Music listening and the eight DIAMONDS –
Can situational clusters predict musical parameters?

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Music listening and the eight DIAMONDS – Can situational clusters predict musical parameters?

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I. Abstract

Technological innovation has enabled the modern individual to listen to any song, anywhere and at any time. Hence contexts of music listening are now more versatile than ever before, which also increases the potential number of motives for listening. Listeners are able to draw pure enjoyment, cognitive stimulation, identification with the artist or song, fulfillment of emotional needs and many more advantages from music listening.

Since there is a wide range of possible circumstances in daily life and an extensive number of personal attributes, it is a challenge for research to reliably predict listening behavior. The main problem of research is to commit to an instrument which captures relevant and representative aspects. Until recently, researchers have largely neglected the influence of situational factors on listener's habits. However, some studies have since then shown that certain differences in listening behavior are largely due to differences in situational factors.

This thesis was built upon this new perspective and aimed at helping establish a new way of integrating situational parameters into musical psychology research. Beyond that, it was the objective of this thesis to generate new findings with regards to situation-specific listening behavior.

In this thesis, the Situational Eight DIAMONDS served as an instrument for capturing the psychological meaning of situations. Together with other situational factors and person-related attributes, DIAMONDS were utilized as predictors for musical/psychological parameters of music. For statistical analysis, 545 self-described and rated situations were captured from 173 participants by means of an online survey. Results indicated that DIAMONDS dimensions were able to significantly and comprehensively predict musical parameters and it was hence shown that Participants chose their music in accordance with the psychological meaning of respective perceived situations. Results further indicated that clusters with different situational characteristics significantly predicted musical arousal, valence and depth.

Participants were therefore found to adapt their music listening behavior in accordance with their needs in different situations with regards to stimulation, emotion and cognitive processes. Results further hinted at a need for DIAMONDS to be included as an Instrument in further research and a possible integration of situational characteristics into real-life applications.

II. Zusammenfassung

Technologischer Fortschritt hat es dem modernen Individuum ermöglicht, jedes gewünschte Lied überall und zu jeder Zeit anhören zu können. Folglich ist die Anzahl an möglichen Hörkontexten heutzutage vielseitiger als je zuvor, was wiederum ebenfalls die Anzahl der potentiellen Motive für das Musikhören erhöht. Hörer können reinen Hörgenuss, kognitive Stimulation, Identifikation mit einem Lied oder Künstler, Erfüllung emotionaler Bedürfnisse und viele weitere Vorteile aus dem Musikhören ziehen.

Da es ein breites Spektrum an möglichen Umständen im täglichen Leben sowie eine Vielzahl an persönlichen Eigenschaften gibt, ist es eine Herausforderung für die Forschung, Musikhörverhalten verlässlich vorherzusagen. Das Hauptproblem ist dabei, sich auf ein Instrument festzulegen, welches relevante und repräsentative Aspekte erfassen kann. Bis vor kurzem haben Forscher die Einflüsse situativer Faktoren auf Hörgewohnheiten weitestgehend vernachlässigt. Jedoch haben einige Studien seitdem gezeigt, dass gewisse Schwankungen im Musikhörverhalten größtenteils auf Veränderungen situativer Faktoren zurückzuführen sind.

Diese Masterarbeit baute auf dieser neuen Perspektive auf und zielte darauf ab, bei der Etablierung einer neuen Art der Integrierung situativer Faktoren zu helfen.

Zudem war es das Ziel dieser Masterarbeit, neue Befunde bezüglich situationsspezifischem Hörverhalten zu generieren.

In dieser Masterarbeit dienten die Situational Eight Diamonds als Instrument für die Erfassung der psychologischen Bedeutung von Situationen. Zusammen mit anderen situativen Faktoren sowie personenbezogenen Eigenschaften, dienten DIAMONDS als Prädiktoren für musikalische/psychologische Eigenschaften von Musik. Für die statistische Analyse wurden 545 selbstbeschriebene Situationen von 173 TeilnehmerInnen einer Online-Umfrage erfasst.

Ergebnisse wiesen darauf hin, dass DIAMONDS musikalische Parameter signifikant und nachvollziehbar vorhersagen konnten und somit zeigten, dass Individuen ihre Musik in Übereinstimmung mit der psychologischen Bedeutung jeweiliger Situationen wählten. Ergebnisse wiesen darüber hinaus darauf hin, dass Situationsklassen mit unterschiedlichen Ausprägungen an Situationscharakteristika musikalische Dimensionen Valenz, Arousal und Tiefe vorhersagten.

Teilnehmer passten folglich ihr Musikhörverhalten an Ihre Bedürfnisse in verschiedenen Situationen bezüglich Stimulation, Emotion und kognitiven Prozessen an. Des Weiteren wiesen die Ergebnisse auf die Notwendigkeit hin, DIAMONDS als Instrument in zukünftige Forschung anzuwenden sowie auf mögliche Integration von Situationscharakteristika in realen Anwendungen.

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III. Abbreviations

- DIAMONDS (dimensions): 1. Duty
  2. Intellect
  3. Adversity
  4. Mating
  5. pOsitivity
  6. Negativity
  7. Deception
  8. Sociality
- ICC: Intraclass Correlation Coefficient
- e.g.: For example
- et al. : And others

1 Introduction

Music is a feeling. Its creation and consumption are both based on emotion. There are patterns, structure, words, sounds, melodies and many more elements to a song. Yet one can listen to a particular track and not remember anything from it afterwards, except for the emotion expressed by it and felt from it.

Music offers not just entertainment and pleasure through the process of auditive perception. It can offer entrance to an artist's mind and life through stories and feelings delivered via voice and instruments. Adolescents are particularly drawn to music and influenced by it, because it offers possibilities for identification and orientation. Most likely, every person's personality has been influenced by the music she or he listened to in younger years.

Music can make people feel pleasure; make people feel inspired and energized; bring people together; increase physical and mental well-being; and help people complete daily tasks. The sheer multitude of implications surrounding music emphasizes its power.

Through new developments in marketing and technology, the relevance of the music itself has decreased. Popular artists in particular utilize their social media presence in order to market themselves and their brand. There are even recording artists who are more famous for their antics than for their musical talent.

Streaming services and digital platforms have vastly simplified music publishing and consumption. This development has enabled a more democratic and accessible market for artists and listeners on the one hand. On the other hand it has led to an overcrowding on the supply level and thereby reduced attention span for new songs, with an overall decreased song-value.

This thesis examines the music itself and explores its effects and usage in daily life.

In combining current insights of musical science, musical psychology and social psychology, this thesis attempts to deliver a deeper understanding of music listening habits in various daily situations.

Why does a particular person listen to a particular musical style in a particular moment? Most likely, no study will ever be able to answer that question with certainty. Nevertheless, it is relevant to attain a deeper knowledge of music listening habits. With

technology on the rise, new possibilities for bringing people closer to music emerge on a regular basis.

1.1 Historical developments of music listening

Music listening has been dependent on situational and locational factors for thousands of years. From ancient Greece, where music was believed to form a person's character, to concert music of the nineteenth century where listeners were solely able to experience music at the locations of performance (Wang, 2004; Landels, 1999; North et al., 2004). Compared to nowadays, music was highly immobile and the amount of different listening situations and contexts was limited accordingly (North et al., 2004). These restrictions were overthrown in 1878 by the first major technological revolution in the field of music creation: the beginning of recorded music. Suddenly, people were able to listen to music via phonograph boxes in their living rooms, which replaced the obligatory concert visit. Not only did this change affect listening behavior, but it also forced musicians to write music for two completely different listening contexts (Byrne, 2012).

In the twentieth century, the number of listening contexts and situations grew even more with the development of new music genres such as Jazz, Rock, Rap, Pop and others. While classical music was played live at theaters and concert halls for attentive listening, songs of newer genres were created specifically for dancing, mingling and partying and were therefore played at nightclubs and arenas, suitable for the respective context and auditive delivery. Not only did technology enable the acoustic communication of the new genres but it further increased the availability of music. Through mass media and inventions like cassettes, compact discs and the Walkman, several new possibilities of listening emerged. Through these new developments, music could easily be listened to in the car, at home or anywhere on the go (Byrne, 2012; North et al., 2004).

The age of increasing digitalization and internet made the possibilities of music listening grow even further. Consumers are now able to access huge databases of different musical styles on different platforms, for music streaming and download. Combined with the mobility of portable devices such as smartphones, the range of

listening contexts and situations is now larger than ever before (North et al., 2004; Krause et al., 2015).

Another relatively new development is the dominating role of video platform YouTube, as a tool to consume and get to know music. According to a study published by Nielsen Co. in 2012, YouTube is the top source of music consumption for teenagers and the third most common source for adults after radio and CDs (Smith, 2012). The fact that there are music videos with a view count of more than three billion confirms the relevance of YouTube as a major listening source (Nevins, 2017).

1.2 Music in the context of culture and health

Reasons for adolescents' affinity towards YouTube could be easy availability of content and the possibilities of interaction between users via sharing, liking and commenting on videos (Edmond, 2014). Another less technical reason for the popularity of music videos amongst adolescents could be the possibility for personal identification with certain musical styles, songs or artists. According to North et al. (2000) adolescents communicate their *"values, attitudes and opinions"* to the world through the music they associate themselves with (North et al., 2000, p. 258; Frith, 1981 in North et al, 2000). Moreover, North et al. (2000) found identity formation and mood-management to be the main reasons for American adolescents to listen to pop music. Sloboda and O'Neill (2001) further emphasized the cultural relevance of music and its consequential use for expression, interpretation and presentation of a person's self. These studies among others hint at music transcending sheer consumption needs, which points at a higher personal motive within listeners.

A more specific example can be found in Hip Hop culture, which spawned today's most popular music genre in the US and other countries: Rap music. In 2017, Rap surpassed Rock in its total US revenue according to Nielsen. This was caused by a massive growth in the use of music streaming (Lynch, 2018). But the overall popularity of the Rap genre can further be attributed to a general appeal of the culture surrounding the musical fraction. Originating in the Bronx of the 1970s, Hip Hop culture offered music, dance and art to underprivileged, mostly minority youths, lending them relief from their lives in poverty and stress (Chang, 2005).

Because of Hip Hop culture emerging from a climate of systematic discrimination against mostly African-American and Latino minorities through politics and parts of society, the music it produced was full of social commentary, in which listeners and participants could find themselves and their everyday struggles (Chang, 2005). Moreover, early Rap music was full of political statements and attitudes, demanding a change of the status quo. It was this authenticity and roughness, reflecting what was going on in the streets of New York and other US cities, that made Rap so appealing to people of all classes and cultural backgrounds (Hall, 2011).

More than 40 years later, Rap music has evolved into a mainstream musical genre, dominating popular culture. Since commercialization of Rap music and the involvement of corporate America using Rap as a marketing tool (Rose, 2008), the social empowerment aspect has faded into the background more and more (Hall, 2011). However, some of the old rebellious character has remained and Rap music as well as Hip Hop culture nowadays offer a way for young people from all over the world to interact within a common identity and express as well as exchange attitudes and values.

The case of Rap music goes to show that motives for listening to and associating oneself with certain musical forms go far beyond the liking of a musical or auditive style: identity, inclusion, fashion and expression to name a few (Parker, 2003 in Hall, 2011; Hall, 2011).

An empirical example regarding effects of Rap music can be found in a study, in which the so-called Rap scale was utilized (Tyson, 2005 in Travis Jr & Bowman, 2011). For the purpose of researching risk and empowerment effects of Rap music, Travis Jr & Bowman (2011) displayed factor loadings for different subscales based on data from 605 college students. For instance *"Hip Hop music provides me an outlet to express myself"* and *"Listening to Hip Hop music has made it easier to talk about my problems"* were the highest loading items on subscale *"individual empowerment"* (Travis Jr & Bowman, 2011, p. 668). On the *"community empowerment"* scale, highest loading items were *"Hip Hop that I listen to gives me hope that conditions in my neighborhood can be better"* and *"Hip Hop has helped me see that other people go through similar problems as me"* (Travis Jr & Bowman, 2011, p. 668).

Beyond the aforementioned effects on individuals such as empowerment and identification mechanisms, music listening can provide major health benefits for persons suffering from different physical and mental conditions. For instance, exposure

to music inside hospitals has shown to create an environment which supports physical healing and mental health (McCaffrey, 2008). Musical sources are easily available (Zimmerman et al., 1989), cost efficient (Miakowski, 1996) and free of major side effects (McCaffery, 1992). This makes musical therapy and musical self-therapy a potential complement or even substitute for medication (Mitchell et al., 2007). In a study investigating the effects of music listening on chronic pain via the WHOQOL Scale (World Health Organization Quality of Life Scale) and in particular items encompassing pain and discomfort, Mitchell et al. (2007) found music listening to offer major relief. Patients from the sample particularly listened to self-chosen songs in order to help them relax and fall asleep, as well as for the purpose of not thinking about their illness or hospital stay. Especially those who regarded music as an important element in their lives were found to benefit from it through an overall improved quality of living (Mitchell et al., 2007).

A direct effect of auditive therapy and self-therapy on health was found in the case of some mental conditions, related and unrelated to physical pain. After exposure to stress, subsequent exposure to classical songs and self-selected songs was shown to significantly decrease anxiety, while increasing relaxation. Self-selected songs were also shown to decrease levels of anger more than silence, classical music and heavy metal songs (Labbé et al., 2007).

In another study evaluating the effects of music on pain, power, and depression, familiar music exhibited the strongest positive influence on depression. Data was collected among patients experiencing physical pain and participants were subdivided into three groups. Group 1, which had a high degree of choice over the music they listened to in a therapeutic context showed a 25% lower depression score, while group 2 which had a moderate degree of choice over the music had a 19% lower depression score compared to the control group (Siedliecki, 2006).

1.3 State of research

1.3.1 Motives for music listening

The link between mental health and music listening highlights the role of emotion as an effective mediating factor between auditive source and human recipient. Across different studies, emotion is depicted as a central motive for music listening. However,

there are numerous perspectives and an overall lack of integration into a broad situational context. Most commonly, emotional regulation is brought forward as a main conscious reason for listening (Saarikallio & Erkkilä, 2007; Ferwerda et al., 2015; Tamir & Ford, 2012). Yet, because music can both induce and express emotional states, a clear separation or coherence between the two is not necessarily given (Salimpoor et al, 2009). There are four different ways of interaction: *"a positive relation"* between expression and induction, which indicates the expressed emotion inducing the same emotion; *"a negative relation"* which describes the induced emotion as being opposed to the expressed one; a *"non-systematic" relation* which implies no induction or induction of a *"different quality"* than the feeling expressed by the song; and *"no relation"* as in an emotional state induced without a recognized musical expression of emotion (Egermann & McAdams, 2013, p. 139-140).

An example of the complex relationship between expression and induction can be found in a qualitative study investigating long- and short-term musical preferences, conducted by Lamont and Webb (2010). When asked about the way a particular participant utilized music to influence his mood, he reported to listen to depressing music in order to calm himself down. While he was in a positively aroused mood before turning on the music, he became more and more relaxed during the listening process (Lamont & Webb, 2010).

Another example of preference for depressing music can be found in the success of Album 17 by recording artist xxxtentacion, which debuted at number 2 on the billboard 200 charts (Caulfield, 2017). The album largely expresses sadness through its depressing musical/psychological attributes, which are communicated by instrumentation and vocal tone as well as by the lyrics covering largely issues of psychological pain. Empirical research regarding the consumption of sad music has brought out different results. On the one hand, musical regulation of emotion was found to primarily serve the purpose of *"mood improvement and emotional self-control"* (Saarikallio & Erkkilä, 2007, p. 105) and individuals reported *to "sort out their feelings"* while listening to sad music in order to regulate their mood and *"feel more positive"* (Van den Tol & Edwards, 2014, p. 20; Chen et al., 2007). Alternatively, sad music was brought in connection with pleasure induction. It is theorized that depending on the degree of empathy felt during listening, a mild degree of sadness is induced in the listener. As a reaction, hormone prolactin is released in the body, which is comparable in its effect to endorphins released in reaction to physical injury. Based on the

psychological pain having no real-life consequences since it is rather an empathic reaction to an auditive stimulus, the hormonal release makes the experience ultimately feel pleasurable (Huron, 2011).

The level of empathy with the artist on a respective song was also found to determine the divergence in the intensity of recognized and felt emotion. Egermann and McAdams (2013) found that in the case of both music-related emotional dimensions valence and arousal, the level of felt emotion was equally high or even higher than recognized emotion when empathy was strong. In comparison, in cases where there was little empathy for the artist, recognized emotion was stronger than felt emotion. Empathy itself was shown to depend on musical preference for the song, as well as on individual factors like musical expertise, gender and situational factors such as attention (Egermann & McAdams, 2013).

Emotional responses to a musical stimulus were also shown to be highly dependent on the respective situation the listener is in or will be in. Juslin et al. (2008) observed that *"happiness-elation, pleasure-enjoyment and anger-irritation"* were primarily evoked by music in settings with social interaction, while *"calm-contentment, nostalgia-longing and sadness-melancholy"* were mainly experienced by persons listening by themselves (Juslin et al., 2008, p. 678).

