1.03, .15]. Nevertheless, when comparing control (minimally depressed) and severely depressed subgroups (“extreme” groups method), the effect becomes “larger” ($d = 0.92$) and significant ($p = .006$; see Figure 7).
Figure 6. Mean ratings of happiness-elation for the Episodic memory condition, displayed for each depression level. (Error bars indicate 95% confidence intervals.)

Figure 7. Mean ratings of anxiety-fear for the Brain stem condition, displayed for each depression level. (Error bars indicate 95% confidence intervals.)

Finally, our third hypothesis was not confirmed. Ratings of sadness for the Contagion condition were roughly equal between depressed ($M = 2.49$, $SD = 1.28$) and controls ($M = 2.43$, $SD = 1.22$), $t(75) = -.22$, $p = .83$, BCa 95% CI [-.62, .54], $d = .05$. No differences appeared either when visually comparing the scores of sub-groups. Figure 8 displays the mean ratings for each depression level.
Conclusions

The aim of this study was to explore whether depressed listeners differed than controls in their emotional reactions to music, with predictions based on information processing biases. Our hypotheses received partial support.

First, happiness ratings for the Episodic memory condition were significantly lower for depressed compared to the control participants, and this effect appeared to be mainly attributable to the severely depressed sub-group. However, we did not find a significant difference between the two participant groups in valence of the evoked memories, which would indicate that lower happiness was due to a mood congruency bias.

One possible interpretation of this result is that depressed participants’ memories were overgeneral (Williams et al., 2007). Another explanation could be that depressed responses were an indication of a general anhedonia which is characteristic of the disorder. According to some theories of depression, this anhedonia is a response to any stimulus regardless of its valence (Rottenberg et al., 2005).

Also in the expected direction, depressed individuals rated higher feelings of anxiety for the Brain stem reflex condition, although they did not differ significantly from controls. However, when comparing different depression levels, the severely depressed sub-group significantly differed from the non-depressed controls (i.e., the minimally depressed subgroup).

Finally, ratings of sadness for the Contagion condition were roughly equal between depressed, disconfirming our third hypothesis. One way of interpreting this result is that, possibly due to a ceiling effect, depressed par-
participants did not perceive higher sadness than did controls, which could have resulted in an increased contagiously felt sadness. Alternatively, depressed may have perceived higher sadness, but not contagiously felt the emotion to a greater degree. This could be due to experiential avoidance of depression-related information (Williams et al., 2007). Finally, these results could also be due to an interaction between sadness and aesthetic pleasure, indicating that depressed people enjoy aesthetically beautiful sadness.

In conclusion, Study III revealed differences between depressed and control participants in emotional reactions to music, which could potentially be explained by biases in the underlying emotion-induction mechanisms. Primarily, memory biases appear to influence emotional reactions to music, particularly in severely depressed individuals.
Study IV

Background and aims

Findings from Study III suggested that depression is associated with different emotion reactivity to music, potentially due to a bias in episodic memory. Depressed and controls did not differ though in the valence of their memories (positive, negative, or mixed), which would have indicated a negative memory bias. However, study III did not investigate the specificity of the memories. In addition, the experiment featured just one “experimenter-selected” musical stimulus, without taking into account personally meaningful music. Study IV follows up on these results and explores the quality of depressed individuals’ MEAMs, in terms of specificity and valence, using a selection of individually tailored music stimuli.

MEAMs have a large influence music listening experiences, as they often function as a motive for engaging in music listening (Juslin & Laukka, 2004; Juslin et al., 2011), and may lead to an emotional reaction (Joormann & Gotlib, 2008; Juslin et al., 2015, 2014). Besides being emotional, MEAMs also appear to be highly specific and vivid (Baumgartner, 1992; Belfi et al., 2016; Ferreri et al., 2015). In fact, research in AD patients, who suffer from acute autobiographical memory deficits, finds that their memories tend to be more specific when retrieved with music (for reviews, see Baird & Samson, 2015; Peck et al., 2016). This apparent enhancing effect of music on memory retrieval has been partly attributed to the involuntary nature of MEAMs (El Haj, Fasotti, & Allain, 2012).

Given the significant role of MEAMs in music listening experiences and music’s power to facilitate the retrieval of specific and vivid autobiographical memories, it appears that MEAMs are of great potential for individuals with memory impairments. One population typically demonstrating memory deficits are individuals suffering from depression.

Depression is associated with two autobiographical memory deficits: First, depressed individuals tend to be biased towards retrieving negative over positive information (negative bias; Joormann & Arditte, 2014; Mathews & MacLeod, 2005); And, second, they demonstrate a difficulty in recalling specific details from personally experienced past events (i.e., over-general autobiographical memory - OAM; Williams et al., 2007). Theories of OAM in depression assume that the deficit is specific to voluntary (i.e., strategic) memory retrieval, suggesting that it should not be evident in invol-
untary (i.e., spontaneous) memories. However, evidence suggesting that there is a lack of OAM during involuntary memory retrieval in depressed individuals is scarce and inconclusive.

**Research questions and hypotheses**

The two main research questions addressed in this study were the following:

1. What is the quality of MEAMs in depressed compared to control individuals, in terms of specificity?
   
   Two competing hypotheses were tested: (1.a) due to OAM, depressed participants’ MEAMs would be less specific than those of controls, and (1.b) due to the involuntary nature of MEAMs, OAM would not affect depressed participants’ memory specificity and there would be no group difference.

2. What is the quality of MEAMs in depressed compared to control individuals, in terms of valence?
   
   Due to a negative cognitive bias, depressed individuals’ memories were expected to be more negative in valence specificity compared to those of controls.

In addition, because emotional reactions to MEAMs typically entail the experience of the emotion associated to the memory, it was hypothesized that (3) the valence of MEAM and the valence of induced emotion would be positively correlated; and that (4) the valence of induced emotion would be more negative for depressed compared to controls.

**Method**

**Participants**

Participants were recruited via two advertisements targeting depressed individuals (defined as individuals with a BDI-II test score ≥ 14) and controls (defined as individuals with a BDI-II test score < 14 and with no diagnosis of a psychiatric disorder).

Seventy-three individuals applied to participate in the study. From the 73 applicants, 11 did not fit the inclusion criteria for either participant group (depressed/control), and were thus excluded. From the 62 participants who were contacted, 39 participants submitted their responses (7 males; Age: 18-55 years, \( M = 29.87, SD = 10.35 \)). Eighteen participants formed the depressed group (with a mean BDI-II score of \( M = 32.44 \), indicating severe depression), and 21 participants formed the control group. The two participant groups did not differ significantly in terms of gender, age, or musical education.
Musical Stimuli
An individualized set of music pieces was assembled for each participant. To maximize the probability of MEAM evocation we used a combination of 5-10 participant-chosen pieces (personal) and 20 experimenter-chosen pieces (experimental). The experimental pieces were popular “hits” from participants’ youth (from the period when the participants were 10-25 years old). The personal pieces were participants’ favorite music, which they provided during the registration.

The task featured a 5-min compilation stimulus, composed of 10 pieces (five experimental and five personal), which were manually segmented into 30-sec fragments. This was done in order to feature a sufficient number of music stimuli while avoiding repeating the memory questions after each stimulus and therefore revealing the study’s objective, since the aim of the task was to maximize the probability of participants retrieving involuntary memories.

Measures
Depression
For measuring depression we used the Beck Depression Inventory-II (BDI-II: Beck et al., 1996), which demonstrates good internal-consistency and test-retest reliability (Arnau et al., 2001). In the present sample, Cronbach’s alpha reliability was α = .97, indicating excellent internal consistency reliability.