Tamir and Ford (2012) exposed individuals' preference for emotions to be in accordance with the respective situation they will be in. Furthermore, individuals were shown to employ emotional self-regulation through music, in a way which benefited them in a particular situational scenario. In the context of the respective study, one group of participants was asked to play a role in a confrontational negotiation, while the other group was asked to take part in a cooperative negotiation. Before the scenarios began, participants were asked to select music to listen to, including happiness- as well as anger-inducing songs. As a result, participants who were part of the confrontation scenario knowingly chose songs which appeared to them as more anger- than happiness-inducing, and therefore consciously increased their levels of anger. Furthermore, respective participants who preferred anger-inducing songs were more successful in their negotiations (Tamir & Ford, 2012).

The process of emotional self-regulation does not solely indicate, that a certain emotional state is aimed for, but moreover that the individual is trying to change or maintain the emotional state experienced at a particular moment. Therefore, musical choice could also depend on the mood state the listener is in when she/he decides to

listen to a particular song (Greb et al, 2017). This is further supported by findings from Ferwerda et al. (2015), who demonstrated that the emotional state of individuals could influence which type of emotionally laden music they preferred. For instance, participants in a neutral mood preferred happy and tender music, while in other cases persons in negative valence states like anger or disgust preferred angry or fearful music and rather disliked valence in the form of happy and tender songs. Sad music was also preferred in sad mood states. Hence, participants' emotional states rather matched the emotional loading of the music they listened to (Ferwerda et al. 2015).

According to Juslin and Laukka (2004) listeners of music mainly look for an emotional experience, which often occurs in situations where music listening is not the main activity. In their study in which an exploratory questionnaire was utilized, the strongest emotional experiences predominantly occurred in situations in which the listener was alone and focused on the music. Whereas in social situations, music was highly common but was reported to be played primarily in the background.
Overall, positive emotions were pursued more frequently by listeners than negative ones. In accordance with the previously mentioned study by Tamir and Ford (2012), Juslin and Laukka (2004) also emphasized that the musical emotions pursued by listeners strongly depended on the reasons for listening (Juslin & Laukka, 2004). A similar connection between emotion and listening purpose was later confirmed again in a study where experience sampling method was utilized as a means of data collection. Participants were observed to evoke calm-contentment in order to relax and sadness-melancholy for the purpose of influencing their mood (Juslin. et al., 2008).

Within the area of musical psychology, the emotional spectrum is generally subdivided into two major dimensions: valence and arousal. According to the circumplex model by James A. Russel (1980), valence incorporates emotions with intrinsic *"good-ness"* (positive loading), e.g. joy, and intrinsic *"bad-ness"* (negative loading), e.g. fear (Russell, 1980; Frijda, 1986, p. 207). Additionally, arousal represents stimulation and includes for instance excitement in a positively aroused state or calm in a negatively aroused state (Russell, 1980). Based on the principles of the circumplex model, Greenberg et al. (2016) identified the most commonly perceived attributes within a wide range of musical genres and categorized them into dimensions arousal, valence, and depth.

In the context of this particular study, 76 participants rated 102 musical excerpts based on their expressed musical/psychological attributes. Attributes which exhibited high loadings on arousal were intense and aggressive among others, while for instance attributes gentle and mellow exhibited strong negative loadings on arousal.
The valence component was split into two subcomponents: valence and depth.
Within the dimension of perceived valence, happy had the highest positive loading while depressing exhibited the strongest negative loading. Attributes which loaded most highly on depth were intelligent with a positive loading and party music with a negative loading (Greenberg et al., 2016). According to Greenberg et al., the findings suggest that

> *"perceptual processing of music may be an extension of psychological processes that occur in daily life"* (Greenberg et al., 2016, p. 602). *"For example the arousal dimension appears to reflect psychological processes such as stimulation and relaxation, valence reflects emotion and mood processes, and depth reflects cognitive processes"* (Greenberg et al., 2016, p. 602).

This approach incorporates a wide range of musical/psychological attributes and therefore constitutes a tool to characterize music in a detailed and tangible way. Beyond that, it hints at a connection between musical attributes and psychological processes.

1.3.2 Situational influences on music listening behavior

Situational influences were found to play a more important role in explaining individuals' music listening behavior than individual attributes in a study conducted by Greb, Schlotz and Steffens (2017). In order to determine significant predictors regarding different functions of music listening, participants were asked to describe three typical everyday listening situations. Each description was followed by a set of questions concerning situational parameters and a list of items which captured the purpose fulfilled by music within the respective situational context. Further individual-related questions were also added.
Items regarding functions of music listening, which were rated on a Likert scale, were divided into five major categories according to factor loadings: *"Intellectual stimulation" (e.g. "it gives me intellectual stimulation"), "Mind Wandering and Emotional Involvement" (e.g. "it mirrors my moods and feelings"), "Motor Synchronization and*

Enhanced Well-being“ (e.g. “it makes me feel fitter“), “Updating One’s Musical Knowledge“ (e.g. “I can learn about new pieces“), “Killing Time and Overcoming Loneliness“ (e.g. “it makes me feel less lonely”) (Greb et. al, 2017, p. 15).
Acquired data was then calculated in a way, which produced situational attributes on a between-subjects and a within-subjects level, as well as personal attributes on a between-subjects level.
Subsequent results indicated that situational parameters on within-subject level had the strongest influence on the functions of music listening on average. Within-subject level referred to attribute-differences between the three situations sampled from each participant respectively, hence represented pure situational predictors. Results further indicated that activity as a situational parameter predicted functions of music listening most reliably (Greb et al, 2017).
These results can be seen in relation to the results acquired by North et al. (2004) with regard to functions of music in different situations. Study participants were observed to react to different situations they were in with a *„mood-optimization strategy“* and adapted their music listening behavior accordingly (North et al, 2004, p. 68). For instance, atmosphere creation when going out; support of concentration in a situation demanding intellectual abilities; enjoyment through pure music listening at home or on the road; music listening for the pleasure of others in social situations; and for passing time in situations at home or in traffic were some of the detected relations between functions of music and particular situations. Overall, most of the submitted purposes of music listening happened in situations, where the music accompanied certain activities without playing the primary role (North et al., 2004).
In another study, it was observed that functions of music listening also vary with degrees of preference for different genres. For instance, preference for electronic music was positively related to feeling energized, while preference for rock was connected to identity expression (Schäfer und Sedlmeyer, 2009).

The importance of being able to choose which music to listen to had been previously emphasized throughout different studies. In the aforementioned study by Greb et al. (2017), *“the possibility to choose the music and the degree of attention that was paid to music in that situation“* also wielded significant influence on the functions of music listening (Greb et al., 2017, p. 25). As opposed to low degrees of choice, self-chosen songs were shown to increase the probability for an emotional reaction though not

mandatorily (Juslin et al, 2008); influence mood more positively and less negatively (Sloboda, 2010); induce more pleasure in the listener (Greasley & Lamont, 2011); decrease stress and anxiety levels (Labbé et al., 2007); as well as enable the listener to choose from her/his favorite songs and therefore increase liking of the music (Krause et al., 2014).
All in all, the listener modifies the music she/he listens to depending on her/his aims in a particular situation, which themselves are in accordance with her/his emotional, cognitive and social needs in the respective situation.

Concerning the influence of person-related attributes on music listening behavior, research yielded different results. Greb et al. (2017) found that pure situational factor differences explained functions of music listening more than situational factors differing between individuals, while differences in individual attributes such as music preference-intensity, genre preference or Big Five personality ratings had the least impact overall (Greb et al., 2017).
However, Greenberg et al. (2016) found character traits to be strongly associated with musical attribute preference. In particular, openness predicted a preference for positive valence and depth, neuroticism predicted negative valence preference and finally conscientiousness and agreeableness were indicators for preference of low arousal (Greenberg et al., 2016).
There are also indications for an interconnectivity between personal and situational factors with regard to the functions of music listening. Greb et al. (2017) as well as Greasley and Lamont (2011) found some participants in their studies to vary strongly regarding the effects/functions of music during different activities. Greasley and Lamont (2011) observed a divergence in the effects of music on individuals during work, while Greb et al. (2017) observed intellectual stimulation to take place during workout in some participants, whilst in others it did not occur. According to Greb et al. (2017) this observation could be rooted in a *“cross-level interaction“* between situational and person-related factors in the sense of *“person-environment interactions“* (Greb et al., 2017, p. 26; Greasley & Lamont, 2011). Such an interaction is also recognized in modern psychology, where individual ratings of situations were found to be influenced by the rating person, the situation itself and the respective interaction between person and situation (Rauthmann, 2012).

However, empirical results in behavioral psychology also showed that person-related and situational factors independently predicted expression of emotion and behavior, yet without any meaningful person x situation interaction (Sherman et al., 2015).

1.4 Relevance of researching situational aspects of music listening

A deeper understanding of situational factors and their psychological effects on individuals and their music listening behavior could benefit the discipline of musical psychology as well as bare real-life applications. Up until this point in time, there are studies that have recognized and dealt with the importance of situational influences on music listening behavior, yet mostly neglected to define situations. More precisely, they included just parts of what the newest findings in the field of personality psychology acknowledge as a comprehensive *"situational taxonomy"* (Rauthmann et al., 2014, p. 17). As previously illustrated, situational factors in different studies of musical psychology have been limited to social context, activity, time of day, location and also yet rarely individual goals connected to emotion in a particular situational context.
While these environmental dimensions hint at why persons choose to listen to music in a particular situation, they leave out individual psychological aspects by which the listener is affected in particular listening situations (Greb et al., 2017) and by which she/he is most likely driven by in her/his choice of music.

1.5 A new perspective on situations

According to Rauthmann et al. (2015), certain principles should be taken into account when researching situations. First of all, situations and their environmental qualities need to be psychologically processed by the perceiving individual or else the situation has no meaning, does not matter and therefore has no consequences *("Processing Principle").* Additionally, it is assumed that individuals basically agree on the physical circumstances of a situation *("cues").* However, how these circumstances are interpreted has a norm based upon social consensus *(„normative reality")* and individual deviations from this norm can occur *(„distinctive personal reality")* (Rauthmann et al., 2015, p. 372).

While there is a common interpretation of each situation, individuals can differ in their interpretations intra-individually, as in the same situation can be interpreted differently by an individual every time. Additionally, situational experience can vary inter-individually, as in different individuals interpret the same situation differently.
Furthermore, a situational experience principally consists of a perceiver, a situational reality and an interaction between the two *("Reality Principle"*).
Finally, a situation should not be analyzed based on individuals' mental states, potential consequences on individuals' mental states or a single person experiencing a situation. Therefore, a situation should be interpreted by at least two test-subjects *("Circularity Principle"*) (Rauthmann et al., 2015, p. 372).
In personality psychology, a situation is divided into *"three situational Cs"* which represent sub dimensions (Rauthmann, 2015, p. 181). Firstly, a situation contains cues, which represent five questions: *"Who is with you?"*; *"Which objects are around you?"*; *"What is happening?"*; *"Where are you?"*; and *"When is this happening?"* (Rauthmann et al., 2015, p. 364). These dimensions do not include any psychological meaning and need to be processed by an individual before they can be interpreted and reacted to. Secondly, characteristics reflect the meaning of different perceived cues to an individual on a psychological level (Edwards & Templeton, 2005; Rauthmann et al., 2014).
A *"standardized and validated instrument"* for capturing and comparing situational characteristics is the Riverside Situational Q-sort by Wagerman and Funder (Rauthmann et al., 2015, p. 364; Wagerman & Funder, 2009). Based on the 89 item RSQ which categorizes a situation as for instance being pleasant, complex or including some form of competition (Wagerman & Funder, 2009), Rauthmann et al. (2014) developed a reduced model that is easier to apply, while still including the most common situational dimensions. The eight situational dimensions, which consist of 4, 3 (short) or 1 (ultra-brief) items each, are

> *"Duty (does something need to be done?), Intellect (is deep information processing required?), Adversity (is someone being overtly threatened?), Mating (is the situation sexually or romantically charged?), pOsitivity (is the situation pleasant?), Negativity (do negative things taint the situation?), Deception (is someone deceptive?) and Sociality (is social interaction or and relationship formation possible desired or necessary?)"* (Rauthmann et al., 2015, p. 364).

Throughout different studies, the eight DIAMONDS were highly agreed upon by different raters, predicted different behaviors accurately and exhibited high consistency and validity. Furthermore, the eight DIAMONDS describe situations through characteristics similarly to how traits describe persons, hence making a person-situation interaction more examinable (Edwards & Templeton, 2005; Rauthmann and Sherman, 2016).

The last of the three situational Cs, classes, integrates both former Cs. Classes of situations, also called clusters, can be distinguished by different cues as well as different characteristic profiles. For example, all situations at a certain time of day (cue), all situations strongly exhibiting dimension Adversity (characteristic) or all situations characterized by a certain DIAMONDS composition can be subsumed under one class/cluster (Rauthmann, 2015).

In summary, the main purpose of the eight DIAMONDS dimensions is to offer a wide-ranging situational taxonomy, which represents the meaning a particular situation has for the perceiving individual. Moreover, eight DIAMONDS have the purpose of enabling the researcher to compare different situations comprehensively and clearly (Rauthmann, 2015; Rauthmann et al., 2015).

1.6 Objectives of this thesis

Potentially, making use of the DIAMONDS dimensions with regard to music listening behavior could extend possibilities for research and bare new types of results. That is assuming that the eight DIAMONDS are a suitable tool for the context of musical psychology. Therefore, an objective of this master thesis is to determine whether or not the eight DIAMONDS are applicable in a music listening context. For this purpose, the principal approach of the previously mentioned study by Greb, Schlotz and Steffens (2017) will be connected to the eight DIAMONDS dimensions (Rauthmann, 2015). In the first step it will be explored if music-related activity categories can be comprehensively explained in their psychological meaning based on eight DIAMONDS dimensions.

Another objective of this thesis is an application of the eight DIAMONDS as predictors for music listening behavior. For this purpose, the aforementioned results of Greenberg et al. (2016) regarding musical/psychological parameters will be integrated. It will be

explored if the psychological meaning of situations, reflected by DIAMONDS dimensions, are able to predict musical parameters connected to stimulation, emotion and cognitive processes. Other factors such as activity and person-related factors will also be integrated. This approach should result in certain insights, possibly new ones, and it will be determined whether hypotheses based on previous research can be confirmed.

Additionally, a connection between functions of music listening and aforementioned predictors will be examined, in order to receive additional results which possibly support general interpretations.

Finally, a two-step cluster analysis will be conducted regarding the eight DIAMONDS dimensions. On the one hand this will be done in order to observe the differences between the situational clusters/classes in this dataset. On the other hand situational clusters will be compared to each other regarding their associations to musical/psychological parameters. This will be done in order to potentially draw stronger connections between certain DIAMONDS and musical parameters.

This master thesis also focuses on potentially gaining new insights into the way that people listen to music in everyday life situations, while particularly focusing on musical/psychological parameters. Additionally, other factors which were shown to play a relevant role in some of the research mentioned above will also be included in the analysis.

Based on the previously illustrated state of research in the areas of musical psychology and behavioral psychology, I suggest a number of hypotheses, which will be tested on the basis of variables integrated into statistical analysis.

1.7 Hypotheses

Based on the aforementioned connection between perceived musical attributes and everyday psychological processes (Greenberg et. al, 2016) and the psychological quality of the eight DIAMONDS (Rauthmann et al., 2015), I suggest the first main hypothesis and related sub-hypotheses.

Individuals purposely chose the music they listened to with regard to musical/psychological attributes depending on the situational characteristics of the situations they experienced:

- 1a) Based on the aforementioned findings, that those individuals who knew they would endure a stressful situation purposely chose music which induced aggression rather than happiness in preparation for the respective situation (Tamir and Ford, 2012), I suggest that individuals in this study listened to aggressive and/or intense music more in those situations that were high on Adversity or Negativity. There was a negative association between adverse/negative situations and happy songs.
- 1b) Based on the aforementioned findings, that the emotional state in a situation matched the emotional loading of the music listened to in the case of a happy and sad songs (Ferwerda et al. 2015), I suggest that in situations high on dimension pOsitivity individuals were listening to happier and more enthusiastic music and therefore to music with positive valence.
- 1c) Based on the tendency of individuals to listen to sad music in order to feel better (Edwards & Templeton, 2014; Chen et al., 2007), I suggest that in situations in which the individual experienced some form of negative valence like sadness, hence situations high on Negativity, the music in these situations was significantly more depressing.
- 1d) Based on the aforementioned findings that sad music could induce states of pleasure (Huron, 2011) and support relaxation (Lamont & Webb, 2010), I suggest that individuals rather listened to depressing music in situations which were not only related to negative emotion but also to positive and/or intellectual situations. Depressing music was therefore predicted by DIAMONDS pOsitivity and/or Intellect.
- 1e) Also in accordance with the findings that music often times matches the mood state and also based on music being played for the pleasure of others in social situations (North et al., 2004), I suggest that in situations high on Sociality happy and/or danceable music was preferred more frequently than in other types of situations.
- 1f) Based on the finding that individuals utilized music for intellectual stimulation when the main activities are working and studying (Greb et al., 2017), I suggest that in situations higher on Intellect and/or Duty high depth music was played more frequently. Therefore, sophisticated and/or inspiring music was positively associated to Intellect and Duty.
- 1g) Finally, I suggest that there were most likely no specific results with regards to musical parameters of songs listened to in situations associated with Deception.

Such situations are most likely too rare to occur on a regular basis for one thing and beyond that, if one or more individuals were deceptive or not telling the truth in a certain situation, intuitively it would not be a typical situation in which music was playing a major role.

Participants of this study were asked to freely describe typical situations of music listening, which will be classified into categories of activity. With regards to these categories I hypothesize as follows:

- 2a) There was a category of sports/exercise, in which music with a highly positive loading on arousal was played, hence intense and aggressive music was preferred for mood regulation purposes. In this context the function of the music was making the listener *"feel fitter"* (Greb et al, 2017, p. 15).
- 2b) There was a category of pure music listening, in which high depth music was played; in particular sophisticated and inspiring music. In this category *"intellectual stimulation"* was the main function of the music (Greb et al., 2017, p. 15).
- 2c) In the context of activity relaxation, mellow music was the main type of music.
- 2d) In transit participants most likely listened to all types of music, since being in transit most likely did not exhibit an overall homogeneous psychological meaning for participants. Therefore, music in transit exhibited a variation of different loadings on arousal, valence and depth.
- 2e) During partying, participants most likely utilized the music in order to move to it. The situation was most likely described as high on dimensions Sociality and Mating. Music in this context most likely exhibited a high positive loading on arousal.
- 2f) During activities subsumed under the category getting ready for the day, music mainly loaded positively on valence and arousal. Negative valence music was being played significantly less.

Referencing the cultural relevance of Rap music, I suggest Hypothesis 3: Preference for Rap was positively associated to music listening functions *"informing myself about the newest hits and trends"* and/or *"I can get to know new tracks"* (Greb et al., 2017, p. 15).

This master thesis primarily focused on the influence of situational parameters on music listening behavior, since they were shown to shape the effects of music on individuals critically (e.g. North et al., 2004; Greb et al., 2017). Yet there were most likely certain person-related traits which determined music listening behavior. I therefore formulate Hypothesis 4:

- 4a) The degree of intellectual stimulation from music increased with the degree of musical training. This is assumed because musically trained individuals previously demonstrated an enhanced ability to recognize abstract changes in melodies, compared to untrained individuals (Fujioka et al., 2004).
- 4b) Certain genre preferences were significant predictors of some musical parameters. This assumption is based on the finding that there are possible correlations between genre preference and different music listening functions (Schäfer und Sedlmeyer, 2009).

2 Methods

2.1 Procedure

In order to acquire the needed amount of data for quantitative analysis, a questionnaire was designed and integrated into an online survey. Before the survey officially went online, a pilot study with four self-chosen, musically interested students from different universities was conducted. One aim was to determine whether or not the first version of the survey was acceptable in length or if the overall length had any negative effects on participants' concentration level and ability to accurately answer questions. Further aims were the exclusion of potential errors in wording and formulation of questions as well as ensuring comprehensibility of each single question.

Results indicated that the time it took to complete the questionnaire was acceptable and did not strain participants' attention to a point at which they were no longer able to fully focus. While participants stated that the third time of being asked to describe and rate a listening situation felt slightly annoying, they nevertheless reported to not being negatively influenced in their answering behavior. Consequently, the amount of questions appeared to ensure an appropriate amount of results for the researcher, while still avoiding a strain on participants' patience and interest.

With regard to questions, there were complaints about the weirdness of items such as *"I am being threatened", "I am being criticized"* and *"I am being blamed?"* (Rauthmann & Sherman, 2015, p. 3). While these items are part of the DIAMONDS model, they could indeed be looked at as odd in a context of music listening. Consequently, they were slightly modified into I am feeling threatened, I am feeling blamed and I am feeling criticized, in order to make the items less extreme and more realistic in a music listening context.

The revised questionnaire was uploaded to the statistical survey application LimeSurvey in German and English language. Subsequently, the direct link was shared via mailing list of the Audiokommunikation und -technologie major, a Facebook group for psychological surveys and shared with my own Facebook contacts. Additionally, dozens of emails were written to music magazines as well as staff of college and university faculties teaching music related majors in Germany and abroad; with a friendly request to share the survey link with their students. Further participants were recruited from my direct and indirect social circle and the staff of an Italian architectural studio also took part in my survey.

As an incentive, every one out of five participants completing the survey had the choice between an iTunes voucher, a Spotify voucher or a donation to Doctors Without Borders, worth 10 euros each.

2.2 Acquired data sample

Altogether, 309 persons started the survey out of which 173 completed it, while 136 surveys were partially completed. Out of all 309 entries, 99 were deleted for not including a single complete situational description and rating. Out of the entries from the remaining 210 participants, 21 consisted of one situation description and rating, 16 entries included two and 173 entries included three complete descriptions and associated ratings of a listening situation.

With regard to participants' sex, 127 participants were female (60.5%); 77 were male (36.7%); 1 participant selected other sex (0.5%); and five participants selected no answer (2.4%).

Mean age of participants was 29.46 years with 14 being the lowest and 75 years being the highest age of a single participant. Female mean age was 28.76 years and 30.47

was the male mean age in this study. Regarding survey language, 201 participants filled out the German version, while 9 utilized the English questionnaire.
With regard to cultural affiliation of participants, the majority of valid entries most likely stemmed from people with at least a partial German cultural background. There were participants with an Italian background, several participants with a multicultural background from my circle and few participants from either the US or other English-speaking countries.
Due to the difficult nature of generating a sufficient amount of completed surveys and due to limited time and budget, the main focus was set on spreading the survey across university students from music-related majors. It must therefore be assumed that the sample largely features university students; in particular those students who are very interested in music and exhibit a certain expertise in different music-related fields.

2.3 Survey design and measures

The survey design was partially based on the one utilized by Greb, Schlotz and Steffens (2017) in their study about music listening functions. In the questionnaire, participants were asked three separate times to describe a typical situation of music listening and rate it based on different situational and person-related factors. Finally, the questionnaire ended with an array of questions concerning individual attributes (Greb et al, 2017).
In order to preserve the ability to utilize incomplete entries in this study, for instance in cases where a participant described and rated just one or two situations, individual attributes and person related data were moved to the beginning of the questionnaire.
In the first part of person-related questions, participants were asked to rate genres Rap/Hip Hop, Pop, Rock, EDM, Techno, House, German Schlager, Reggae/Dancehall, Soul/RnB, Latin, World Music, Classic, Jazz, Blues, Metal, Funk and Soundtrack with regard to their personal preference on a 1-7 Likert scale (1 = I do not like at all, 7 = I like a lot and I don't know that genre).
The genre list was based on a musical taste *„inventory currently under construction at the Max Planck Institute for Empirical Aesthetics"* (Greb at al., 2017, p. 8). Despite not being musically homogenous, the genre Soundtrack was added because of its common usage on streaming platforms such as iTunes or Spotify.

Secondly, participants were requested to indicate their highest educational degree, their sex and their age. Finally, the predefined Gold MSI inventory for musical sophistication was implemented, which consists of seven self-report items capturing the amount of formal musical training on an instrument; formal training in music theory; as well as self-rated musical ability and talent (Schaal et al., 2014).

In the next step, participants were asked to freely describe a typical situation in which they listen to music, by using a short but detailed and precise sentence. This approach was utilized because it gives the describing person room to express the respective situation without constraints, hence not forcing her/him to fit into any predefined settings.

Though participants were asked about the social context (Greb et al., 2017) and the level of choice over the music (Krause et al., 2015) in the respective situations, the two factors were not included in the statistical analysis. Social context was excluded because it had a significantly positive association with DIAMONDS dimensions Sociality and Mating. Additionally, choice exhibited a significant negative association to Sociality and was therefore inversely represented by Sociality. Another aspect which was excluded from analysis was participants' mood before music listening (Krause et al., 2015), since certain mood states should also be represented by the eight DIAMONDS.

Subsequently, participants were asked whether they typically consumed the music in the particular situation as music videos, audio format or a combination of the two. This question was chosen because YouTube has become the number one go-to platform for music consumption among younger age groups. Since a strong role of music videos in everyday listening habits can be assumed, analyzing its role in the context of this study was suitable.

The next survey part included 24 items capturing the eight DIAMONDS dimensions within the respective situational context. Up to this point in time, including psychological meaning of a situations reflected by DIAMONDS dimensions into research of music listening has never been done. Focusing on situational characteristics, which reveal how the individual is psychologically affected by a situation (Rauthmann et al., 2015), could extend insights into habits of and motives for music listening.

For the sake of not overworking participants, yet preserving validity and precision, John F. Rauthmann personally recommended to replace the original 32 item questionnaire

with an optimized 24 item version for this thesis. The three item per dimension version (S*8) was shown to be nearly as informative as the four-item version (RSQ-8*). Furthermore, S*8 and RSQ-8* were shown to exhibit similar nomological correlations with regard to different criteria. For instance, in both cases Duty correlated with categories such as school and job; Intellect correlated with school and body; Adversity correlated with anger; Mating correlated with categories like sexual; pOsitivity correlated with categories tied to positive emotion; Negativity correlated with negative emotion; Deception correlated with cognitive categories such as tentative or discrepancy; and Sociality correlated with categories such as family and friends (Rauthmann & Sherman, 2016).

Participants rated each DIAMONDS item on a Likert scale from one to seven in this study.

In the next step, participants were asked to rate the music in the previously described situation with regards to musical/psychological attributes. Attributes were also rated on a Likert scale from one to seven. In order to integrate meaningful dependent variables, attributes with different loadings on arousal, valence and depth were selected. This was done in accordance with findings from a study by Greenberg et al. (2016), in which listeners rated songs from different genres based on their psychological/musical attributes. From the resulting list, nine attributes with maximum tangibility were chosen for this thesis. Two attributes loading highly positively on arousal, valence and depth as well as one attribute loading highly negatively on arousal, valence and depth were respectively chosen for this thesis. Selected attributes with high positive loadings on arousal were Intense and Aggressive. Mellow was chosen for its highly negative loading on arousal. Attributes with high positive valence were Happy and Enthusiastic. Depressing was selected as an attribute with a highly negative valence. Finally, Sophisticated and Inspiring were integrated as items with a high positive loading on depth. Danceable was selected due to its highly negative loading on depth.

In the final part of situational data collection, participants were asked to rate a 12-item list, representing potential functions of music listening in the respective self-described situational context (Likert scale from 1 - 7). The list utilized in this thesis is a reduced version of a previously published list of functions of music listening. Items were selected based on exhibited factor loadings on the five factors illustrated in Greb et al. (2017).

After participants were done describing and rating their third and final typical music listening situation, they were given the opportunity to type in their email address for a chance to win a voucher.
The complete German version of the questionnaire is depicted in section 1 of the appendix.

2.4 Data analysis

In preparation for statistical analysis, the dataset had to be restructured from wide to long format via SPSS. In this process, each row consisting of three situations and person-related data was divided into three rows consisting of one respective situation and personal data.
Next up, each single self-reported situation was personally checked regarding content and conclusiveness. Descriptions which did not constitute understandable situations, false entries and ambiguous situation descriptions were deleted including associated ratings. This process resulted in 545 valid and completely described and rated situations. Afterwards, the situation list was divided into 13 categories of activity.
In the next step, a factor analysis was performed for the items of music listening functions, utilizing a rotated component matrix via Varimax method. Twelve functions were reduced to a list of four factors based on eigenvalue.
For the list of musical genres, a rotated component matrix was created by utilizing the same method for factor generation.
Dummy variables were created for categorical variables Audio/Video and activity in order to integrate categorical variables into predictor analysis. Additionally, ratings of the 24 single DIAMONDS items were merged into eight dimensions; three items per dimension as in accordance with theory (Rauthmann & Shermann, 2016).
Ratings for the first two items of the Gold MSI musical sophistication inventory were inverted and merged with the remaining items, in order to represent musical sophistication.
In order to determine strength of DIAMONDS dimensions across different activities and hence check the ability of DIAMONDS to reflect the psychological meaning of activities during music listening, an analysis of estimated marginal means and confidence intervals was performed.

Because most participants described and rated three situations each, there was a clustering of data, and thus it had to be determined to what extent variance in DIAMONDS ratings could be explained through situational differences as well as through individual differences between subjects. Consequently, a random intercept model was calculated for each DIAMONDS dimension, in order to determine *„behavioral consistency“* in individuals (Sherman et al., 2015, p. 12).

For a random intercept model in SPSS, participant id was specified as subject variable, which resulted in estimates of covariance parameters for residual and intercept. Based on these two values the Intraclass Correlation Coefficient was calculated: $Corr\left(Y_{ij}, Y_{ij'}\right) = \frac{\sigma_0^2}{\sigma_0^2 + \sigma^2}$.

In case of the ICC not equaling 1, estimates for predictor variables would have had to be calculated via linear mixed models in SPSS.

Because all DIAMONDS ratings were influenced by situational as well as individual influences according to ICCs, estimates of predictor variables had to ultimately be generated through the linear mixed model function in SPSS.

For the purpose of identifying items which significantly predicted musical parameters as well as functions of music listening via linear mixed model, a step-wise linear regression model was performed beforehand. As independent variables, eight DIAMONDS dimensions, dummy variables for activity, dummy variables for medium (audio/video), factors of genre preference, age, musical sophistication and education were all inserted into one model. The process was repeated for each dependent musical parameter. All situation- and person related variables as well as dependent variables were z-transformed beforehand, in order to obtain prediction estimates comparable to each other.

Step-wise linear regression as a first step was chosen in order to minimize multicollinearity among predictor variables and maximize the likelihood of extracting variables which reliably predicted dependent variables.

For analysis of activities as predictors, dummy variable for activity category Other served as a reference point for its heterogeneous and therefore overall neutral meaning.

All situational and person-related variables that were significant predictors of musical parameters according to stepwise regression were subsequently reintegrated into a

linear mixed model. Maximum likelihood was selected as method of estimation and id was specified as subject (West et al., 2014).

Application of linear mixed models resulted in multilevel estimations with associated standard errors. This approach reflected the prediction of musical/psychological parameter-variation through individual traits differing among individuals as well as through between-person differences in average ratings of situational characteristics.

Additionally, results reflected prediction of variation in musical/psychological parameters through differences in ratings of situational characteristics on a within-person level.

Significant predictors for functions of music listening were determined in the same fashion as predictors for musical/psychological parameters.

For the purpose of establishing and evaluating situational classes or clusters, based solely on DIAMONDS composition, a two-step cluster analysis was performed via statistics program SPSS. Number of clusters was automatically determined with a log-likelihood distance measure under Schwarz's Bayesian clustering criterion. Eight DIAMONDS dimensions were selected as input variables. For the four resulting clusters, dummy variables were created which were then inserted into a linear mixed model and compared by their association to musical parameters.

3 Results

3.1 Activity categories

Table 1 depicts the list of activity categories with respective relative and absolute frequencies. The most common activity category during music listening was In transit with 24.8 % of overall answers. Descriptions falling in this category were all variations of moving from one place to another, for instance via public transportation on the way to work or in the car. The second most common activity in a music listening context was Getting ready for the day (13.9%). This category included all activities performed in preparation for daily life and its tasks such as showering, having/making breakfast, waking up, getting dressed etc.

Closely behind was activity category Work/Study (12.3%). Belonging to this category were all situations, in which music listening accompanied working at a job, working at home and studying for a university course.

The fourth most common category of activities was Housework/Cooking (10.5%), which included cooking, cleaning and similar activities.

The next category was Other, which included activities unfitting for each of the other twelve categories.

Relaxation was the sixth most common activity for music listening (6.6%) and was comprised of all types of situations in which music was described as supporting relaxation. For instance, during breaks between work sessions, in the park, on the sofa, on the balcony or in bed.

Category seven was Socializing with a relative frequency of 4.8%. During activities of this category music was always playing in the background, while social interaction was the main objective. This was the case when participants were meeting up and talking to friends or partners; cooking and eating with friends or partners; during sexual activity and while playing games with friends.

Next up, belonging to the category of Pure music listening (4.6%) were all activities involving music listening as a central part. This included concentrated attentive listening on the sofa; checking out new releases at the computer or in record stores; as well as listening in the recording studio or with friends.

The next most common category, Sports/Dancing (4.2%) was comprised of activities such as physical activity at home, at a fitness studio or outside as well as dancing to music.

Partying was another activity category involving music listening in 3.5% of situations and took place at clubs, home-parties or in preparation for either.

Nearly as frequent were activities involving Creative use of music (3.1%). Participants reported to practice singing, perform at concerts, create musical pieces, record music and receive creative input.

Attending concert was reported by participants in 2.4% of music listening situations and included visits of concerts, operas, plays and open-air festivals.

Finally, the least common activity involving music listening was Musical self-therapy (0.7%). Participants described the situation either as a state of needing time for themselves; recovering from stress or fights; doubting themselves or working out feelings of anger, sadness and tension.