Autobiographical memory
Memories were assessed in two steps: (1) written memory descriptions were used for inspecting the memories’ content; and (2) self-report questionnaires were used for measuring memory specificity and valence. Specifically, the descriptions were inspected qualitatively in order to verify that participants were indeed referring to an episodic autobiographical memory in their specificity ratings (and not to general autobiographical memories).

Memory specificity was measured by means of a 13-item self-report questionnaire assembled for this study. The items are largely based on the structured interview and the scoring categories included in the Autobiographical Interview (AI; Levine, Svoboda, Hay, Winocur, & Moscovitch, 2002), which measures specificity of episodic memory. Specifically, in the AI, the recorded memory narrations are transcribed and segmented into “elements” (units of text), which are categorized according to their content (episodic or semantic). The episodic “elements” are further placed in five categories (i.e., event, time, place, perceptual memory, and thoughts/emotions). The scoring of episodic memory specificity is based on the aggregated specificity scores for each of these categories.
The items of the self-report questionnaire used in the present study were thus based on these five categories. Participants scored the specificity of recollection in each category, by rating their recollection of, for instance, location of the event, on a 5-point scale (ranging from 0: *no recollection*, to 4: *clear recollection*). Some categories (e.g., perceptual memory) included more than one item, in which case the item ratings were aggregated and a mean rating for the category was computed. I thus ended up with five specificity scores, which were aggregated to form the total episodic autobiographical memory “specificity” score, ranging between 0 (*non-specific*) and 20 (*very specific*).

The *valence* of MEAMs and of induced emotion were measured with one item each. These two valence items were presented after the specificity questionnaire and were rated on 5-point scales, ranging from 0 (*very negative*) to 4 (*very positive*). All questionnaire items can be found in Appendix A of Study IV.

**Procedure**

All data were collected on the Internet with the use of Google Forms.

**Registration**

The advertisements featured a web-link directing applicants to a registration form, where applicants were asked to provide personal background information, a selection of 5-10 pieces of their all-time favorite music, and one piece that always makes them feel good. Finally, they completed the BDI-II depression test.

**Experimental session**

Participants received an e-mail with a web-link to the study together with instructions. Once they were directed to the study and after reading the study information and providing informed consent they were directed to the task.

Because the objective of this experiment was to measure spontaneous (i.e., *involuntary*) memories, it was important that participants were not aware that their memories were being measured. Therefore, the only instruction they received was to click on a link which would initiate the music (i.e., the compilation music stimulus). When the music ended, participants were asked if the music evoked any memory of an event from their lives. If they answered “yes”, they were given 5 minutes to describe the memory. Next, they were asked to rate the specificity questionnaire and the two “valence” items. If they answered “no” to the question whether the music evoked a memory, the task ended and participants were directed to another task (constituting a separate experiment, which will be reported in another article).
Results

Memory content
Because spontaneous MEAMs were measured, the only instruction that participants received was to listen to the music. Naturally, a number of participants did not get any memory. The participants who did get a memory first provided written description of their memory. The first step of the analysis involved a qualitative inspection of the memory descriptions, in order to sort out the episodic from the non-episodic autobiographical memories. Non-episodic memories were defined as memories describing prolonged lifetime periods, such as “When I lived in the USA”, instead of referring to an event, (c.f., Conway & Pleydell-Pearce, 2000; Janata et al., 2007).

Memory descriptions were thus classified in three memory content categories: (1) no memory, (2) lifetime period memory, and (3) episodic memory. The majority of participants (ca. 77%) retrieved a memory, most of which were episodic. Fisher’s Exact Test revealed that frequencies of reported “no memory”, “lifetime period memory”, and “episodic memory” did not differ significantly between depressed and controls, \( p = .67, \) Cramer’s \( V = .17, \) a “small” effect (Cohen, 1988, pp. 79–80).

Memory specificity
Specificity was calculated only for the memories which were categorized as “episodic” from the qualitative inspection (\( N = 27 \) participants, 13 controls and 14 depressed). A t-test revealed that specificity level did not differ between depressed (\( M = 14.10, SD = 2.58 \)) and controls (\( M = 14.45, SD = 3.04 \)), \( t(25) = .32, p = .75, r = .06. \)

Next, group differences in specificity ratings for each of the five subdomains were explored (i.e., event, time, place, perceptual memory, and thoughts/emotions). T-tests revealed no significant differences between depressed and controls for any of the subdomains. However, there was a marginally insignificant effect (when alpha was corrected for multiple comparisons to \( \alpha = .01 \)) of group on specificity for thoughts/emotions, with depressed rating this category as more specific (\( M = 2.86, SD = .95 \)) than controls (\( M = 2.13, SD = .70 \)), \( t(25) = -2.26, p = .03, r = .41, \) a “medium” effect size according to Cohen’s (1992) guidelines.

Valence
For the analyses for the two valence items the memories of all participants who retrieved a memory were analyzed (\( N = 30 \) participants; half depressed). Figure 9 displays the mean ratings for each valence item per participant group. The association between the valence of memory and the valence of induced emotion were significantly correlated, Spearman's rank-order correlation \( r_S(28) = .95, p < .001, \) indicating a “large” effect size (Cohen, 1992).
Next, mean scores for each valence item were compared between groups. Because the assumption of normality was violated for both items, the non-parametric Mann-Whitney test is reported. As hypothesized, MEAMs were significantly more negative for depressed (Mdn = 2.00, M = 1.93, SD = 1.53) compared to controls (Mdn = 4.00, M = 3.60, SD = .63), U = 44.50, Z = -2.99, p = .001, r = -.55, indicating a “large” effect (Cohen, 1992). Also as expected, depressed reported feeling significantly more negative (Mdn = 1.00, M = 1.73, SD = 1.62) compared to controls (Mdn = 4.00, M = 3.40, SD = .82), U = 51.50, Z = -2.65, p = .002, r = -.48, a “medium” towards “large” effect (Cohen, 1992).

![Figure 9. Mean ratings for memory valence and induced emotion valence per group. Note that 0 = very negative and 4 = very positive. (Error bars indicate 95% confidence intervals.)](image)

**Conclusions**

The aim of this study was to explore the quality of MEAMS in depressed compared to non-depressed individuals. The first research objective regarded the specificity of MEAMs, where two competing hypotheses were tested (i.e., (a) lower specificity in depressed due to OAM; and (b) no group difference, due to the involuntary nature of MEAMs). Results indicating that memories of depressed and controls did not differ in terms of specificity confirmed the second hypothesis. This finding is in line with the theoretical predictions for OAM in depression (Williams et al., 2007) and the limited empirical evidence indicating that OAM is specific to voluntary/strategic retrieval of autobiographical memories (Watson et al., 2013).
The second research objective regarded the valence of MEAMs. The hypothesis was that, compared to those of controls, depressed individuals’ MEAMs would be more negative. Indeed, confirming this hypothesis, MEAMs of depressed were significantly more negative, with an effect size of $r = .55$, suggesting a large effect (Cohen, 1992). These findings suggest that, in line with cognitive bias theories (Mathews & MacLeod, 2005), depressed individuals demonstrated a negative bias in their MEAMs.

Depressed and control participants’ valence of induced emotion was also compared, revealing that the depressed participants experienced significantly more negative emotion as a response to the MEAM. The valence of these memories and the valence of the induced emotions were highly significantly correlated, sharing 92% of the variance. Therefore, results indicated that depressed individuals’ memory bias was associated with their emotional reactions to music.