Table 1. Absolute and relative frequencies of reported activities in music listening situations

Activity Category	Absolute frequencies	Relative frequencies (%)
In transit	135	24.8
Getting ready for the day	75	13.8
Work/Study	67	12.3
Housework/Cooking	57	10.5
Others	48	8.8
Relaxation	36	6.6
Socializing	26	4.8
Pure music listening	25	4.6
Sports/Dancing	23	4.2
Partying	19	3.5
Creative use of music	17	3.1
Attending concert	13	2.4
Musical self-therapy	4	0.7
Total	**545**	**100**

3.2 Situational characteristics as descriptors of activities

Marginal means as a result of a mixed models with activities as categorical variables and respective DIAMONDS dimensions as respective dependent variable were calculated via SPSS. Significant differences between mean ratings were determined via confidence intervals (See appendix section 2, Figures A - H). Regarding Duty, ICC equaled 0.0399, which indicated that 3.99% of variance in dimension Duty was attributable to mean variations in situation perception between individuals regarding Duty. Furthermore, 96.01% of Duty variance could be explained through variations within individuals regarding perceptions of situational characteristic Duty.

Dimension Duty exhibited significant differences regarding mean ratings across the spectrum of activities. Most notably, Work/study was rated significantly higher on Duty than any other activity (Estimated marginal mean = 18.685, Standard Error = 0.519). Activity pair Creative use of music (EMM = 14.449, SE = 1.025) and Housework/cooking (EMM = 14.432, SE = 0.563) were rated significantly lower than Work/study, yet significantly higher on Duty than the rest of activities according to confidence intervals.

Regarding Intellect, 4.7% of variance could be explained by individual traits (ICC = 0.047), while 95.3% were caused by differences in situational states (1-ICC = 0.953).

Significant differences in ratings of Intellect were reflected through confidence intervals. Work/study (EMM = 16.297, SE = 0.484) and Creative use of music (EMM = 15.904, SE = 0.955) scored significantly higher on Intellect than the rest of activities while scoring insignificantly higher than Attending concert (EMM = 13.637, SE = 1.078). Pure music listening (EMM = 10.367, SE = 0.782) and Socializing (EMM = 9.995, 0.765) scored moderately with musical self-therapy below moderate (EEM = 8.705, SE = 1.939).

For DIAMONDS dimension Adversity, 26.317% of variance was caused by person-related characteristics, while 73.682% occurred due to situational parameters.

The only activity category scoring above moderate on Adversity was Musical self-therapy (EMM = 12.031, SE = 1.085). All other activities did not significantly differ from each other with low EMMs.

Variance in Mating could be explained by differences between individuals to a percentage of 5.453%, while 94.547% were caused by differences between situations. Significant differences among activities regarding ratings of Mating could be found for instance between Partying (EMM = 13.394, SE = 0.757) and the three categories Socializing (EMM = 10.435, SE = 0.648), Attending concert (EMM = 8.078, SE = 0.915) and Sports/Dancing (EMM = 7.849, SE 0.690).

Differences in ratings of Dimension pOsitivity could largely be attributed to situational influences (87.887), while individual factors caused 12.112% of variance.

With regard to strength of pOsitivity across activities, ratings were strong overall.

Categories Partying (EMM = 17.774, SE = 0.9) and Socializing (EMM = 17.092, SE = 0.771) exhibited insignificantly higher ratings on pOsitivity than Attending concert (EMM = 15.140, SE = 1.086) and significantly higher ratings than the remaining categories, according to confidence intervals. Additionally, activities Musical self-therapy (EMM = 3.684, SE = 1.953) and In transit (EMM = 7.414, SE = 0.352) were rated significantly lower on pOsitivity than every other category.

Negativity was another DIAMONDS dimension included in the analysis. 18.8% of variance could be viewed as being trait based while 81.087% could be explained as state based. Across activities, ratings of Negativity were significantly higher for Musical self-therapy (EEM = 16.220, SE = 2.022) as compared to the rest, with the exception of Work/Study (EMM = 12.206, SE = 0.504). In transit (EMM = 10.591, SE = 0.364) was also rated insignificantly lower than Work/Study among others.

With regard to Deception, 25.807% of overall variance was caused by differences between individuals, while 74.193% stemmed from differences between situations. All estimated marginal means of Deception were well below moderate. Partying (EMM = 7.414, SE = 0.644) was the highest rated activity regarding Deception, with a significantly higher EMM than Getting ready for the day (EMM = 3.649, 0.381), Housework/cooking (EMM = 3.689, 0.381) and others.

The final DIAMONDS dimension was Sociality. Overall, 8.472% of variance was attributable to mean individual variations in situation perception, while 91.528% of variance stemmed from variations within individuals regarding perceptions of Sociality. Significant differences were observable between activities regarding Sociality. Activity pair Partying (EMM = 17.869, SE = 1.108) and Socializing (EMM = 17.733, SE = 0.948) were rated significantly higher with regard to Sociality than the remaining activity categories. Attending concert was also rated above moderate (EMM = 12.790, SE = 1.338).

3.3 Factor analysis

For a simpler integration of genres into overall analysis, a Varimax factor reduction of genres was performed resulting in 6 conclusive factors with factor loadings above 0.500. Resulting factors are depicted in table 2 with respective Eigen Values, and explained variance in percent.

Electronic dance music, Techno and House were pooled into factor Electro/Dance. Jazz, Blues and Funk all loaded highly on factor 2: Jazz/Blues. Third factor, World, included country-specific genres Reggae/Dancehall, Latin and World Music. Hip Hop/Rap, Soul/RnB and Pop music exhibited high loadings on factor 4, which was named Urban/Popular. High loadings on factor 5 were exhibited by German Schlager, Classical music and Soundtrack. Respective factor was named Folk/Classical. Lastly, Rock and metal loaded highly on factor 6, which was named Rock/Metal. Solely Country music did not exhibit a sufficiently high factor loading and was therefore excluded.

Factor reduction regarding functions of music listening resulted in four different factors. Factor loadings of each function on are illustrated in table 3.

Table 2. Factor loadings of musical genres on six genre factors. Explained variance and Eigen Value for each factor illustrated below

	Genre factor					
Genre	**Electro/Dance**	**Jazz/Blues**	**World**	**Urban/Popular**	**Folk/Classical**	**Rock/Metal**
Techno	0.878					
House	0.865					
Electronic Dance Music	0.743					
Jazz		0.883				
Blues		0.709				
Funk		0.654				
Latin			0.832			
World Music			0.788			
Reggae/Dancehall			0.537			
Pop Music				0.678		
Soul/RnB				0.656		
Rap/Hip Hop				0.652		
German Schlager					0.785	
Soundtrack					0.639	
Classical Music					0.559	
Rock						0.771
Metal						0.759
Explained Variance in %	17.776	14.152	10.846	8.861	7.493	6.064
Eigen Value	3.2	2.547	1.952	1.595	1.349	1.092

Method: Principal component analysis; Varimax Rotation with Kaiser normalization
Kaiser-Meyer-Olkin: .571; Bartlett's Chi-Square: 2117.835; p = .000; Determinant of correlation matrix = .003

Table 3. Factor loadings of music listening functions on four function factors. Explained variance and Eigen Value are illustrated below

Music listening function	Function factor			
	Intellectual stimulation & Self-Awareness	**Mood improvement & Background Listening**	**Movement & Personal Fitness**	**Staying in Tune**
I can learn about myself while listening to it	**0.787**			
It gives me intellectual stimulation	**0.748**			
It reminds me of past phases or events of my life	**0.566**	0.303	0.412	
It reflects my moods and feelings	**0.558**	0.334	0.481	
It helps me pass time		**0.717**		
I feel less lonely while listening to it		**0.693**		
It improves my mood		**0.649**	0.481	
I need it in the background while doing other things	-0.491	**0.602**		
I can move to it			**0.846**	
It makes me feel fitter		0.313	**0.713**	
I want to inform myself about the newest hits and trends				**0.855**
I can get to know new tracks	0.387			**0.760**
Explained Variance in %	28.935	16.126	11.153	9.065
Eigen Value	3.472	1.935	1.338	1.088
Method: Principal component analysis; Varimax Rotation with Kaiser normalization				
Kaiser-Meyer-Olkin: .755; Bartlett's Chi-Square: 1773.115; p = .000; Determinant of Correlation Matrix: .37				

The first factor included items: I can learn about myself while listening to it; It gives me intellectual stimulation; It reminds me of past phases or events of my life; and It reflects my moods and feelings. These items were consequentially subsumed under factor name Intellectual Stimulation & Self-Awareness. Factor two was comprised of items: It helps me pass time; I feel less lonely while listening to it; It improves my mood; as well as I need it in the background while doing other things. Based on the items' meanings, the second factor was named Mood Improvement & Background Listening. The third factor featured the two functions: It makes me feel fitter and I can move to it. Hence factor three was named Movement & Personal Fitness. Finally, the fourth factor of music listening functions featured: I want to inform myself about the newest hits and trends as well as I can get to know new tracks. Factor four was consequently named Staying in Tune.

3.4 Predictors of musical/psychological parameters

Regarding the prediction of musical attributes throughout different situations of music listening, results highlighted a multitude of significant predictors in various combinations for each parameter. Estimates and standard errors for fixed effects are depicted in tables 4.1 and 4.2.

First evaluated musical/psychological attribute Intense had an Intraclass Correlation Coefficient of 0.118, which indicated that a comparatively low 11.8% of variance was caused by trait-differences, while 88.2% could be attributed to state-differences. Regarding eight DIAMONDS as predictor variables for Intense music, it was found that higher degrees of Adversity as well as pOsitivity were increasing the probability for intense music. However, it was much more likely that intense music was listened to during pleasant situations than adverse situations. Also, there was a negative association between intense music and Sociality. Hence, the more interpersonal communication and personal relationships mattered in a certain situation, the more unlikely it was for intense music to be played.

Regarding activities, situations in transit exhibited a positive association with intense music. A strong association was found between intense music and pure music listening as well as concert visits. The highest likelihood for intense music was exhibited by situations, in which individuals practiced musical-self therapy. No specific fixed effects came from person related variables.

Table 4.1. Multilevel estimations and standard errors for situation- and person-related predictors of musical/psychological parameters (fixed effects)

	Estimate (SE)								
Predictor variables	Intense	Mellow	Aggressive	Happy	Depressing	Enthusiastic	Danceable	Sophisticated	Inspiring
Eight DIAMONDS									
Duty						0.152 (0.045)	0.223 (0.052)	-0.142 (0.05)	
Intellect					0.108 (0.047)		-0.138 (0.05)	0.307 (0.054)	0.267 (0.039)
Adversity	0.101 (0.043)				0.113 (0.052)	-0.12 (0.48)			
Mating						0.11 (0.051)			
pOsitivity	0.277 (0.055)	0.174 (0.048)		0.232 (0.060)		0.318 (0.056)	0.323 (0.050)		0.257 (0.051)
Negativity			0.199 (0.045)						
Deception				-0.10 (0.048)					
Sociality	-0.13 (0.051)			0.155 (0.062)	-0.133 (0.06)				-0.209 (0.051)
Activities									
In transit	0.36 (0.097)					0.433 (0.105)	0.345 (0.108)	0.345 (0.104)	0.35 (0.091)
Getting ready f. t. day			-0.41 (0.120)						
Work									
Housework		-0.32 (0.151)					0.305 (0.153)	0.514 (0.154)	
Relaxation		0.607 (0.199)		-0.49 (0.188)				0.582 (0.192)	0.425 (0.146)
Socializing									
Creative use of music								0.902 (0.249)	
Sports/Dancing		-0.91 (0.245)					0.537 (0.227)		
Pure music listening	0.918 (0.189)							0.787 (0.187)	0.766 (0.172)
Partying		-1.62 (0.245)	0.680 (0.225)	-0.76 (0.246)			1.045 (0.235)		
Attending concert	1.16 (0.260)				0.69 (0.317)	0.776 (0.294)		0.677 (0.304)	0.514 (0.237)
Musical self-therapy	1.46 (0.481)			-1.72 (0.586)					

Table 4.2. Multilevel estimations and standard errors for situation- and person-related predictors of musical/psychological parameters (fixed effects)

	Estimate (Standard Error)								
Predictor Variables	Intense	Mellow	Aggressive	Happy	Depressing	Enthusiastic	Danceable	Sophisticated	Inspiring
Medium									
Audio				Reference	Reference				
Video					1.715 (0.868)				
Audio & Video				-0.299 (0.119)					
Genre preference									
Electro/Dance							0.170 (0.050)		
Jazz/Blues			0.124 (0.061)					0.247 (0.055)	
World						-0.132 (0.054)			
Urban/Pop				0.167 (0.056)				-0.12 (0.054)	
Classical/Folk			-0.122 (0.060)	0.128 (0.056)	-0.133 (0.06)				
Rock/Metal			0.207 (0.059)						
Musical sophistication									
Age						-0.178 (0.051)	-0.212 (0.05)		
Education									
Middle/Jr. High S. deg.									
High School diploma									
College degree			0.499 (0.239						
Bachelor's degree			0.6 (0.223)						
Master's degree									
Doctorate			Reference						

Musical/psychological attribute Mellow had an ICC of 0.177. It was significantly more likely that mellow music was played in situations which were playful, pleasant and exuberant, hence in situations with a higher pOsitivity rating.
Regarding activities, situations in which the main activity was relaxation had the highest probability of individuals listening to mellow music. While housework had a slightly negative association to mellow music, it was fairly unlikely that mellow music was consumed during sports/dancing and even more unlikely when individuals were out partying. Regarding individual attributes, no significant fixed effects were observed.

Musical parameter Aggressive had a relatively high ICC of 0.504. Throughout situations of music listening, aggressive music had the highest likelihood of being listened to when the situation entailed stress, tension and/or frustration, meaning situations high on Negativity.
When participants were getting ready in the morning, it was rather unlikely for them to consume aggressive music. On the contrary, concert visits were positively associated with aggressive music. A preference for Rock/Metal made listening to aggressive music significantly more likely, while listeners of Jazz/Blues were also more likely to listen to aggressive songs. Additionally, Classical/Folk music was negatively associated with aggressive music. Another individual attribute which played a role was participants' educational status. In comparison to participants with a doctorate, individuals with a lower educational degree, such as college or bachelor's degree, reported to listen to aggressive music significantly more often.

Variance in ratings of parameter Happy were caused by individual trait differences to a significant degree (31.76%), while situational differences still dominated (68,23%). Listening to happy music was shown to be significantly influenced by three different DIAMONDS dimensions. Firstly, typical music listening situations which were pleasant, joyous, playful and exuberant (pOsitivity) were most likely to include happy music. Also featuring happy music with a higher likelihood were situations with strong communication between individuals (Sociality). Additionally, situations in which it was possible to deceive, be deceived or be dishonest (Deception) had a significantly negative association to happy music.
Regarding activities, it was significantly less likely for individuals to listen to happy music while relaxing. Happy music during partying was even more unlikely than during

relaxation, while it was highly unlikely that participants listened to happy music during musical self-therapy. Regarding the medium of the music played, happy music was consumed significantly less in situations where both videos and audio format were consumed, as compared to situations where only audio format was played. Concerning individual factors, listeners of Urban/Popular music as well as of Classical/Folk music were significantly more likely to listen to happy music throughout their three typical situations.

Depressing music with an Intraclass Correlation Coefficient of 0.326 can be viewed as the auditive counterweight to happy music. This is also reflected by the composition of eight DIAMONDS dimensions. During situations with increased Sociality depressing music was played significantly less. Whereas during situations with higher information processing or demonstration of intellectual capacities (Intellect) depressing music was played significantly more, as compared to situations
in which this was not the case. Furthermore, the more individuals felt threatened, criticized or blamed for something (Adversity) in a particular situation, the more likely it was for depressing music to be played.
With regard to activities, attending concert was the category in which depressing music was listened to significantly more often, compared to other activities. Another significant association was observed for video consumption. When music videos were consumed in music listening situations, music was significantly more depressing, compared to when music was listened to in audio format. Finally, a genre preference for Classical/Folk made listening to aggressive music more unlikely.

Parameter Enthusiastic had an ICC of 0.308. Enthusiastic music was solely significantly associated to one single DIAMONDS dimension. The more a situation was regarded as positive, the more likely it was for enthusiastic music to be consumed.
Attending a concert was also positively associated with enthusiastic music. Regarding person related fixed effects, a genre preference for category World music decreased the probability for consumption of enthusiastic music. Additionally, the older a participant was, the more unlikely it was for her/him to listen to enthusiastic music.

The next evaluated musical/psychological attribute was Danceable, which had an ICC of 0.370. A comparably strong positive association could be observed between positive

situations and danceable music. Situations in which a job or duty had to be fulfilled or task-oriented thinking was required also exhibited a strong significantly positive association to danceable music. On the contrary, when intellectual capabilities were demanded in a particular situation, it significantly lowered the probability of danceable music to be played.
With regards to activities, individuals preferably played danceable music while in transit as well as when doing housework. During sports/dancing danceable music was played even more frequently, while parties exhibited the highest probability for danceable music. Accordingly, a genre preference for factor Electro/Dance also increased the likelihood for danceable music. Another significant factor was participants' age. The older a participant was, the lower the tendency to listen to danceable music.