Taken together, Study IV found that spontaneous MEAMs are negatively biased in depressed individuals, and this is associated with the outcome emotional reactions. On the other hand, their memories do not differ from those of non-depressed participants in terms of specificity and are thus not described by OAM.
Ethical Considerations

The studies included in this thesis involved human research participants and as such featured two main ethical issues: (1) the collection of sensitive personal data, and (2) the measurement of the effect of musical stimuli on participants’ affective states, which can be regarded as “mental influence”. Consequently, the studies aspired to fulfill the requirements of the Declaration of Helsinki and followed the Act concerning the ethical review of research involving humans (SFS 2003:460), which aims to protect the integrity and dignity of human research participants. In accordance, applications were submitted to the Regional Ethical Review Board in Uppsala, Sweden. Study I was part of a larger project which was ethically reviewed and approved as a whole. For the remaining studies, two separate applications were submitted and approved by the Ethics Board: one for studies II and III, and another one for Study IV.

For all studies, there were considerations taken regarding the information provided to participants, the obtainment of consent, and the protection of participants’ identities. Participants were informed about the studies’ expected duration and procedures; the voluntary nature of their participation and their right to decline to participate or to withdraw from the study at any point, with no consequences, and with no need for an explanation; confidentiality and anonymity matters (which will be discussed below); benefits and risks of the study; and compensation for participation. Participants were also informed that the study had no commercial interests. Finally, the contact information of the researchers was provided and participants were encouraged to express any questions or concerns, either during the study or after it had ended. Once information was delivered, verbal (for study I) and written (for studies II, III, and IV), consent was obtained.

Data collected which measured depression (the Beck Depression Inventory, BDI-II) and anxiety (the Beck Anxiety Inventory, BAI) are considered to be “sensitive” personal data. In order to promote the protection of their identities, data were handled with the highest possible degree of anonymity and confidentiality. Addressing confidentiality, only authorized researchers (the authors of the articles) had access to the data. Addressing anonymity matters, serial numbers were assigned to each participant, while no names or any identifying information were recorded. In addition, all data collected were compiled statistically, so that individual responses could not be traced. Therefore, no individual could be identified from their provided data.
An additional consideration regarded the effect of the experimental musical stimuli on participants’ affective state, because depressed individuals may be susceptible to affective stimulation. This was of particular concern in Study IV which was conducted on the Internet, in which case researchers were not in the presence of participants and could not provide support if needed. This issue was addressed by including a music piece at the end of the experimental session, which served the function of positive affect induction in order to counteract potential negative affect induced by the experiment.

To conclude, the studies included in the present thesis aimed to protect the human rights, integrity, and dignity of the participants by informing them about all necessary aspects of the study, obtaining their consent, and preserving confidentiality and anonymity to the highest possible degree. This research may be beneficial in the application of music therapeutic interventions for depression, while no notable risks have been identified, indicating a favorable balance between benefits and risks. Finally, the studies were carried out by competent researchers and were supervised by a professor, ensuring the integrity and quality of the research. Therefore, the balance between benefits of the research and protection of the participants indicates that this project is favorable for all contributing members.
General Discussion

Summary of main findings

The primary aim of this thesis was to investigate whether depressed individuals have distinct affective responses to music. The thesis and the empirical studies explored two types of affective responding: **aesthetic judgments** (Study I) and **emotional responses**, in terms of emotion **regulation** (Study II) and emotional **reactions** (Study III).

Findings from Study I indicate that depression is associated with an elevated aesthetic judgment, suggesting a relationship between depression and appreciation of aesthetic value in music. Findings from Study II suggest that depressed individuals use music for regulating their emotions in a similar way to non-depressed. Differences in emotional responding did occur, though, in emotional reactions to music: Study III found that depressed individuals’ *happiness* ratings were significantly lower than those of non-depressed.

The second aim of the thesis was to provide possible explanations for differences in affective responding, in terms of underlying psychological processes. Specifically, aesthetic judgment **criteria** (Study I), emotion regulation **strategies** (Study II), and emotion-induction **mechanisms** (Studies III and IV) were explored. In Study I, the depression-related elevated aesthetic judgment appears to co-occur with an enhanced reliance on the *expressivity* criterion. Study II did not find any differences between depressed and non-depressed individuals in the emotion regulation strategies they use with music. Finally, the experimental paradigm employed in Study III suggested that the decreased *happiness* response reported by depressed individuals was due to the episodic memory mechanism.

The third aim of the thesis was to explore how differences between depressed and non-depressed relate to depressive attributes. Study I tested whether differences in aesthetic judgments were accompanied by a relationship between depression and personality, specifically the *Openness to Experience* trait. However, no relationship was identified, suggesting that it may be other attributes related to depression, such as emotionality or cognition, which underlie the relationship between depression and aesthetic judgment.

Study III found that depressed individuals differed in emotional reactivity, potentially due to memories. Following up on this finding, Study IV explored the quality of MEAMs in depressed individuals, in terms of valence
and specificity. The results from this final study suggest that spontaneous MEAMs are negatively biased in depressed individuals, but do not differ in terms of specificity.

In conclusion, based on these data it appears that depression is related to elevated aesthetic judgments and differences in emotional reactions to music, potentially due to cognitive biases. In what follows, I discuss these main results in relation to each other as well as to theory and previous empirical findings.

Emotional reactions to music in depression

Based on the results of Study III, depressed individuals appear to differ from non-depressed in their emotional reactions to music. Although these results are preliminary and should be replicated in the future with a variety of methods (discussed further in “limitations and future directions” section), I below discuss what they mean in terms of the dominant theories of emotion reactivity in depression.

Theories of emotion reactivity in depression

Major theories of emotion reactivity in depression can be summed down to three approaches, which were presented in the Introduction of this thesis. Namely, these are the Emotion Context Insensitivity (ECI), the Negative Potentiation (NP), and the Positive Attenuation (PA) hypotheses (Rottenberg et al., 2005). To briefly recapitulate, the ECI hypothesis predicts that depressed individuals have lower responses regardless of valence; the PA hypothesis assumes that depressed differ from non-depressed individuals in terms of an attenuated reactivity for positive emotions; and, finally, the NP hypothesis predicts enhanced negative emotional reactions in depressed people.

The lower happiness ratings found in Study III are in line with the PA and ECI views, and do not contradict the NP view. However, the tendency for a higher anxiety reaction, especially in the severely depressed participants, goes against the ECI and is in line with the NP hypothesis. Finally, the similar sadness reactions between depressed and controls cannot be explained by any of the three views. In conclusion, none of these theories can adequately explain the combination of these findings.

Nonetheless, perhaps this deviation from the dominant theories occurred precisely because these were emotional reactions to music. In particular, two characteristics of music may have contributed to the present findings: The first regards music’s temporality and the second that music is personally meaningful.
Music’s temporal nature

Music requires time to unfold, in order to exist as music and not as isolated sounds (Schubert, 2010). Usually, laboratory studies measure emotional reactions as an immediate response to a stimulus. Music, though, which has a longer duration than other experimental stimuli may allow for the emotional reactions to “mature”.

Depressed individuals generally tend to show slower emotional responses. For example, while depressed individuals sometimes exhibit a blunted initial negative reaction, they appear to display a prolonged negative emotional reaction after stimulus exposure (Rottenberg & Bylsma, 2014), also demonstrated in a sustained amygdala activation in response to emotional stimuli (Siegle, Steinhauer, Thase, Stenger, & Carter, 2002). This slower responsiveness is also evident in negative attention biases, which appear to be exclusive for information which is elaborated, as reflected in a difficulty in disengaging from negative information (Sanchez et al., 2013). This negative attention bias has been associated both with emotion reactivity (increased stress reactivity: Sanchez et al., 2013), and maladaptive emotion regulation (Joormann & Stanton, 2016; Koster et al., 2011; Sanchez et al., 2013). Similarly, slower responses are also evident in interpretation biases and have been attributed to a general psychomotor retardation (Lawson et al., 2002).

It thus appears that depressed have a difficulty in discarding negative emotions over a longer time course. Therefore, the fact that we did not find reduced negative emotional reactions (i.e., reduced sadness or anxiety), as ECI would predict, may be due to the fact that emotional reactions to music were not measured instantaneously, but were allowed to unfold in time.

An issue is raised at this point, as one could argue that in this case what is measured is not an emotional reaction, but a regulated emotion. That is, if the initial emotional reaction is reduced but in time becomes more negative, it may have been regulated in a maladaptive way (e.g., difficulty to employ disengagement). Therefore, while on the one hand the fact that music provides time for the emotion to mature may aid the measurement of depressed individuals’ slower reactions, on the other hand it may indicate that the emotions have been regulated. This issue highlights the difficulty in empirically distinguishing between a regulated and a reactive emotion, which has been long discussed and debated in the literature (Gross & Thompson, 2007).

Music is personally meaningful

The second characteristic of music that may have contributed to the resulted emotional reactions concerns its personally meaningful nature. In the views presented in this thesis (Juslin, 2013), music is regarded to be highly personal, constituting what could be described as a personally meaningful stimulus. The valence of the music, then, depends largely on the personal significance that a specific music piece has for a specific individual.
Typically, studies on emotion reactivity in depression use paradigms featuring “normative” (i.e., objectively valenced) stimuli, such as positive or negative words (Rottenberg & Bylsma, 2014). Preliminary findings on emotion reactivity for personally meaningful stimuli find that depressed individuals show higher negative reactions to the personally meaningful compared to the normative stimuli, providing support for the NP view (Rottenberg & Bylsma, 2014).

Conclusion
In conclusion, music’s personal meaningfulness and temporal nature may result in a stimulus which is not directly comparable to the typical experimental stimuli used for studying emotional reactivity in depression. In fact, music may actually constitute a suitable stimulus for exploring depressive emotional reactions, taking into account the speed of depressed individuals’ emotional reactions and the importance of personally significant stimuli. Therefore, it may be able to induce emotional reactions which are more “realistic” and which resemble everyday scenarios, which do not have any time-limit to responses. Rottenberg and Bylsma (2014) suggested that including personally meaningful stimuli in laboratory assessments of emotion reactivity may indeed benefit our understanding of emotional functioning in depression.

The perspective of emotion-induction mechanisms
This thesis posits that music is personal, and the personal significance will be determined in terms of how the musical information is processed. The theoretical perspective presented here takes as point of departure the emotion-induction mechanisms, which reflect information processing (BRECVEMA: Juslin, 2013; Juslin & Västfjäll, 2008). In studying emotion reactivity to music in depression, the idea is that individual differences in information processing, such as cognitive biases, will influence the process of emotion induction by affecting the mechanisms.

In line with these hypotheses, depressed participants reacted with lower happiness to the Episodic memory stimulus and with higher anxiety to the Brain stem reflex stimulus. The most surprising finding, though, was the similarity in sadness reactions to the Contagion stimulus between depressed and non-depressed participants.

One way to interpret this finding is that the Contagion piece was “too sad”. The specific piece of music is characterized by an exceptionally sad expression, to which all participants might have responded with as much felt sadness as could reasonably be expected in a laboratory context, resulting in a “ceiling” effect. In addition, negative interpretation biases are predominately evident response to neutral/ambiguous emotions, and demonstrate an increased sensitivity towards subtle negative emotions (Bistricky et al., 2011). Therefore, perhaps the use of a stimulus expressing an ambiguous or
a subtle negative emotion would have more effectively revealed a negative bias. This however might have introduced methodological difficulties, impeding the selective activation of the contagion mechanism, which was the aim of the experimental paradigm.

Another way to interpret the result regards the possible co-activation of other emotion-induction mechanisms. Emotion-induction mechanisms are not necessarily activated in isolation (Juslin & Västfjäll, 2008). Even though the experimental paradigm employed in Study III was designed specifically for addressing this issue and selectively activating target mechanisms, it is of course unfeasible to entirely inhibit the co-activation of other mechanisms.

Specifically, participants’ self-reports indicated that the Contagion piece evoked the aesthetic judgment mechanism in addition to the contagion mechanism. Therefore, while a cognitive bias may have been influencing the perception of sadness, participants’ aesthetic judgment of the piece may have influenced the outcome emotion. In fact, Study I found a relationship between aesthetic judgment and depression, which was accompanied by a tendency to rely on the music’s expressivity for making their judgments. In Study III, the musical piece targeting the activation of contagion was selected because of its strong emotional expressivity. Therefore, if depressed individuals’ aesthetic judgments for this piece were also based on the expressivity of the piece, the piece would likely be highly evaluated. This positive evaluation could lead to the induction of a positive emotion, counteracting the sadness, and possibly leading to the experience of a pleasurable-sadness.

Finally, another way to understand this finding is by considering the results from Study II, which was conducted on the same participants. Study II found that over the whole sample (depressed and controls), participants chose to listen to music in order to reduce a negative emotion significantly more frequently compared to the goal of enhancing a negative emotion. Therefore, although they may have initially contagiously felt higher sadness, they may have down-regulated it by suppressing or avoiding it. Although depressed individuals did not differ significantly from non-depressed in emotion regulation strategies, there was a non-significant trend for them to employ distraction/avoidance and suppression more often than controls.

Episodic memories
The most robust finding in the literature of cognitive biases in depression regards memory biases. Similarly, the most prominent finding from this thesis regards depressed individuals’ MEAMs. Study III found that depressed participants’ largest difference in emotional response was attributable to the episodic memory mechanism. The hypothesis put forward was that a biased memory resulted in lower happiness ratings. Although Study III did not find any difference in memory valence between depressed and controls, Study IV found a large difference. Specifically, depressed individuals retrieved spontaneous MEAMs which were more negative in valence com-
pared to controls, and this was associated with the experience of negative emotion induction.

The fact that Study IV found a negative memory bias which Study III did not find may be explained by methodological differences between the two studies: Study III used just one experimenter-selected piece of music for targeting the evocation of a memory, while Study IV featured a larger selection of stimuli (10 pieces) including both experimenter-selected and participant-selected (personal) music, possibly allowing for the effect of music’s personal meaningfulness to be even more pronounced.

Therefore, while both studies found a difference between depressed compared to non-depressed individuals in emotional reactions to MEAMs, these results may be attributed to different reasons: anhedonia (potentially due to OAM) in Study III, and a negative memory bias in Study IV.

Specifically, the results from Study III appear to describe the phenomenon of a blunted reactivity to positive stimuli (i.e., positive memory), commonly evident in depression (Pizzagalli, Iosifescu, Hallett, Ratner, & Fava, 2008). Perhaps because of the stimulus (a popular music piece that was expected to evoke happiness due to pleasant associations), depressed participants happened to retrieve pleasant memories, to which they consequently responded with the typical depressive anhedonia (e.g., reduced happiness responses). This could potentially be due to OAM resulting in reduced responsiveness (e.g., Ford, Addis, & Giovanello, 2011), in line with findings that depressed compared to non-depressed individuals tend to recall less vivid positive episodic memories (Werner-Seidler & Moulds, 2011). However, this explanation remains just an assumption, because Study III did not measure specificity of MEAMs.

On the other hand, results from Study IV appear to describe a different phenomenon, namely an enhanced negative emotional reaction due to a negative memory bias. The selection of stimuli in this study, which included participants’ personally-selected music, may have thus afforded them the opportunity to retrieve negative memories. It must be noted though that Study IV did not take into account any of the other emotion-induction mechanisms (e.g., contagion, aesthetic judgments, etc.), which may have co-occurred and contributed to the emotional response. However, the high correlation between the MEAM valence and the induced emotional valence suggests that participants’ emotional reactions were strongly related to their memories.