Sophisticated music exhibited an ICC of 0.379. Regarding eight DIAMONDS dimensions, the strongest predictor for sophisticated music was Intellect; as in situations where intellectual stimuli had to be cognitively processed. Also, the higher situations were rated on Duty, the lower the probability was for consumption of sophisticated music. Sophisticated music was also negatively associated to situations with a social meaning or strong interpersonal communication.
Regarding activities, creative use of music was the strongest indicator for sophisticated music. Pure music listening and attending concert were also strong predictors. Further activities with a positive association to sophisticated music were Relaxation, Housework and In transit. Lastly, Jazz/Blues as a personal genre
preference also exhibited a significantly positive association to music regarded as sophisticated.
The final evaluated musical/psychological parameter in this study was Inspiring, with an Intraclass Correlation Coefficient of 0,332. Music was rated significantly higher on attribute Inspiring in situations where intellectual capacities were utilized. A similarly positive association could be observed between inspiring music and positive situations. Moreover, if a situation was rated highly regarding Sociality, it was rather unlikely to feature sophisticated music.
Concerning activities, pure music listening had the strongest positive association to sophisticated music. Concert visits were also a significant predictor for sophisticated music. Finally, there was an increased likelihood for individuals to listen to inspiring music during relaxation and while spending time in transit.

3.5 Predictors of music listening functions

Predictor variables for music listening functions throughout described situations were generated by utilizing the same method of step-wise regression, followed by a linear mixed model. Results are illustrated in tables 5.1 and 5.2, which include estimates and standard errors for fixed effects of individual characteristics and situational factors as predictor variables. For the first of out of the four previously generated factors, Intellectual Stimulation & Self-Awareness, it was comparably unlikely for the music to serve said function, when a duty or job had to be fulfilled utilizing cognitive abilities, as in situations high on dimension Duty. However, there was a strong association between function factor 1 and situations with intellectual stimuli and information processing, as in dimension Intellect. This hints at music being the intellectual stimulus in these situations, which hints at music listening playing a central role in the respective situational context.

Activity evaluation showed that Intellectual Stimulation & Self-Awareness as a function of music occurred when individuals were practicing music listening as a central activity. Situations in transit also exhibited an increased probability for Intellectual Stimulation & Self-Awareness. On the other hand, results hint at function factor 1 occurring significantly less in situations where the main activity was working/studying or sports/dancing. The lowest chance for Intellectual Stimulation & Self-Awareness through music was exhibited by situations in which participants were socializing with others. As for individual attributes, a positive predictor for factor 1 could be found in individuals' musical sophistication. Participants with a higher musical sophistication according to the Gold MSI index were more likely to report items of function factor 1.

The second determined music listening function factor, Mood Improvement & Background Listening, occurred significantly more often in situations where a duty or job had to be completed. Function factor 2 was also found to be negatively associated with sexually charged situations and those where potential romantic partners were present, as in situations high on dimension Mating.

Concerning activities, individuals who listened to music while in transit had a higher probability of playing music in the background and for the purpose of improving mood. Additionally, when individuals were preparing for the day in the morning, they were also using music for mood improvement and background listening with an increased likelihood. At the same time, when individuals were listening to music as a central

activity, music was rather unlikely to fulfill function 2. Moreover, during creative use of music mood improvement and background listening were most likely not fulfilled. Further negative associations were found between factor 2 and person-related traits. Participants who preferred genre factor World music were significantly less likely to play music in the background and for mood improvement. Finally, it was observed that music fulfilled function factor 2 less for participants with increasing age.

Function factor 3, Movement and Personal Fitness, exhibited significant connections to most of the eight DIAMONDS dimensions. In situations which were regarded as pleasant and generally positive, function factor 3 had the highest probability of occurring. However, in situations where individuals felt stressed and tense (increased Negativity), or even threatened or criticized (increased Adversity), there was also a higher probability for music to fulfill items of function factor 3. At the same time, situations which were intellectually challenging for individuals (increased Intellect) exhibited a decreased likelihood for music to support Movement and Personal Fitness. Furthermore, potentially deceptive situations were also negatively associated to function factor 3.

Several activities exhibited significant connections to Movement and Personal Fitness. There was a high likelihood for individuals to utilize music in order to move to it in situations where sports/dancing was the main activity. Compared to other activities, it was also likely for music to support movement and fitness when partying was the main activity. Moreover, there was a significantly positive association between function factor 3 and categories Housework and Relaxation. Finally, there was an increased probability for participants to use music in order to feel fitter and move to it when preparing for the day. There were no specific individual attributes identified as significant predictors for function factor 3.

The fourth and final identified function factor of music listening, Staying in Tune, was solely connected to one DIAMONDS dimension. In listening situations where other individuals were present, there was a slightly increased chance for individuals to get to know new music and trends.

A significantly increased probability for function factor 4 was also reported when music listening was the main activity. On the other hand, when sports/dancing was the main activity, there was a significantly decreased likelihood for function factor 4. Regarding

Table 5.1. Multilevel estimations and standard errors for situation- and person-related predictors of music listening functions (fixed effects)

	Estimate (Standard Error)			
Predictor Variables	Intellectual Stimulation & Self-Awareness	Mood Improvement & Background Listening	Movement & Personal Fitness	Staying in Tune
Eight DIAMONDS				
Duty	-0.294 (0.05)	0.098 (0.044)		
Intellect	0.461 (0.05)		-0.228 (0.43)	
Adversity			0.115 (0.05)	
Mating		-0.18 (0.045)		
pOsitivity			0.296 (0.052)	
Negativity			0.145 (0.049)	
Deception			-0.1 (0.049)	
Sociality				0.087 (0.043)
Activity				
In transit	0.279 (0.094)	0.564 (0.100)		
Getting ready for the day		0.295 (0.121)	0.301 (0.120)	
Work	-0.450 (0.154)			
Housework			0.449 (0.136)	
Relaxation			0.441 (0.176)	
Socializing	-0.695 (0.181)			
Creative use of music		-1.67 (0.237)		
Sports/Dancing	-0.479 (0.214)		1.34 (0.218)	-0.528 (0.238)
Pure music listening	0.454 (0.18)	-0.441 (0.181)		0.801 (0.188)
Partying			0.704 (0.234)	
Attending concert				
Musical self-therapy				

Table 5.2. Multilevel estimations and standard errors for situation- and person-related predictors of music listening functions (fixed effects)

	Estimate (Standard Error)			
Predictor Variables	Intellectual Stimulation & Self-Awareness	Mood Improvement & Background Listening	Movement & Personal Fitness	Staying in Tune
Medium				
Audio				
Video				
Audio & Video				
Genre preference				
Electro/Dance				
Jazz/Blues				
World		-0.124 (0.059)		
Urban/Pop				0.140 (0.055)
Classic/Folk				
Rock/Metal				
Musical sophistication	0.179 (0.056)			
Age		-0.122 (0.058)		
Education				
Middle/Jr. High S. deg.				
High School diploma				
College degree				
Bachelor's degree				
Master's degree				
Doctorate				

person-related factors, it was observed that individuals who preferred Urban/Pop music were significantly more likely to actively check for new music, hits and trends.

3.6 Cluster analysis

Two-step cluster analysis of eight DIAMONDS dimensions resulted in four different clusters with an overall fair silhouette measure of cohesion and separation.
Figures 1 - 4 show the different cluster compositions with regards to eight DIAMONDS dimensions, reflected by respective mean values (min. = 3; max = 21).
The first cluster comprised 52.5% (n = 286) of all described situations (n = 545). Within cluster 1 all DIAMONDS dimensions exhibited low mean ratings, with pOsitivity, Negativity and Duty scoring slightly higher. Cluster 2 included 20.6% (n = 112) of situations with a high mean of Sociality and pOsitivity, a moderate mean of Mating as well as a low mean of the remaining dimensions.
In the third cluster 14.3% (n = 78) of situations were included. Most notably, Negativity and Duty were rated highly on average; pOsitivity, Sociality and Intellect had moderate means; while the remaining dimensions scored slightly below moderate.

Figure 1. Mean values of eight DIAMONDS dimensions across situational cluster 1

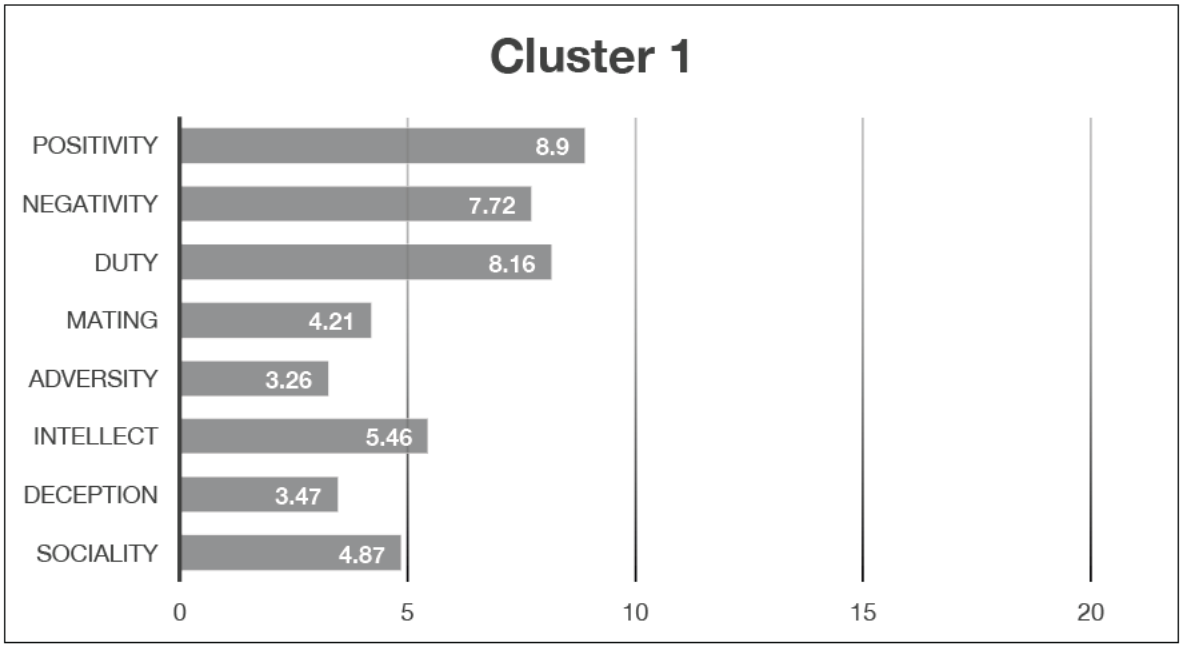


Figure 2. Mean values of eight DIAMONDS dimensions across situational cluster 2

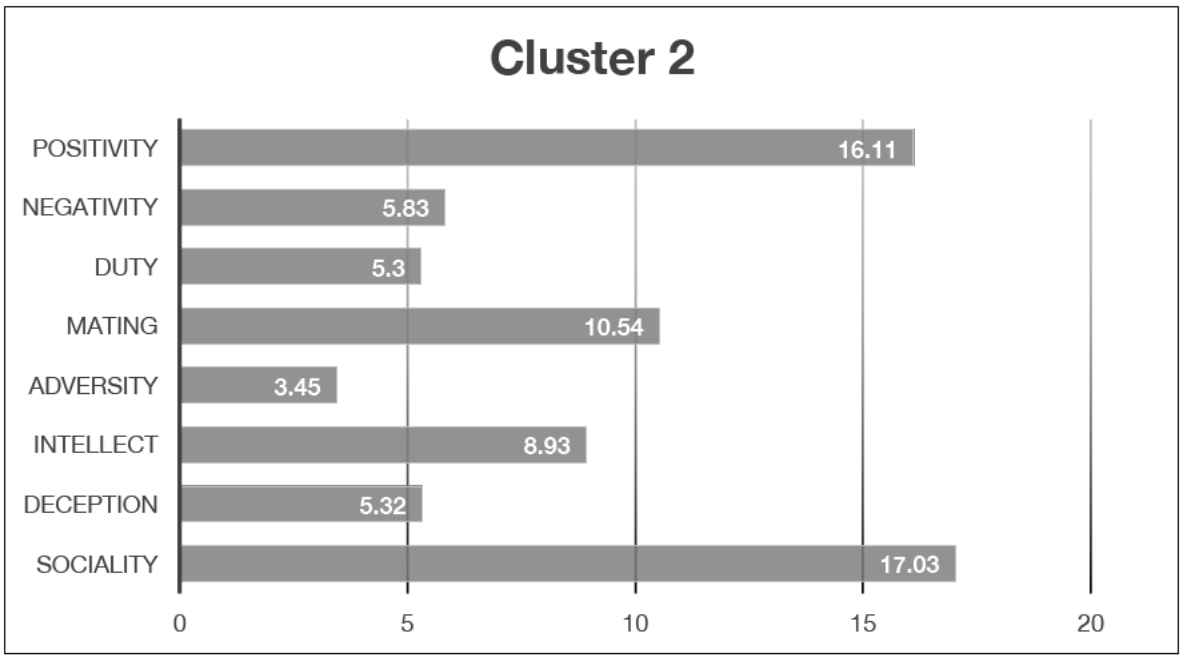
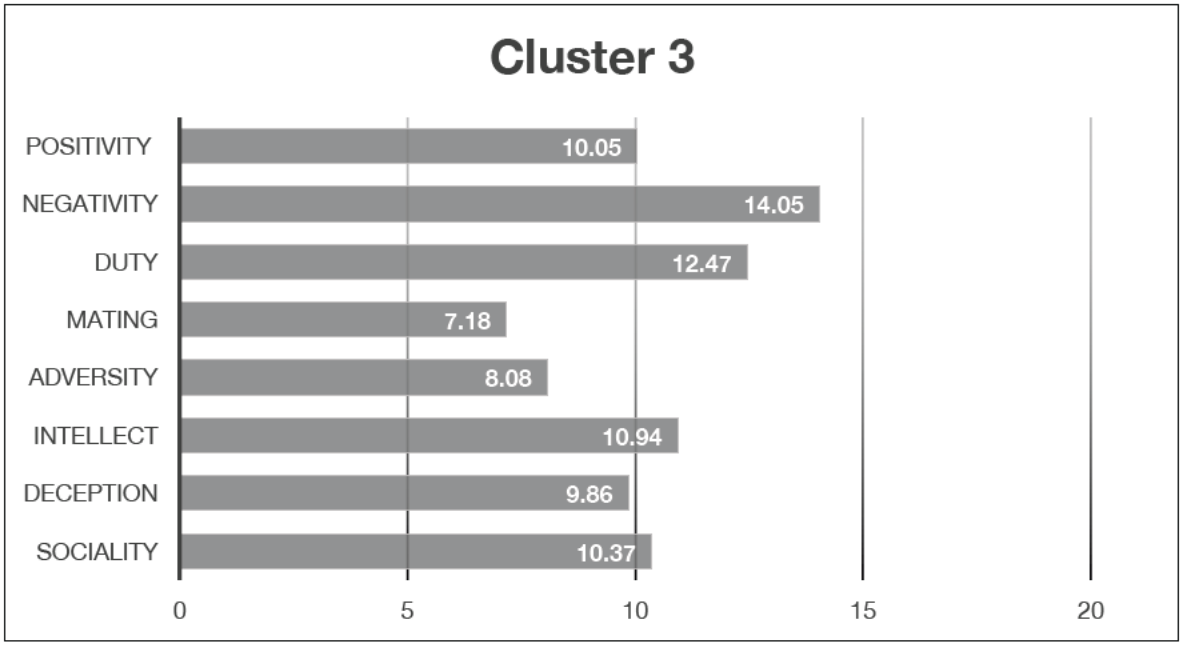
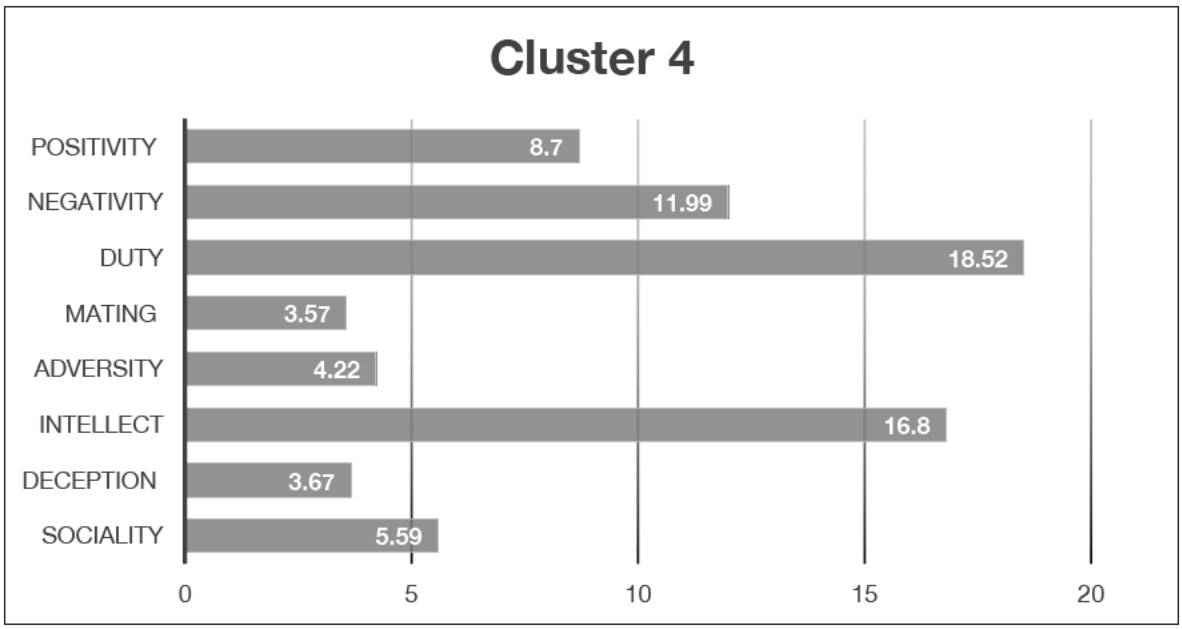


Figure 3. Mean values of eight DIAMONDS dimensions across situational cluster 3



Lastly, cluster 4 incorporated 12.7% of all situations. Duty and Intellect both received high mean ratings; Negativity had a moderate mean rating; pOsitivity scored below moderate; sociality and the remaining DIAMONDS dimensions were rated lowly.

Figure 4. Mean values of eight DIAMONDS dimensions across situational cluster 4



3.7 Situational clusters as predictors of musical/psychological parameters

In order to determine whether situational clusters extracted from the dataset significantly predicted musical/psychological parameters or even exhibited certain patterns with regards to their associations with different musical parameters, a linear mixed model was performed. Dummy variables for the four respective clusters were inserted as covariates, while musical/psychological parameters were inserted as dependent variables. Tables 6.1 and 6.2 depict multilevel estimations for clusters predicting musical parameters. Since each cluster is represented by a dummy variable, each estimation is in relation to a reference variable.

According to fixed effects analysis based on maximum likelihood method, attribute Intense had a significantly positive association with cluster 3, as compared to cluster 4 and 1. This indicates that situations higher on Duty and Negativity with a moderate positive, social or intellectual meaning were stronger associated with intense music, as compared to situations which were high on Duty with a strong intellectual meaning and lower negative and social meaning; as well as compared to situations with overall low DIAMONDS ratings.

Mellow music was rather listened to in situations belonging to cluster 4, as compared to those consistent with clusters 1 and 3. This hints at mellow music being rather listened to when situations were high on Duty and Intellect and low on Sociality,

compared to situations with a stronger negative meaning connected to Duty and a moderate Sociality as in cluster 3; as well as in comparison to situations with a more heterogeneous meaning as in cluster 1.

Table 6.1 Multilevel estimations and standard deviations for DIAMONDS clusters predicting musical/psychological parameters.

	Estimate (Standard Error)				
Predictor Variables	Intense	Mellow	Aggressive	Happy	Depressing
DIAMONDS Clusters					
Cluster 1	-0.302 (0.13)	-0.321 (0.13)	-0.566 (0.11)	-0.386 (0.10)	0.218 (0.10)
Cluster 2			-0.557 (0.13)	Reference	Reference
Cluster 3	Reference	-0.39 (0.16)	Reference	-0.582 (0.14)	0.552 (0.14)
Cluster 4	-0.448 (0.16)	Reference	-0.592 (0.14)	-0.522 (0.14)	0.336 (0.14)

Aggressive music exhibited a significantly stronger connection to cluster 3, as compared to all remaining clusters. Clusters 1,2 and 4 all exhibited a negative association to parameter Aggressive.

Happy music was significantly more likely to be played in situations with a positive or social meaning, as in cluster 2. Clusters 1,3 and 4 were negatively associated to happy music, as compared to cluster 2. Cluster 1 exhibited a slightly lower negative relation.

Depressing music had the lowest probability of being played in positive, social or mating situations, as in cluster 2. Situations of cluster 3, which were high on Negativity and Duty overall, exhibited the highest probability for inclusion of depressing music. Situation cluster 4, which was high on Intellect and Duty as well as low on Sociality, had the second strongest positive relation to depressing music. Cluster 1 had a slightly weaker association, as compared to Cluster 3.

Enthusiastic music was significantly stronger associated to cluster 2, in comparison to cluster 1 and 4. Enthusiastic music hence was preferably played in situations with a higher social and positive meaning as well as a moderate mating score.

Music played in situations belonging to cluster 4 was significantly less danceable, compared to situational clusters 2 and 3. Positive and social situations were therefore significantly stronger related to danceable music than situations high on Duty and Intellect with low Sociality. Moreover, situations with high ratings of Duty and Negativity

as well as moderate Sociality and pOsitivity ratings were also more likely to include danceable music.

Sophisticated music exhibited no significant association to any situational cluster.

Table 6.2 Multilevel estimations and standard deviations for DIAMONDS clusters predicting musical/psychological parameters.

	Estimate (Standard Error)			
Predictor Variables	Enthusiastic	Danceable	Sophisticated	Inspiring
DIAMONDS Clusters				
Cluster 1	-0.326 (0.10)			-0.262 (0.12)
Cluster 2	Reference	0.615 (0.13)		-0.335 (0.14)
Cluster 3		0.466 (0.15)		-0.322 (0.15)
Cluster 4	-0.349 (0.14)	Reference		Reference

Lastly, inspiring music was significantly more likely to occur in situations of cluster 4, as compared to all other clusters. Hence, inspiring music had the highest likelihood of being played in situations which had a weaker social component and where individuals had jobs or tasks to fulfill and intellectual stimuli to process.

4 Analysis and discussion of results

4.1 Analysis of results and hypotheses

Results of this thesis indicate that the eight DIAMONDS were an overall appropriate tool to reflect and characterize the psychological meaning of music listening situations. To begin with, it is important to mention that this thesis has a more explorative character, compared to many other studies in the field of musical science or musical psychology. There are no established results or specific theories connecting eight DIAMONDS dimensions to situations in which music listening plays a relevant role. The promising results of previous psychological studies, which hinted at the universal validity of the eight DIAMONDS, were a motivation for the integration into a music listening context. Results of this study will also be put into a global context of musical psychology as much as this is possible.

First of all, frequencies of different activities indicated that music accompanied activities or was listened to in the background in most situations.

With regards to activities connected to music listening, the eight Diamonds dimensions were able to depict the psychological meaning for activities connected to music listening in all of the cases. However, less comprehensively in certain cases.

The most common activity was listening to music while being in transit. A moderate Negativity score and the fact that solely Musical self-therapy scored significantly higher on Negativity than In transit points at its unpleasantry for many participants. Nevertheless, ratings of DIAMONDS dimensions were relatively low overall, which hints at a heterogeneous meaning for participants. This could stem from individual differences in people, as in individual traits. Alternatively, situations in transit could have been regarded as psychologically or emotionally neutral.

Getting ready for the day exhibited an overall moderate yet significantly lower pOsitivity rating compared to other activities. It was also rated below moderate on Duty, yet significantly higher than most activities. This result is conclusive yet does not reflect a solid representation through DIAMONDS dimensions. This was also either due to individual differences in situation experience or due to the neutral psychological character of the activity.

Working/studying scored significantly higher on Duty than all other activities and higher on Intellect and Negativity than most. This indicates that working had the meaning of tasks having to be fulfilled as well as intellectual abilities having to be utilized. But it also indicates that working was connected to negative emotions such as tension and stress for many participants. It could be regarded as surprising that work/study came in as the third most common activity. This indicates that even though individuals were being intellectually and emotionally strained by work, they still decided to listen to music. Alternatively, the negative psychological meaning of work situations could have been the reason for integrating music listening as a measure to cope.

Socializing and Partying were rated significantly higher on pOsitivity and Sociality than all other activities, except for concert visits regarding pOsitivity. Partying also scored significantly higher on Mating than all other activities and Socializing scored higher than most. The observation that partying as well as socializing was first and foremost a social activity with a positive connotation, in which the search for potential partners can also play a role hints at a comprehensive DIAMONDS characterization.

Overall, situations were almost exclusively rated lowly regarding dimensions Adversity and Deception and there were no significant differences between activities; except for musical self-therapy, which scored significantly higher on Adversity compared to other

activities. This result hints at the possibility of individuals turning towards music-therapy when experiencing distress and negative emotions, most likely in order to ultimately feel better. Deception ratings were not able to point out any psychological differences between activities. This was anticipated beforehand.

Attending concert was rated highly on pOsitivity and above moderate regarding Intellect and Sociality. While concerts are a potentially social activity and serve the purpose of pleasure induction, mean ratings of Intellect show that music listening at a concert can be an active process that demands cognitive processing of musical stimuli. Therefore, DIAMONDS reflected a comprehensive picture.
Housework/cooking received a high Duty rating and a moderate pOsitivity score, which appears comprehensible.
Sports/dancing was rated moderately regarding pOsitivity, yet not significantly lower regarding Mating, Negativity, Duty and Sociality. This hints at a psychologically heterogeneous meaning of sports/dancing which is most likely due to different individual interpretations.
Pure music listening received pOsitivity ratings above moderate and slightly lower Intellect ratings. Solely partying and socializing received higher estimated means with regards to pOsitivity, while solely working and creative use of music scored significantly higher on Intellect. This indicates a positive effect from music listening and an intellectual processing of the music itself. DIAMONDS were therefore able to explain the psychological meaning of pure music listening in a comprehensive way.

Creative use of music was rated highly on Intellect and Duty, and above moderate on pOsitivity. This result is comprehensive, given that this survey was forwarded to and filled out by a number of professional musicians. Moreover, Intellect signals that individuals were intellectually involved during creation, while creating was deemed a predominantly positive act.
Relaxation was rated as moderately positive overall, with low scores for all other DIAMONDS. This points at a heterogeneous or neutral psychological character of relaxation.
All in all, psychological meaning of activities such as Housework/cooking, Partying, Socializing, Attending concert, Working, Pure music listening and Creative use of music were comprehensibly characterized through DIAMONDS dimensions.

However, main activities In transit, Getting ready for the day, Sports/Dancing and Relaxation showed that music listening situations which were more neutral, subjective or interpretable in their psychological meaning were not clearly characterized through eight DIAMONDS ratings. This was either due to trait differences or due to a psychologically neutral character of certain activities.

Compared to the eight DIAMONDS, musical/psychological parameters exhibited a significantly increased Intraclass Correlation Coefficient. Variance of musical attribute ratings due to individual differences were therefore larger than in the case of situational characteristics. This is intuitively comprehensive, since perception of musical characteristics can be subjective and dependent on prior musical exposure.

Identified predictor variables for musical parameters were predominantly situational factors, with person-related factors playing a role in some cases. This result is in accordance with the aforementioned study by Greb, Schlotz and Steffens (2017), in which functions of music listening were also largely predicted by situational factors.

Regarding the eight DIAMONDS, musical parameters exhibited to be in accordance with the psychological meaning of situations to a large part, while there were inconclusive results in some of the cases.

Intense music, which was shown to be high on arousal (Greenberg et al., 2016), was positively associated to adverse as well as positive situations. High arousal music being played during situations in which the individual experienced strong negative emotion is in line with the previously mentioned findings, that individuals played high arousal music in order to induce emotional states that are in accordance with an adverse situation (Tamir & Ford, 2012). This result hints at individuals playing intense music in order to handle adverse situations better. Moreover, it hints at individuals benefitting from music far beyond pure listening pleasure. This finding confirms hypothesis 1a).

Intense music as well as mellow music, happy music, enthusiastic music, danceable music and inspiring music all exhibited a positive association with dimension pOsitivity. Solely aggressive, depressing and sophisticated music were not likely to be played in positive situations. Therefore, a wide range of musical attributes were played in positive situations, while negative valence as in depressing music was avoided. This points at music largely matching the positive psychological meaning and therefore an overall preference for positive emotion. This result confirms hypothesis 1b). It is also

in line with previous findings of individuals listening to music that matched their mood (Juslin & Laukka, 2004).

Dimension Sociality was negatively related to intense music, depressing music as well as inspiring music and positively associated to happy music. Hence, the higher the social component of a situation, the lower the tendency for high arousal, low valence and high depth music. Solely high valence music was increasingly preferred with an increasing Sociality. This confirms hypothesis 1e). This result also shows an example of music's emotional meaning in accordance with the particular situational characteristic and furthermore, that music was chosen in order to maximize benefits from it. This is the case because social situations are not only related to positive feelings, but it was also shown that music in social situations induced happiness more than music listened to alone (Liljeström et al., 2013). Happy music was also negatively associated to dimension Deception which is also in line, because of the negative connotation of Deception. This partially confirms hypotheses 1g).

The likelihood for aggressive music increased with a higher Negativity characteristic across situations. This is also in accordance with the principle of mood induction through aggressive music for the purpose of preparing for and handling negative situations, as stated by Tamir and Ford (2012). This again confirms hypothesis 1a). Furthermore, negative valence in negative situations hints at musical choices matching the mood of particular situations.

Depressing music was particularly selected in situations high on Adversity, which supports the notion of people *„sorting out their feelings"* while listening to sad music in order to regulate their mood and „feel more positive" in the end (Edwards & Templeton, 2014, p. 20; Chen et al., 2007). This confirms hypothesis 1c). Additionally, a tendency of participants to listen to sad music when a situation was high on dimension Intellect strongly hints at the aforementioned pleasure from listening to sad music, which confirms hypothesis 1d). Because depressing music was positively associated to Intellect but not to Duty, it can be assumed that the respective intellectual stimulus did not stem from work or tasks, but from the music itself. This notion is also supported by a significantly positive and solid relationship between depressing music and music listening function Intellectual Stimulation & Self-Awareness (E = 0.304; SE = 0.041; p = 0.00) (See appendix section 3, Table A). These findings are also in accordance with the aforementioned success of sad music in popular culture, which based on the

findings of this study either stems from depressing/sad music fulfilling a therapeutic function for individuals suffering from psychological pain (Edwards & Templeton, 2014; Chen et al., 2007); or alternatively from depressing/sad music inducing a hormonal reaction in the brain due to a simulated sadness ultimately resulting in pleasure (Huron, 2012). The popularity of depressing music in modern culture is further highlighted by a strong connection to music video consumption found in this study.

Musical/psychological attribute enthusiastic was found to load highly on valence and is therefore related to positive emotion (Greenberg et al., 2016). A positive relation to dimensions pOsitivity and Mating implies that uplifting music was played in accordance with the psychological meaning of listening situations. A negative association between enthusiastic music and Adversity is also in line with that notion. Furthermore, it is in line with the aforementioned findings by Ferwerda et al. (2015), by which angry or fearful individuals disliked happy music.

However, the cause for a positive relationship between enthusiastic music and Duty is not obvious. This result could stem from a general preference for positive valence music by individuals experiencing a neutral mood (Ferwerda et al., 2015).

Duty additionally exhibited a positive association to danceable music, which is low on depth (Greenberg et al., 2016), and a negative association with sophisticated music, which is high on depth (Greenberg et al., 2016). Consequently, Duty exhibited a negative association to depth, which reflects cognitive processes according to Greenberg et al. (2016). It could be speculated that situations high on Duty required music that is not cognitively demanding but rather simple as in danceable music, or good mood inducing as in enthusiastic music. A link between Duty and music listening function Mood Improvement and Background Listening supports this assumption (E = 0.079; SE = 0.04; p = 0.48) (See appendix section 3, Table A). This hints at music in situations of Duty to improve mood, help pass time, help the listener feel less lonely and/or serve as background music.

High depth musical attributes Sophisticated and Inspiring both exhibited significant positive associations to dimension Intellect, while low depth attribute danceable was negatively associated. This confirms hypothesis 1f) regarding Intellect. It is also in line with the suggestion that depth represents cognitive processes (Greenberg et al., 2016). However, a positive relationship between Duty and sophisticated music was disproved and the opposite was the case. This disproves hypothesis 1f) regarding Duty.

An observed positive relationship between danceable music and pOsitivity most likely implicates a partying or physical component, which is also supported by the positive association between pOsitivity and music listening function Movement and Personal Fitness. Activity partying was also strongly related to danceable music.

The decreased likelihood for inspiring music during social situations is in line with the finding of this study that solely high valence music was preferred during social situations. It is also in line with findings from previous studies, that music in social situations was largely played in the background (Juslin und Laukka, 2004), since high depth music (as in Inspiring) would most likely not be the common choice for background music.

With regards to activities, situations in transit did not showcase conclusive patterns of musical parameters. In transit was a comparably moderate predictor for high arousal, high valence, low depth and high depth music. This finding confirms hypothesis 2d). This is most likely due to individual characteristics as well as due to situational characteristics. Some individuals might look at a car or subway ride as a negative task and hence tend to listen to more arousal-based music. Other individuals might see the same subway or car ride as a task with a low social component and therefore use the time to listen to music as an intellectual stimulus.
Another possible reason for variations in musical characteristics during situations in transit would be that some situations in transit are possibly different than others and therefore exert different psychological implications.
At least for car rides, it was found that music in a driving context can serve the function of counteracting boredom (Walsh, 2010). In comparison to other activities, In transit exhibited the strongest connection to Mood Improvement & Background Listening in this thesis, which points in the same direction.
Getting ready for the day was negatively associated to aggressive music. There was hence no association to positive valence or positive arousal. It could therefore not be confirmed that people start their day off on a positive or energetic note. Hypothesis 2f) was therefore disproved. A negative association with aggressive music rather hints at people preferring music that is not high in arousal while getting ready in the morning.
Results did not show that high arousal music was preferred during sports/dancing. Solely low arousal music was negatively associated. Music during sports/dancing did

however fulfill Movement & Personal fitness. Hypothesis 2a) could hence only be partially confirmed.
Hypothesis 2b) could be confirmed, since there was a positive association between high depth attributes sophisticated and inspiring and pure music listening. Pure music listening also exhibited the strongest connection to Intellectual Stimulation & Self-Awareness.
Hypothesis 2c) could also be confirmed, since relaxation was the strongest activity predictor variable for mellow music.
Hypothesis 2e) could be confirmed. Partying scored highly and significantly higher on Mating and Sociality than other activities. Also, high arousal music was preferred during partying and music during partying fulfilled function factor Movement & Personal Fitness.