The fact that the memories in Study IV were involuntary in nature, specific, and negative in valence suggests that music may evoke intrusive memories in depressed individuals. A significant body of research has demonstrated that depressed individuals often experience intrusive memories of negative events from their lives, which are characterized by their involuntary nature, vividness, and negative valence (Moulds & Krans, 2015). The fact that music may trigger such memories has implications for everyday music
listening and for therapy, which will further be described below (Implications section).

At this point, the question arises why OAM would only be evident in memories of Study III, but not in Study IV, to which the answer might rely on the valence of those memories. It has been suggested that personally salient memories are re-experienced more vividly than non-salient memories (Janata et al., 2007). Therefore, it may be the case that memories in Study III were overgeneral because they were positive (not depression-related, and therefore, not personally salient). This overgenerality may have consequentially led to the anhedonic emotional response. On the other hand, memories in Study IV may have been high in specificity because they were negative (i.e., emotionally salient). In fact, findings from Study IV show that depressed compared to control participants tended to remember more details regarding their emotions and thoughts, and regarding the implications of the memory, suggesting that their memories were indeed relatively personally salient.

To sum up, Studies III and IV show that depressed individuals may react with more negative emotions to MEAMs because of negative intrusive memories, and with anhedonia to positively valenced MEAMs. MEAMs play an important role in how we experience music listening, and, as also demonstrated in Studies III and IV, they often lead to emotional reactions to music. In conclusion, it appears that memories with music can account for a significant part of depressed individuals’ different emotional responses to music.

Emotion regulation with music in depression

Maladaptive emotion regulation is considered to be a core contributing factor in depression. Study II, however, found that depressed individuals did not differ from controls in their use of music for emotion regulation. One possible explanation for this finding is that music offers a safe context for dealing with emotions. Therefore, while the experiences of “uncontrolled” emotional reactions and spontaneous memories with music may be more negative (as indicated in Studies III and IV), music may offer a safe environment for individuals to adaptively work through these emotions and memories.

It should be emphasized though that the current thesis investigates the emotion regulation process in terms of the intention (goals, mechanisms, and strategies), not considering the emotion regulation outcome. This is in line with a general trend to focus on the level of the strategy when studying individual differences in emotion regulation.

Although it is indeed a robust finding that psychopathology is related to the habitual use of “maladaptive” over “adaptive” strategies (Aldao et al., 2010), some researchers highlight that strategies should not be characterized as “adaptive” or “maladaptive” by their nature (Gross & Thompson, 2007).
Rather, their adaptability varies depending on the individual’s goals and the specific situation, highlighting the contextual and dynamic properties of emotion regulation. Therefore, while the chronic habitual use of certain strategies is associated with more positive outcomes than the use of other strategies, this should not be generalized to every single occurrence. Nevertheless, most research, including present Study II, focuses on the level of the strategy.

Garrido and Schubert (2015b) compared emotion regulation with music in ruminators (i.e., individuals with depression tendencies) and non-ruminators, and found that the former experienced more sadness than non-ruminators after listening to sad music. When it came to the emotion regulation intention though (operationalized in their study as “prediction”), the results provided a mixed picture: While some ruminators did predict that this listening habit would increase their sadness, others predicted the opposite, that is, that they would actually benefit from listening to sad music. These results by Garrido and Schubert (2015b) show that high ruminators felt worse than low-ruminators after listening to sad music (emotion regulation outcome), regardless of their anticipation (emotion regulation intention).

In conclusion, Study II suggests that emotion regulation with music, at least in terms of the regulation intention, is similar between depressed and non-depressed people. These findings however do not necessarily imply that depressed are as efficient in regulating their emotions as non-depressed individuals, since the outcome of the process is not always consistent with the intention. It may likely be that emotion dysregulation resides precisely in the difficulty of employing emotion regulation strategies appropriately in relation to the goal.

Depression and aesthetic judgments of music

Findings from Study I suggest a relationship between depression and appreciation of aesthetic value in music, largely due to a greater reliance on expressivity as a judgment criterion. No relationship was found between depression and Openness to Experience in Study I, which could have potentially explained the relationship between depression and aesthetic judgment. However, it must be noted that this Big Five personality dimension has been found to be the most complex to measure (Barrick & Mount, 1991). Indeed, in the present study the reliability for the Openness to Experience dimension was quite low (Cronbach’s alpha was \( \alpha = .64 \)), suggesting that perhaps our measure did not adequately capture this dimension. Depression was associated though with lower levels of Extraversion. Young and colleagues (2013) suggest that the relationship between depression and the arts may be partly due to depressive “introversion” (which corresponds to low extraversion),
proposing that the introvert personality is more inclined towards art because of its solitary nature.

Another interpretation for the association between depression and aesthetic judgment may be that an introspective and “hypersensitive” idiosyncrasy underlies both depression and appreciation of art (Verhaeghen et al., 2014). Furthermore, depressed individuals may be more responsive to art in general because of their emotional struggles: Art, thus, may assist depressed people to handle difficult emotions, by matching those emotions with the often intense emotions expressed by the art. Supporting this view is our finding that higher depression scores were associated with the reliance on the expressivity criterion for judging aesthetic value in music.

Juslin’s (2013) model of aesthetic judgments in music and the empirical data from Study I suggest large individual differences in the criteria used for judging music’s aesthetic value. These differences may be influenced by cultural factors, preferences, personality, and expertise (Juslin, 2013). In addition to these factors, I propose that the criteria people deem important for assessing music’s aesthetic value may also reflect their goals and motives – what they seek in music.

If this speculation has any truth in it, we could further speculate that people who value expressivity in music search for music which is emotional and seek for emotional experiences with art. Others, who for instance value skill or novelty, may seek for a more “cognitive” and analytic experience with music (these could be, e.g., musicians). Therefore, depressed individuals may seek more emotional experiences with music. These experiences may offer some form of mood-matching (cf. Saarikallio & Erkkilä, 2007), contributing to an adaptive emotion regulation intention, similar to what we found in Study II.

To conclude, the relationship between depression and aesthetic judgment may be associated with depressed individuals’ search for emotional expression in music, to help them match their emotions and regulate them. Therefore, music featuring an intense sad expression to match their depressive sadness (like the Contagion stimulus in Study III) might constitute the ultimately aesthetically valuable music. This idea adds to the explanation of the unexpected finding in Study III that depressed and controls responded with similar sadness levels: not only was the sadness counteracted by a positive aesthetic judgment outcome, but this positive judgment was precisely because they could match their sadness to the music’s sad expression.

Methodological considerations

The present thesis constitutes an initial attempt to understand how depressed individuals experience affect during music listening, a largely unexplored research topic. Therefore, while partly answering some questions, the pre-
sent research has introduced a number of new research questions and potential directions for future research.

The following sections begin by highlighting novel contributions of the thesis, and continue with a presentation of methodological limitations and recommendations for future research.

Novel contributions

Overall, the theoretical approaches and empirical studies of this thesis highlight the importance of investigating affective experiences with music at the level of the individual, by analyzing how different individuals attend to and process the music’s information.

Study I contributes to the field of aesthetic responses to music with an empirical test of a novel model of aesthetic judgments in music, proposed by Juslin (2013). The findings were able to support the main hypotheses of the model and, for the first time, it was shown that the way in which music listeners form aesthetic judgments in music is highly personal and systematic. Study I also highlights the importance of adopting an idiographic approach in the study of aesthetic responses to music. Importantly, the results indicate that the nomothetic regression model does not fit participants’ individual regression models in terms of judgment strategy configuration, meaning that the response of the “average” listener could not adequately describe individual listeners’ responses. Study I emphasizes that idiographic approaches could constitute a beneficial approach for the study of various psychological phenomena.

Study II contributes with an integrative conceptual framework of emotion regulation with music, for comparing depressed to non-depressed individuals’ use of music for emotion regulation. This framework emphasizes the use of well-established “generic” psychological theory (namely, the process model of emotion regulation; Gross, 1988), adjusted to the musical situation. It also highlights the importance of measuring emotion regulation on multiple levels and adhering to clear differential definitions for each level.