Hypothesis 3 could be confirmed. A preference for music genre factor Popular/Urban was a positive predictor for music listening function Staying in Tune. This highlights the habit of today's listener to constantly check for new music and points at the high frequency of new Pop/Urban releases nowadays.

Regarding person-related fixed effects predicting musical parameters, results were largely as expected. Rock/Metal preference predicting aggressive music; Electro/Dance predicting danceable music; Jazz/Blues predicting sophisticated music; Classical/Folk predicting non-aggressive music; and Pop/Urban predicting happy music were expected results. Genre preference was therefore shown to significantly predict some musical/psychological parameters. Hypothesis 4b) was consequently confirmed.
Hypothesis 4a) stated that individuals with a higher musical sophistication draw intellectual stimulation from music with a higher likelihood than those with lower sophistication, which was previously observed by Greb et al. (2017). The same result was confirmed here, thus confirming Hypothesis 4a).

DIAMONDS clusters as predictors for musical/psychological parameters revealed clear patterns of valence, arousal and depth.
Cluster 1, which included overall low DIAMONDS scores, did not predict any parameters. Cluster 2, which included a high score for pOsitivity and Sociality as well

as a moderate score for Mating, was a significant predictor for high valence music, as compared to other clusters. It had the highest fixed effect estimation with regards to happy (high valence) and enthusiastic music (high valence); as well as the highest negative effect on depressing music (low valence).

Cluster 3, with a high mean score of Negativity and Duty as well as moderate scores of Intellect, Sociality and pOsitivity was a significant predictor for high arousal music, as compared to other clusters. Cluster 3 exhibited the highest fixed effect on intense music (high arousal) and aggressive music (high arousal); as well as the lowest effect estimation regarding mellow music (low arousal).

Finally, cluster 4, with overall high Duty and Intellect mean scores, a moderate Negativity score and a lowered Sociality and pOsitivity score was the comparably strongest predictor for high depth attribute inspiring; as well as the weakest predictor for low depth attribute danceable.

These results highlight the ability of certain specific DIAMONDS constellations to predict musical attributes and the psychological implications of music. In situations of cluster 2 music represented positive emotion/valence. In situations belonging to cluster 3 arousing music was played more likely than in other clusters. And music in situations of cluster 4 were associated with music related to cognitive processes/depth.

4.2 Implications of results

In this thesis, DIAMONDS dimensions, activities and individual factors were able to confirm the majority of hypotheses. Since these were mostly based on research from multiple studies of musical psychology and related fields, it can be concluded that the combination of predictor variables accurately captured different facets and mechanisms of music listening. DIAMONDS also proved to be solid predictors for musical/psychological parameters in this study. Moreover, different groupings separated by their strengths of DIAMONDS ratings, as in DIAMONDS clusters or classes, were clear predictors for music related mechanisms arousal, valence and depth. In demonstrating that situational characteristics as well as clusters of situational characteristics could be linked to musical parameters in a way that is in line with current scientific state of research, eight DIAMONDS proved to be a fitting tool for research. Moreover, links between DIAMONDS and those musical parameters that were more

difficult to interpret, as for instance in the case of Duty, hint at the need for a more detailed and extensive research.

In this study, DIAMONDS were further able to capture multiple facets of single musical parameters. For instance, depressing music was predicted by Intellect as well as by Adversity, which resulted in two different inferences. Results like this indicate that DIAMONDS as potentially versatile tool in their application for research. The advantage of including DIAMONDS as predictors for music listening behavior lies in the ability to capture complicated implications. Beyond that, DIAMONDS as predictors for musical/psychological parameters delivered solid conclusions about peoples' music listening behavior. These conclusions could be drawn with or without individuals being aware of their behavior. In comparison, reported functions of music listening required listeners to know why they listened to music in certain situations.

While different activities as predictors for musical parameters are relevant, they did not imply a clear psychological meaning for the individual. As was shown, individuals varied in their experiences of activities and therefore viewed the same activity differently than other individuals.
DIAMONDS dimensions are therefore a more nuanced tool for situation description.

In this thesis, the case of Duty is rather interesting. On the one hand when observed in the context of various fixed effects, Duty exhibited a positive association to high valence attribute enthusiastic and low depth attribute danceable. A negative effect on high depth attribute sophisticated was also in line with that.
On the other hand high Duty combined with other attributes was positively associated to high arousal music in cluster 3; and also positively associated to high depth music in cluster 4. Because high arousal music could be due to high Negativity in cluster 3 and high depth could due to high Intellect in Cluster 4, the exact effect of Duty on musical/psychological parameters is unclear.
Duty could possibly determine musical choice in combination with other situational characteristics. There is most likely a relation to activity Work, which did not predict any musical parameters. The roles of dimension Duty and activity Work should be further explored in musical psychology, since Duty was common as a situational characteristic and work was common as an activity during music listening.

Overall, pure situational differences influenced peoples' perceptions of situations more than individual differences. This was also the case for musical parameters. However, variance in perception of situations due to between-person differences was much weaker compared to the perception of musical/psychological attributes. For DIAMONDS ratings, ICCs varied between 0.04 and 0.263, with an average ICC of 0.131. In comparison, ICCs of musical parameters varied between 0.118 and 0.504 with an average ICC of 0.308. DIAMONDS Adversity, Deception and Negativity had the highest ICCs. Thus, negative situations in particular had a higher ICC and therefore perception due to between-person differences. This could be due to personality traits such as pessimism. In past studies, personality traits were found to play a role in the perception of situations (Sherman et al., 2015).

With regards to musical attributes, aggressive and mellow music had the highest ICCs. A higher individual consistency in ratings of musical parameters is most likely due to individual preferences for specific musical styles, which are featured stronger in some genres and weaker in others.

Individuals of this study reacted to psychological meanings of situations through adaption of musical loadings. This hints at a conscious or subconscious effort to maximize benefits from music consumption. An inclusion of situational characteristics as a reflection of psychological meaning into future research could yield further insights into subconscious processes connected to music selection behavior.

Results of this thesis also highlight emotional motives for music listening. While a small number of participants reported to consciously practice musical self-therapy, every instance in which a person decided to listen to music in order to feel better afterwards, maintain a certain emotional state or receive support for what she/he is doing can ultimately be interpreted as a therapeutic process by means of music.

Increasingly easy availability and powerful effects of music are what make it potentially beneficial for society. The more mechanisms and information musical science can uncover regarding music listening behavior, the more benefits can be incorporated into real life applications. In the light of growing mental health issues based on effects from social media use, music could act as a counterweight.

4.3 Potential real-life applications of results

Music recommendation systems are an obvious example of how a situation- or purpose-based access to music could be granted. In 2014, Beats Music created an app for its streaming service with an integrated function named The Sentence. Via tapping on suggested sentence parts such as current activity, desired activity, genre and social context the app recommended songs supposed to fit that selected situation. The generated music suggestion could then be rated as fitting or not fitting (Sande, 2015). It is not clear whether this function was successful or not, since the app was discontinued after Apple's purchase of the company Beats Music.

Nowadays, people can utilize playlists generated by algorithms, such as Discover Weekly on streaming platform Spotify. This widely popular recommendation function utilizes three ways of data generation: comparing streaming behaviors of users; comparing songs by the words associated with them online; and comparison of audio data. If a listener listens to a particular song, other matching songs will be recommended based on the algorithms results (Ciocca, 2017).

Another function on Spotify is the parameter-based search, which allows users to search based on strength of valence, danceability, energy, tempo etc. (Tiffany, 2018). While this approach is promising, accuracy of results is not clear as of now.

In conclusion, a situation-based recommendation method that integrates psychological parameters could be a supplemental approach to preference-based recommendation. Given that a sufficient amount of micro and macro data regarding individual listening habits based on situational characteristics can be acquired, a combination with preferential data could result in more goal-driven listening habits.

Of course, medically prescribed musical therapy could benefit from further research into how individuals react to certain psychological stimuli by turning on music.

Beyond that, knowing more about the mechanisms behind people's music listening behaviors could have certain implications for creators. An example of musical creation for real-life purposes can be found in the song Weightless pt. 1 by British Ambient collective Marconi Union. The eight-minute song which is also available in a 10-hour version, features different instruments subtly playing over a low frequency spectrum background. As a collaborative effort with the British Academy of Sound Therapy, the purpose and effect of the song was a significant reduction of listeners' anxiety levels

(Passman, 2016). If a similar approach was applied in order to create music for other contexts such as work or commuting, potential benefits of music listening could be expanded further.

5 Limitations

The first limitation of this study lies in the sample composition. Since the mean age was around 30 years, results apply to a comparatively young demographic. Moreover, the fact that 60.5% of participants were female makes results slightly biased regarding participants' sex. Furthermore, this study did not focus on acquisition of strictly group-specific data. However, for the reason that
surveys with a music psychological emphasis are generally more likely to be filled out by persons with a music-related background and also due to easier access to music-related groups, the sample most likely features a higher proportion of musicians, musical scientists and university students, as compared to general population. Due to financial restrictions and a time limit regarding the draft of this master thesis, neither acquiring a larger sample size, nor a more diverse or more group-specific sample was within the bounds of possibility.
Also due to restrictions in budget and time, participants were asked to answer survey questions regarding past behavior and not while the particular situation was taking place. In general, retrospective self-reports of behavior are a common tool for scientific studies and have been utilized with success. However, they are prone to more errors compared to experience sampling method, which enables a more precise account with less memory flaws (Shiffman et al., 2008).

Overall, sample size of 205 different participants and 545 self-described situations was sufficient for the results to be valid. Moreover, results do not appear to be strongly biased in any regard, since music listening tendencies in this study did not strongly contradict past findings in related fields.
As previously mentioned, a pilot study with the aim of eliminating redundant and incomprehensible formulations as well as excessive amounts of questions was implemented prior to survey distribution. Though all participants of the pilot study were

reportedly able to complete the survey to the best of their abilities, it cannot be ruled out that the survey length had a straining effect on some of the participants.

In order to keep the survey as concise and short as possible, not all potentially relevant person-related parameters were integrated. In future studies related to eight DIAMONDS, personality traits could be integrated in the form of Big Five parameters for a deeper observation of how personality influences situation perception.
In this study, a 24-item DIAMONDS survey was utilized instead of the long 32-item version. Despite having achieved meaningful and reliable results, the long version could have possibly led to a slightly increased reliability.

6 Conclusion

This thesis was the first to explore the relationship between explicit situational characteristics and the musical attributes listened to by individuals.
In acquiring a sufficient sample size for a valid generation of results via statistical methods, it was shown that test-subjects adapted their music listening behavior in accordance with the psychological meaning of situations. It was also shown that clusters of situational characteristics were clear predictors of musical arousal, valence and depth.
Results of this study imply that the eight DIAMONDS are more suitable as predictors of music listening behavior than activities, due to a more nuanced characterization of situations. Hence, eight DIAMONDS should be utilized in order to further research purpose-based listening habits.
In particular, music listening in work-related situations should be further examined in future studies, since this context was observed to be common yet inconclusive regarding association to musical parameters.
Overall, this thesis hints at situation-related states exerting a stronger influence on listening behavior, compared to person-related traits.
An integration of knowledge about situational characteristics into the work of recording artists, musical therapists and software developers could yield benefits for music listeners.

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V. Appendix

1. Online questionnaire – German version

Fragen zur Person – Teil 1

Bitte beantworten Sie zunächst folgende Fragen bezüglich Ihrer Person.

- Bitte geben Sie an, wie sehr Sie die folgenden Musikrichtungen mögen.

Mag ich gar nicht	- Mag ich nicht	- Mag ich eher nicht	- Neutral	- Mag ich	- Mag ich sehr	- Kenne das Genre nicht

Rap/Hip Hop

Pop

Rock

EDM

Techno

House

Schlager

Reggae/Dancehall

Soul/RnB

Latin

World Music

Klassische M.

Jazz

Blues

Country

Metal

Funk

Soundtrack

Fragen zur Person – Teil 2

Bitte vervollständigen Sie die folgenden Angaben bezüglich Ihrer Person.

- Bitte geben Sie Ihren höchsten Bildungsabschluss an.

Hauptschulabschluss

Realschulabschluss

Abitur/(Fach-)Hochschulreife

Bachelor

Master/Diplom/Magister

Doktor

Kein Schulabschluss

- Bitte geben Sie Ihr Geschlecht an.

Weiblich

Männlich

Anderes Geschlecht

Keine Angabe

- Wie alt sind Sie?

Fragen zur Person – Teil 3

Bitte vervollständigen Sie die folgenden Angaben bezüglich Ihrer musikalischen Ausbildung.

- Bitte wählen Sie die zutreffende Antwort für jeden Satz aus:

Stimme ganz und gar nicht zu	Stimme nicht zu	Stimme eher nicht zu	Weder noch	Stimme eher zu	Stimme zu	Stimme voll und ganz zu

Ich bin noch nie für meine musikalischen Fähigkeiten gelobt worden.

Ich würde mich selbst nicht als Musiker/-in bezeichnen.

- Bitte wählen Sie jeweils eine der folgenden Antworten aus:

Ich habe regelmäßig und täglich ein Instrument (einschließlich Stimme) für __Jahre geübt

0; 1; 2; 3; 4-5; 6-9; 10 oder mehr

An dem Höhepunkt meines Interesses habe ich mein Hauptinstrument __ oder mehr Stunden pro Tag geübt.
0; 0,5; 1; 1,5; 2, 3-4, 5 oder mehr

Ich habe __ Jahre lang eine formelle Ausbildung der Musiktheorie (außerhalb der Schule) genossen
0; 0,5; 1; 2; 3; 4-6; 7 oder mehr

Ich kann __ verschiedene Instrumente spielen (inklusive Stimme)
0; 1; 2; 3; 4; 5; 6 oder mehr

Beschreibung von Hörsituation 1

Bitte beschreiben Sie nun die erste typische Situation, in welcher Sie Musik hören, in einem kurzen und präzisen Satz (Ort, Aktivität, Tageszeit etc.). Z.B. Wenn ich zu Hause morgens dusche.

Fragen – Hörsituation 1 – a)

Bitte beantworten Sie nun folgende Fragen bezüglich der soeben von Ihnen beschriebenen Hörsituation.

- Sind weitere Personen in der soeben beschriebenen Version anwesend? (Bitte wählen Sie eine der Antworten aus)

  Nein, ich bin alleine
  Ja, aber ich interagiere/kommuniziere nicht mit den anderen anwesenden Personen
  Ja und ich interagiere mit den anderen Personen

- Inwieweit haben Sie die Musik in der Situation selbst gewählt? (1-7)

Gar nicht selbst gewählt 1 - 2 - 3 - 4 - 5 - 6 - 7 Vollkommen selbst gewählt

- Konsumieren Sie die Musik in der soeben beschriebenen Situation in Form von Musikvideos? (Bitte wählen Sie eine der Antworten aus)

  Nein, nur in Audio-Format

  Ja, ausschließlich in Form von Musikvideos

  Musikvideos und Audio-Format

- Wie ist Ihre Stimmung typischerweise in der beschriebenen Situation, bevor Sie die Musik hören/einschalten? (1-7)

	1	-	2	-	3	-	4	-	5	-	6	-	7	
Gar nicht														Sehr

  Gelangweilt

  Fröhlich

  Entspannt

  Unruhig

Fragen – Hörsituation 1- b)

- Inwieweit treffen folgende Aussagen auf die gerade von Ihnen beschriebene Hörsituation zu, auf einer Skala von 1-7?

	1	-	2	-	3	-	4	-	5	-	6	-	7	
Gar nicht														Sehr

  Eine Arbeit muss erledigt werden

  Aufgabenorientiertes Denken ist notwendig

  Ich muss (m)eine Pflicht erfüllen

  Die Situation enthält intellektuelle Reize

  Es besteht die Möglichkeit intellektuelle Fähigkeiten zu demonstrieren

  Informationen müssen tiefgründig geistig be-/verarbeitet werden

  Ich fühle mich für etwas kritisiert

  Ich fühle mich für etwas beschuldigt

  Ich fühle mich durch etwas oder jemanden bedroht

Potentielle sexuelle oder romantische PartnerInnen sind anwesend

Physische Attraktivität ist relevant

Die Situation ist sexuell aufgeladen

Die Situation ist erfreulich

Die Situation ist verspielt

Die Situation ist fröhlich und ausgelassen

Die Situation könnte Stress auslösen

Die Situation könnte Gefühle der Anspannung auslösen

Die Situation bringt Frustration mit sich

Es ist möglich jemanden zu täuschen

Jemand in der Situation könnte sich betrügerisch verhalten

Es ist möglich, nicht ehrlich mit anderen umzugehen

Enge persönliche Beziehungen sind wichtig oder könnten sich entwickeln

Andere Leute zeigen viele kommunikative Signale

Kommunikation mit anderen Menschen ist wichtig oder erwünscht

Fragen – Hörsituation 1 – c)

- Bitte bewerten Sie die in der beschriebenen Situation gehörte Musik anhand folgender musikalischer/psychologischer Eigenschaften.