Study III presents the first attempt to apply the BRECVEMA framework to psychopathology. This framework appears fruitful for exploring individual differences in emotional reactions to music, as it focuses on emotion-induction mechanisms within individuals. Finally, Study IV presents the first attempt to investigate the quality of MEAMs in depressed individuals. While MEAMs have been explored in other populations with memory deficits, no study had explored them in depressed individuals, who characteristically show memory impairments.
Limitations and future directions

**Participant characteristics**

Methodological considerations regarding the participant samples must be highlighted. First, throughout the four studies, the participants cover a wide range of depression levels: Study I sampled participants from the general population, and depression was measured as a continuous dimension reflecting levels of symptoms. Studies II, III, and IV compared depressed to non-depressed participants, which were defined in terms of their scores on the BDI-II. The depressed samples included individuals of different depression severity, covering mild, moderate, and severe depression. Therefore, “depression” in these studies is defined by a wide range of symptom severity and is not exclusively limited to dysphoria or clinical depression, or to a primary diagnosis of MDD. Finally, a significant number of depressed participants also demonstrated comorbid anxiety.

Therefore, it should be emphasized that this thesis describes individuals with elevated depression scores, as indicated by the BDI-II test. Depression is a highly heterogeneous disorder (Klein & Allmann, 2014) and thus clinical depression may present qualitatively different symptoms and characteristics compared to subclinical depression (Ingram, Siegle, & Steidtmann, 2014). In conclusion, the findings of the present studies should be cautiously interpreted and are not directly generalizable to clinical depression.

Instead, this research should be regarded as a first step in exploring whether there is any relationship between depression level and affective experiences with music. Future research may want to further these findings by focusing on more exclusive populations. Our findings from Study III suggest that the effect of cognitive biases may be pronounced in severely depressed individuals. In support of this finding, participants of Study IV, which found a negative memory bias, were on average severely depressed. Future research may thus selectively focus on severely depressed individual for studying the quality of emotion-induction mechanisms, such as brain stem reflex or episodic memory, and their effects on emotional reactions.

A second consideration in relation to the participants relates to self-selection bias. Depression is typically associated with decreased motivation to engage in activities (Cléry-Melin et al., 2011) such as, for example, visiting the laboratory for participating in a study. It is therefore possible that the depressed participants who signed up for the studies differed from the general depressed population in terms of motivation. This can be related to the fact that a large proportion of the depressed participants were receiving treatment, indicating that they were actively dealing with their symptoms.

In addition, regarding the (common) sample in Studies II and III, anecdotal data suggested that some participants decided to sign up for the studies because they felt that music had helped them deal with their depression. Supporting the argument of increased motivation in this sample are the find-
ings that differences in emotional responding were only found in the “pas-
active” and “uncontrolled” responses (i.e., emotional reactions - Study III), but
not in the “active” response (i.e., emotion regulation - Study II), which in the
specific study reflected the intentions for emotion regulation. This self-
selection bias in fact contributed to the decision to conduct Study IV on the
Internet, the idea being that because the study could be completed from the
comfort of participants’ home, it would require less motivation than the typi-
cal laboratory study.

A final consideration regarding the participants regards the rather small
samples, especially in Study IV, due to a difficulty in recruiting a sufficient
number of depressed individuals within a reasonable timeframe. Besides
impeding the statistical power of the analyses, the small sample size limits
the generalizability of the findings. In conclusion, the studies suffer from
small samples varying in terms of depression severity, which must be taken
under consideration when interpreting the findings.

Context and time
Music listening experiences are considered to be influenced by a dynamic
musical event featuring interactions between the music, the listener, and the
situation (Gabrielsson, 2010). This thesis focuses on individual differences,
and therefore explores the psychological processes within the individual in
order to understand depression-specific responses. As a consequence, how-
ever, contextual factors have been neglected.

Studies I, II, and III were conducted in the laboratory, while study IV fea-
tured a web-experiment. Both approaches feature advantages and disad-
vantages. While the laboratory offers experimental control, it limits the gen-
eralizability of the findings to real-life situations. On the other hand, con-
ducting music-listening studies on the Internet offers the opportunity for the
participant to experience music listening in a more natural environment (i.e.,
their home), contributing in a sense to more ecologically valid data. Howev-
er, an important disadvantage of conducting a study on the Internet is re-
duced experimental control. To address this issue, Study IV included de-
tailed instructions for the participants, with the aim of creating more stand-
ardized conditions.

A promising future direction would be to explore affective experiences
with music in depressed individuals with the use of naturalistic methods,
such as Event-Sampling Method (ESM). ESM refers to a diary method
which collects data in real-time (as events naturally occur), throughout long-
er time courses, and in “real-life” environmental settings. This method has
been used previously to measure emotional responses to music (e.g., Juslin
et al., 2008; Randall et al., 2014; Thompson & Larson, 1995), and is useful
for measuring psychological phenomena as they naturally occur in everyday
life. Modern technology has contributed to the development of sophisticated
ESM methods, such as the \texttt{MuPsych}, which features an application (app) for
mobile devices that collects data during real-time music listening episodes on mobile phones (Randall & Rickard, 2013).

Such methods are of particular usefulness considering the dynamic nature of emotion regulation (Gross, 2008) and the influence of situational factors on the formation of aesthetic judgments (Juslin, 2013). Their usefulness increases when studying depressed individuals, considering the time course of emotion reactivity in depression (Rottenberg & Bylsma, 2014), and considering the effect of involuntarily retrieved memories on depression-related OAM (Williams et al., 2007).

In the case of emotion regulation, it is necessary to measure the process on several levels (such as the goal, the strategy, the mechanism, and the outcome) in order to understand how the whole process works. The results of Study II indicates a lack of differences between depressed and control participants’ use of music for emotion regulation in terms of the intention (i.e., goal, strategy, and mechanism), but could not inform us about the emotion regulation outcome. Studies conducted in “static” laboratory environment and using retrospective self-report questionnaires, such as the method of Study II, cannot easily address all levels. However, a dynamic real-time method, such as ESM, would be a promising method for exploring such research questions. Therefore, future research can investigate how effectively “adaptive” emotion regulation strategies are actually employed by depressed individuals during music listening, and what the outcome of this process is.

Furthermore, ESM would provide a useful method for measuring spontaneously retrieved episodic memories. Study IV measured spontaneous MEAMs in depressed individuals, however could not include a control condition measuring spontaneous memories evoked without music, because such memories (with no stimulus as a trigger) would require some sort of real-time measurement, offered by ESM. Nevertheless, a disadvantage with ESM is that it could introduce methodological limitations relating to demand characteristics and reactivity (Fisher & To, 2012).

**The measurement instruments**

The studies included in the thesis rely on self-report methods for measuring the constructs in question. This method comes with a number of potential biases, due to, for instance, demand characteristics, self-presentation biases and strategic responding, or limited awareness and ability to label internal states (Västfjäll, 2010; Zentner & Eerola, 2010). The latter issue is of particular concern when studying depression, which has been associated with alexithymia (see, e.g., Punkanen et al., 2011).

However, self-reports are also undeniably valuable for psychological research. Regarding the measurement of emotional reactions, self-reports measure the “feeling” component of the emotion, which forms the core of what emotion investigations seek to explain, and what lay people essentially
mean when referring to emotions. Furthermore, self-reports have the advantage of measuring a wide range of emotions, also including mixed emotions, which cannot be measured with such precision using physiological or facial EMG methods. Alternatively, future research can employ a multi-component measurement approach for measuring emotional reactions to music in depressed individuals, similar to studies of Juslin and colleagues (2015, 2014). It should be highlighted though that such an approach could perhaps produce less interpretable findings, because depression has been linked to a dissociation between various emotional components (e.g., feeling, and facial expression; see Rottenberg, Kasch, Gross, & Gotlib, 2002).

In contrary to the self-reported measurement of “conscious” experiences, such as felt emotions (Study III), ratings of aesthetic value (Study I), or ratings of memory characteristics (Study IV), the self-reported measurement of emotion induction mechanisms (Study III) or emotion regulation strategies (Study IV), which may be “subconscious” in nature, introduces an additional limitation.

However, while some of these mechanisms are implicit in nature (such as conditioning), they may co-occur with subjective impressions that can be reported by listeners. For example, a listener influenced by the conditioning mechanism may be able to identify that the music “reminds them” of something. Regarding the questionnaire used for measuring the mechanisms (Studies II and III), previous research confirms that the items are predictive of both target mechanism conditions (Juslin et al., 2015) and self-reported emotions (Juslin et al., 2014). Nevertheless, self-reports of strategies and mechanisms must be cautiously interpreted.

A final consideration regards the measurement of the emotion-induction mechanisms (Study III) which was performed indirectly, by measuring the outcome emotion. Nevertheless, this is an issue of psychological research in general: psychologists must rely on outcome variables and correlates (e.g., behaviors, physiological responses, brain activity) in order to make inferences regarding the underlying psychological processes. Still, in order to understand how depressed individuals process music at the level of the mechanism, future studies can examine cognitive biases in a more “direct” manner. For instance, emotional contagion with music could be measured at both the levels of emotional perception and emotional induction, in order to obtain a better understanding of the mechanism’s (i.e., contagion’s) function. Study IV reflects such an attempt, by measuring the valence and specificity of the Episodic memory induction mechanism.

Conclusions
To sum up, the empirical results presented in this thesis must be considered as preliminary evidence of a relationship between depression and affective experiences during music listening. Future research should replicate such findings with larger participant samples, and preferably focus on specific
depression sub-types, such as clinical depression. In addition, future research can explore these phenomena with the use of complementing methodologies and in naturalistic and dynamic environments.

**Additional future directions**

Besides the suggestions for future research stemming from current methodological limitations, the present research also introduces new potential research questions. This thesis investigated isolated occurrences of emotional reactions to music, MEAMs, aesthetic judgments, and the retrospective evaluations of emotion regulation habits with music. Results indicate that, while in some ways music can offer positive experiences (e.g., the finding of adaptive emotion regulation in Study II), it can also lead to more negative experiences (e.g., negative MEAMs in Study IV).

What remains unexplored though is how these isolated responses affect depression in its course. Miranda et al. (2012) emphasize that everyday music listening may have a cumulative effect, either positive or negative, on depressive symptoms. Therefore, future research can investigate how isolated affective responses add up and influence depressive negative mood and symptoms. Another potential next step would therefore be to explore how emotion reactivity and emotion regulation interact and contribute (positively or negatively) to depressed individuals’ mood and symptoms.

Finally, the role of cognitive biases in other emotion-induction mechanisms, besides the ones studied here, could also be investigated in the future. For instance, psychopathology has been associated with vivid mental imagery (Holmes & Mathews, 2010). Research investigating visual imagery with music and its effect on emotional reactions in a depressed sample thus constitutes another possibility for future research.

**Implications**

Understanding how depression influences affective responses to music has implications for the role of music listening in everyday life. Specifically, the findings from Studies III and IV, while preliminary, may have implications for how depressed individuals experience music listening. Memories with music play an important role in how we experience music and may lead to emotional responses to music. In addition, memories and emotions both act as a motivating factor for people to engage in music listening. Therefore the experience of negative memories and of the associated negative affective responses with music may demotivate depressed individuals to listen to music. In addition, memory impairments in depression are considered to influence the development of the disorder and to contribute to maladaptive emotion regulation (Joormann & Stanton, 2016). Therefore, music’s ability to evoke vivid negative memories may encourage the use of music listening for
ruminating over negative events, promoting maladaptive emotion regulation. However, this assumption does not agree with our finding that depressed are no more likely than non-depressed individuals to ruminate with music, at least not explicitly (Study II).

The findings of this thesis also have implications which could be suggestive for psychotherapy against depression. The basic “data base” of talking psychotherapy is the discussion of autobiographical memories (Rubin, 1996). A difficulty in accessing such memories may therefore constitute a therapeutic obstacle (Garland & Scott, 2008). While this thesis does not show that music per se benefits memory functioning in depression by reducing OAM (as it does in AD), what Study IV does show is that music may trigger the evocation of negative and specific autobiographical memories in depressed individuals. This may be useful in the therapeutic situation in which a depressed patient has difficulty in recalling specific significant memories from their past (e.g., Blake & Bishop, 1994).

The finding that music may trigger specific negative autobiographical memories and the associated emotional reactions in depressed individuals may also be applicable in exposure-based therapies for depression. The idea behind this therapeutic approach is that avoidance behaviors contribute to the maintenance of depression (Hayes et al., 2007). Exposure-based therapy thus targets avoidance behaviors and aims to expose the depressed individual to the unwanted and disturbing thoughts and emotions, in order to facilitate their therapeutic processing. Therefore, the use of personal music may function as a useful aid for dealing with unwanted memories, thoughts, and emotions during psychotherapy.

In addition, as mentioned above, the possibility of retrieving negative memories with music may demotivate depressed individuals to engage in music listening. However, the findings from this thesis suggest that music may also constitute a positive affective experience for depressed people, for instance when listening to aesthetically valuable music (Study I). Furthermore, Study II suggests that depressed individuals have relatively adaptive emotion regulation intentions when listening to music. Therefore, music listening might also be a beneficial activity for counteracting depressive symptoms, which could be utilized by behavioral activation therapeutic approaches. Behavioral activation refers to a structured action-oriented treatment (Martell, Dimidjian, & Herman-Dunn, 2010), found to be highly effective for treating depression (for a meta-analysis, see Cuijpers, van Straten, & Warmerdam, 2007). The primary aim of behavioral activation is to engage patients in potentially rewarding activities and decrease avoidance behaviors, in order to increase rewarding experiences and overall engagement and activation in their lives (Martell et al., 2010). Music listening in itself could thus constitute an avoidance behavior for depressed people, which on the other hand could be a potentially rewarding behavior to engage in and to be encouraged in treatment. In addition, music listening often accompanies, en-
hances, and motivates the engagement in other potentially beneficial activities, such as studying, socializing, or exercising (Juslin et al., 2008; Karageorghis & Priest, 2012). Consequently, music listening could also be used in the framework of behavioral activation in order to stimulate the activation of other rewarding behaviors.

Finally, the present findings may have implications for music therapy. While music therapists emphasize the crucial role of aesthetics in the therapeutic process (Aigen, 2007), aesthetic value is often conceptualized in terms of a single criterion (i.e., beauty) and a specific kind of music (i.e., classical). Study I indicates that the way in which music is perceived and judged aesthetically varies widely between listeners, while the methodology used in Study IV suggests that personal music is efficient in evoking vivid MEAMs in listeners. In combination, these results highlight the importance of personally significant music for affective experiences with music.

Final conclusion

This thesis aimed to investigate depressed individuals’ affective responses to music. The featured empirical studies suggest that depression is associated with differences in affective responses in relation to aesthetic judgments and emotional reactions. At the core of these differences appear to be cognitive biases. Specifically, Study I found an association between depression and a heightened appreciation of aesthetic value in music, coupled by a reliance on music’s expressivity for judging its overall aesthetic value. Study II did not find any difference in the way depressed and non-depressed regulate their emotions with music, but Study III found that depressed responded with lower happiness reactions than non-depressed individuals. As Studies III and IV indicate, differences in emotional reactions may be attributable to cognitive biases, and specifically to anhedonic responses to positive memories and to negative responses to negative and vivid spontaneous music-evoked episodic autobiographical memories.

It therefore appears that music may have a dual potential for depressed individuals, functioning both as a beneficial resource for alleviating depressive symptoms (due to, e.g., aesthetic appreciation of music), and as a contributing factor to depressive mood (due to, e.g., negative memories). The outcome ultimately depends on how this powerful emotional resource, music, is utilized.
Η μουσική έχει την ικανότητα να επηρεάζει έντονα τα συναισθήματα μας και να ανακουφίζει την κατάθλιψη. Η συχνή αυτή επιρροή της μουσικής στις συναισθηματικές μας καταστάσεις βρίσκει συχνά εφαρμογή σε μουσικο-θεραπευτικές παρεμβάσεις κατά της κατάθλιψης, όπως και στην καθημερινότητα για τη διαχείριση συναισθημάτων. Δεδομένης της δυνατότητας της μουσικής να επηρεάζει τα συναισθήματα και τα συμπτώματα σε ανθρώπους με κατάθλιψη, είναι απαραίτητο να κατανοήσουμε τον τρόπο με τον οποίον οι άνθρωποι αυτοί ανταποκρίνονται συναισθηματικά στη μουσική. Ωστόσο, υπάρχει έλλειψη έρευνας διερευνώντας την ανταπόκριση των καταθλιπτικών ατόμων στη μουσική ακρόαση. Η παρούσα διατριβή φιλοδοξεί να δώσει μια πρώτη προσπάθεια για να καλύψει την έλλειψη αυτή, διερευνώντας τις συναισθηματικές ανταποκρίσεις καταθλιπτικών ατόμων στη μουσική.

Με τέσσερις εμπειρικές μελέτες, ο πρωταρχικός σκοπός της παρούσας διατριβής είναι να μελετήσει εάν τα άτομα που πάσχουν από κατάθλιψη παρουσιάζουν ξεχωριστές συναισθηματικές ανταποκρίσεις στη μουσική, όπως αφορά τις αισθητικές αντιδράσεις, τις συναισθηματικές αντιδράσεις, και τη διαχείριση συναισθημάτων. Επιπλέον, η διατριβή αποσκοπεί στο να παράσχει πιθανές εξηγήσεις για ενδεχόμενες διαφορετικές ανταποκρίσεις, όπως αφορά τις συμβάλλουσες υποκείμενες ψυχολογικές διεργασίες (όπως, π.χ., ψυχολογικοί μηχανισμοί που οδηγούν στην έγερση συναισθημάτων), και όπως αφορά συγκεκριμένα χαρακτηριστικά των καταθλιπτικών ατόμων (όπως, π.χ., προσωπικότητα, συναισθηματική ιδιοσυγκρασία, γνωστικά σφάλματα).

Η πρώτη μελέτη περιλαμβάνει ένα πείραμα μουσικής ακρόασης που ερευνά τη σχέση μεταξύ κατάθλιψης και αισθητικών κρίσεων στη μουσική. Τα ευρήματα δείχνουν ότι η κατάθλιψη συσχετίζεται με υψηλότερη αξιολόγηση της συνολικής αισθητικής αξίας της μουσικής, βασισμένη κατά κύριο λόγο στο αισθητικό κριτήριο "εκφραστικότητα". Ωστόσο, η σχέση αυτή δεν βρέθηκε να συνοδεύεται από συσχέτιση μεταξύ του επιπέδου κατάθλιψης και του παράγοντα προσωπικότητας "δεκτικότητα σε εμπειρίες".

Η δεύτερη μελέτη ερευνά την διαχείριση συναισθημάτων με τη μουσική, συγκρίνοντας καταθλιπτικά με μη-καταθλιπτικά άτομα. Η μελέτη αυτή παρουσιάζει ένα νέο εννοιολογικό πλαίσιο για την κατανόηση του φαινομένου της διαχείρισης συναισθημάτων.
με τη μουσική. Το εννοιολογικό αυτό πλαίσιο είναι βασισμένο στο καθερμομένο μοντέλο διαχείρισης συναισθημάτων του Gross (process model; Gross, 2008), σε συνδυασμό με την προσέγγιση των van Goethem και Sloboda (2011), η οποία αφορά το φαινόμενο της διαχείρισης συναισθημάτων αποκλειστικά στα πλαίσια της μουσικής ακρόασης. Τα αποτελέσματα της δεύτερης μελέτης δείχνουν ότι τα άτομα με κατάθλιψη δεν διαφέρουν από τα μη-καταθλιπτικά άτομα στις "ενεργές" συναισθηματικές ανταποκρίσεις τους στη μουσική (διαχείριση συναισθημάτων), τουλάχιστον όσον αφορά την πρόθεση για διαχείριση συναισθημάτων.

Η τρίτη μελέτη περιλαμβάνει ένα πείραμα μουσικής ακρόασης, το οποίο συγκρίνει τις "παθητικές" συναισθηματικές ανταποκρίσεις (συναισθηματικές αντιδράσεις) καταθλιπτικών και μη-καταθλιπτικών ατόμων σε μουσική ερεθίσματα. Τα ερεθίσματα αυτά σχεδιάστηκαν και επιλέχθηκαν με τον σκοπό να ενεργοποιήσουν συγκεκριμένους μηχανισμούς πρόκλησης συναισθημάτων, πιο συγκεκριμένα, αντανακλαστικό στελέχους εγκεφάλου, συναισθηματική μεταδοτικότητα, και επεισοδιακή μνήμη. Τα ευρήματα υποδηλώνουν ότι οι άνθρωποι με κατάθλιψη εμφανίζουν διαφορές στις συναισθηματικές αντιδράσεις τους αντιδράσεις, όσον αφορά συναισθημάτα που εγείρονται λόγω της ανάκλησης της επεισοδιακής μνήμης κατά τη μουσική ακρόαση, πιθανός λόγο γνωσιτικών σφαλμάτων.

Η τέταρτη μελέτη, τέλος, διερευνά την ποιότητα των αναμνήσεων που προκαλούνται από τη μουσική, όσον αφορά το φορτίο (θετικό ή αρνητικό) και την λεπτομερότητα τους (λεπτομερείς ή γενικευμένες). Η μελέτη δείχνει ότι οι αναμνήσεις των καταθλιπτικών συμπτωμάτων είναι λεπτομερείς και αρνητικά προκατειλημένες (υποδεικνύοντας γνωσιτικό σφάλμα), γεγονός που υποδηλώνει ότι η μουσική έχει την ικανότητα να προκαλέσει αρνητικές παρεμβατικές αναμνήσεις σε άτομα με κατάθλιψη.

Συνδυαστικά, τα ευρήματα της παρούσας διατριβής υποδηλώνουν ότι η μουσική ακρόαση μπορεί να έχει τόσο θετικές όσο και αρνητικές επιπτώσεις στις συναισθηματικές καταστάσεις καταθλιπτικών ατόμων, λεπτομερώντας τόσο ως οφέλη πιτή για την ελάφρυνση των καταθλιπτικών συμπτωμάτων (λόγω, π.χ., αυξημένης αισθητικής εκτίμησης της μουσικής), όσο και ως παράγοντα που συμβάλλει στην καταθλιπτική διάθεση (εξαιτίας, λ.χ., των αρνητικά προκατειλημένων αναμνήσεων).
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References


A doctoral dissertation from the Faculty of Social Sciences, Uppsala University, is usually a summary of a number of papers. A few copies of the complete dissertation are kept at major Swedish research libraries, while the summary alone is distributed internationally through the series Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Social Sciences. (Prior to January, 2005, the series was published under the title “Comprehensive Summaries of Uppsala Dissertations from the Faculty of Social Sciences”.)