1	-	2	-	3	-	4	-	5	-	6	-	7
Gar nicht												Stimme voll zu

Intensiv

Sanft

Aggressiv

Fröhlich

Deprimierend

Enthusiastisch

Tanzbar

Anspruchsvoll

Inspirierend

- Warum hören Sie Musik in der beschriebenen Situation? Bitte bewerten Sie die folgenden Gründe.

1 - 2 - 3 - 4 - 5 - 6 - 7	
Stimme gar nicht zu	Stimme voll zu

Weil ich sie im Hintergrund brauche, während ich etwas anderes tue

Weil ich mich über Hits und Trends informieren will

Weil sie meine Stimmung verbessert

Weil ich mich dann weniger einsam fühle

Weil ich dabei neue Stücke kennenlernen kann

Weil ich mir damit gut die Zeit vertreiben kann

Weil ich dadurch etwas über mich lernen kann

Weil sie mich an bestimmte Phasen meines Lebens bzw. an vergangene Ereignisse erinnert

Weil ich mich dazu bewegen kann

Weil ich darin meine Gefühle und Stimmungen wiederfinde

Weil ich mich dann fitter fühle

Weil sie eine intellektuelle Stimulation für mich ist

Beschreibung von Hörsituation 2

….

Fragen – Hörsituation 2

…

Beschreibung von Hörsituation 3

…

Fragen – Hörsituation 3

2. Mean values of eight DIAMONDS across activity categories

Figure A. Marginal means of Duty across activities, including confidence intervals

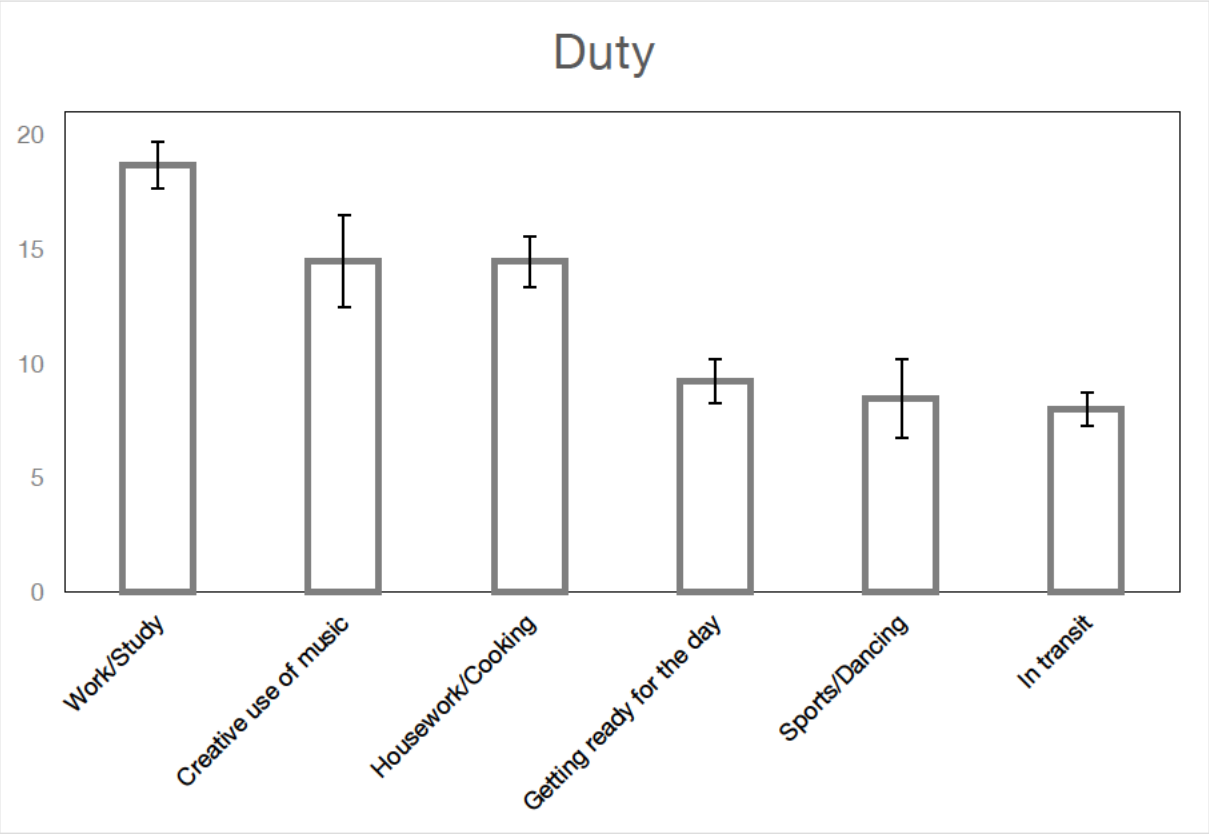


Figure B. Marginal means of Intellect across activities, including confidence intervals

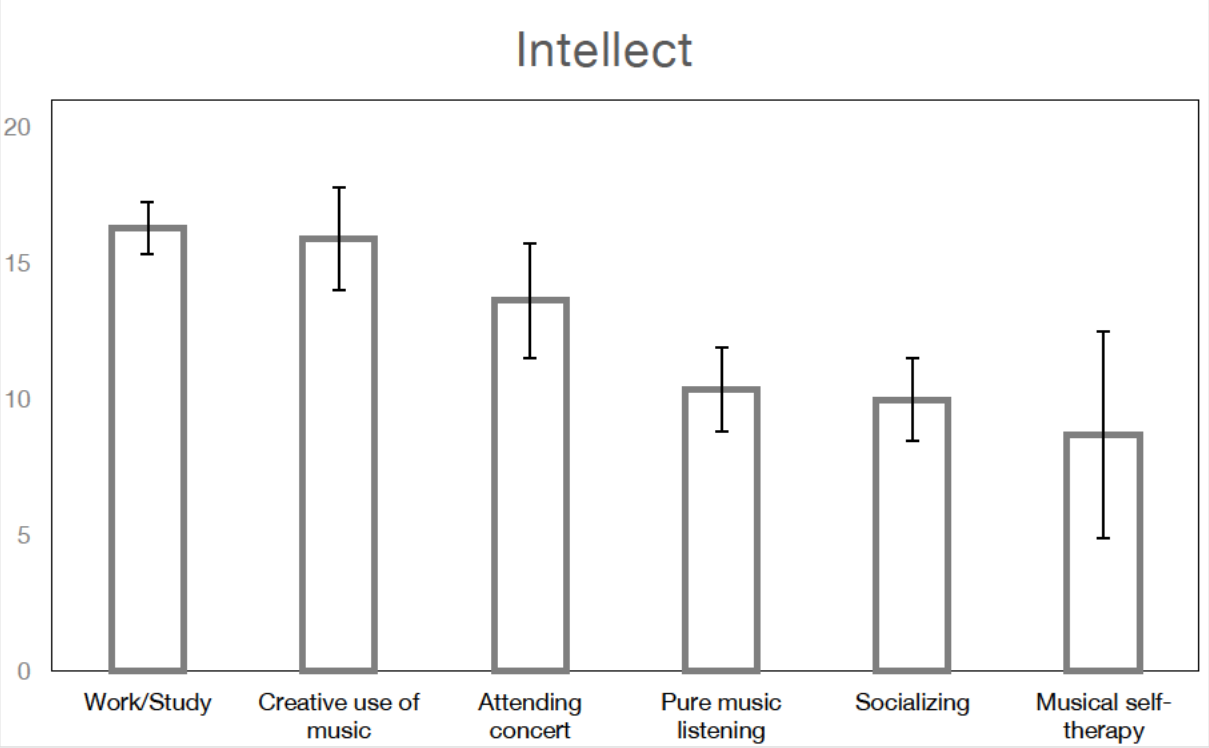


Figure C. Marginal means of Adversity across activities, including confidence intervals

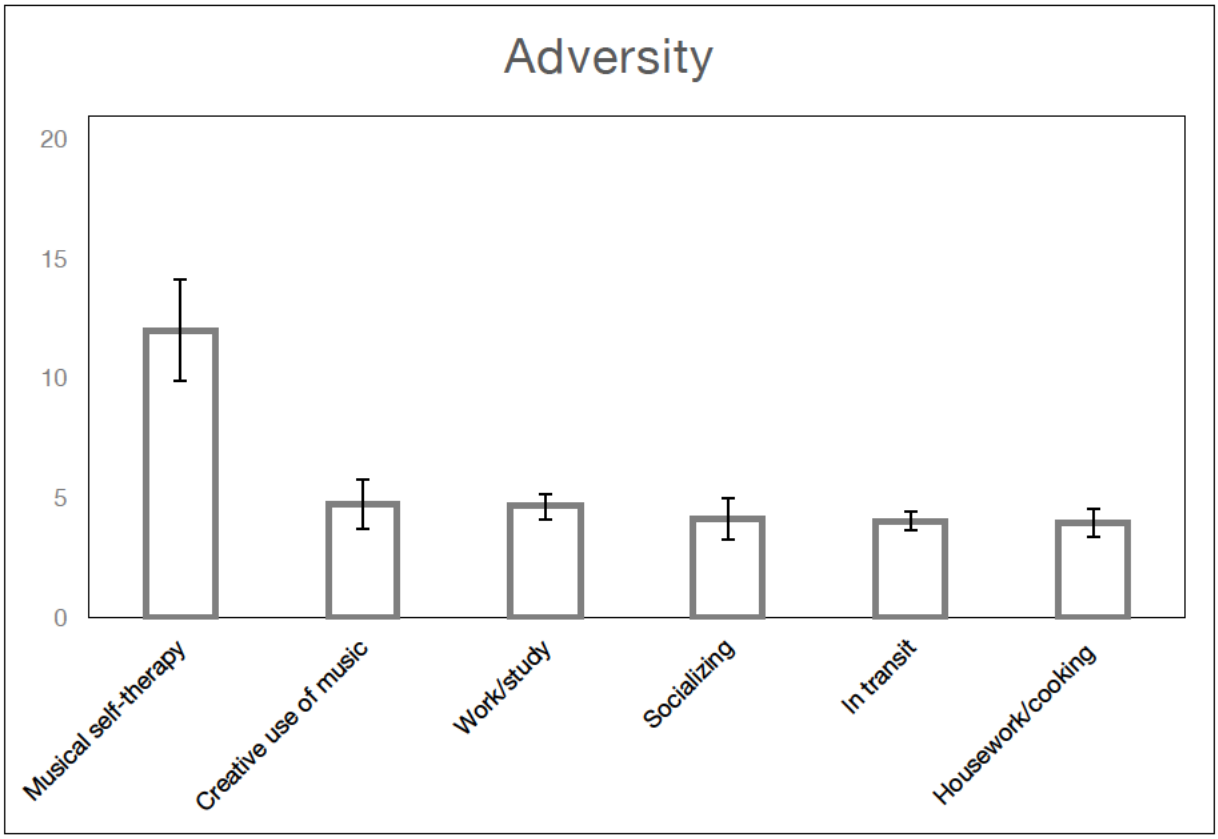


Figure D. Marginal means of Mating across activities, including confidence intervals

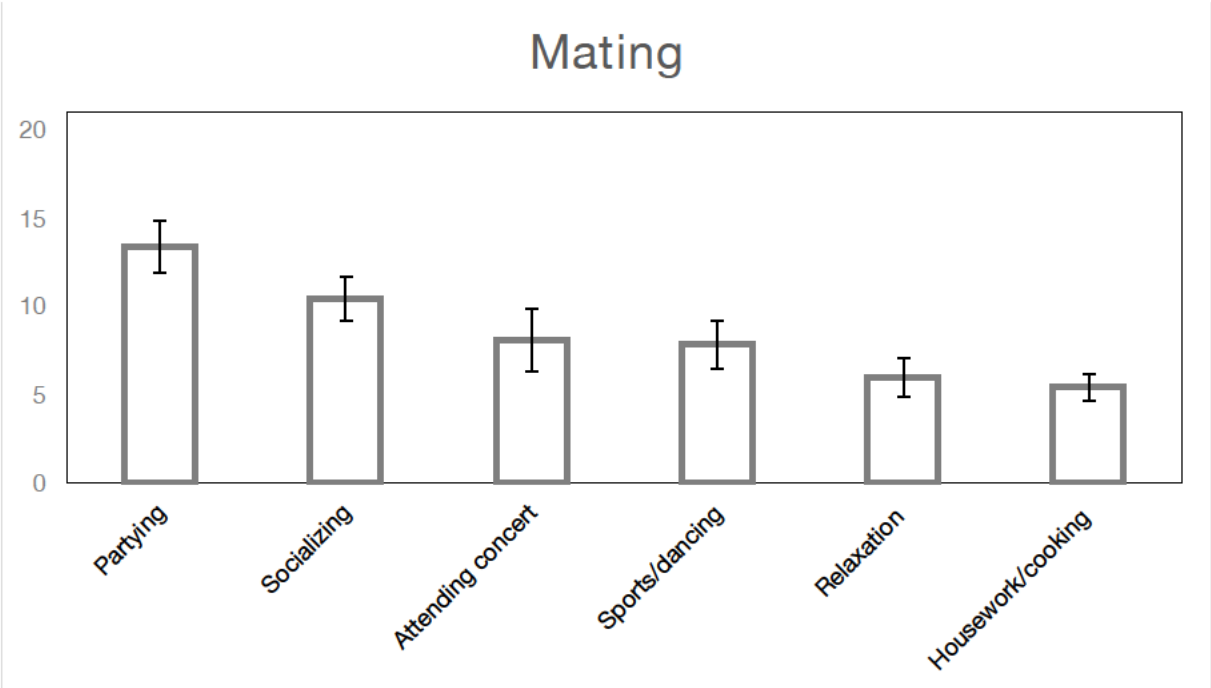


Figure E. Marginal means of pOsitivity across activities, including confidence intervals

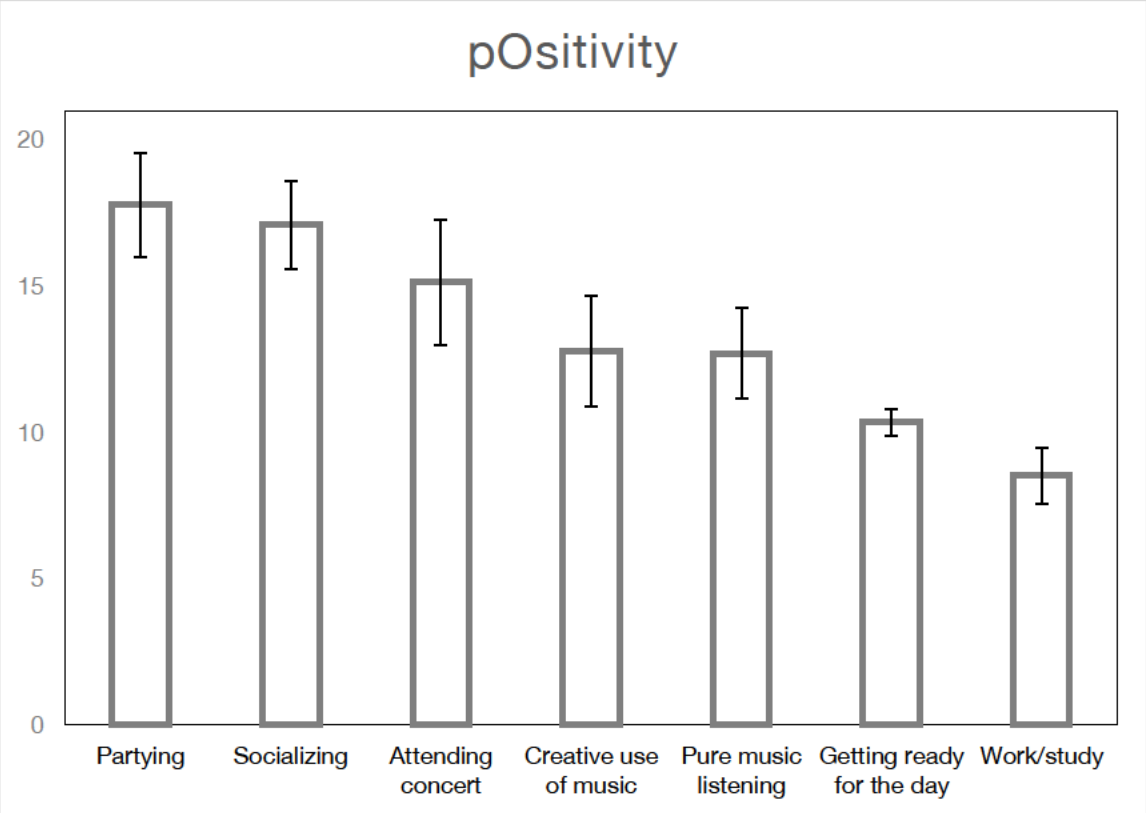


Figure F. Marginal means of Negativity across activities, including confidence intervals

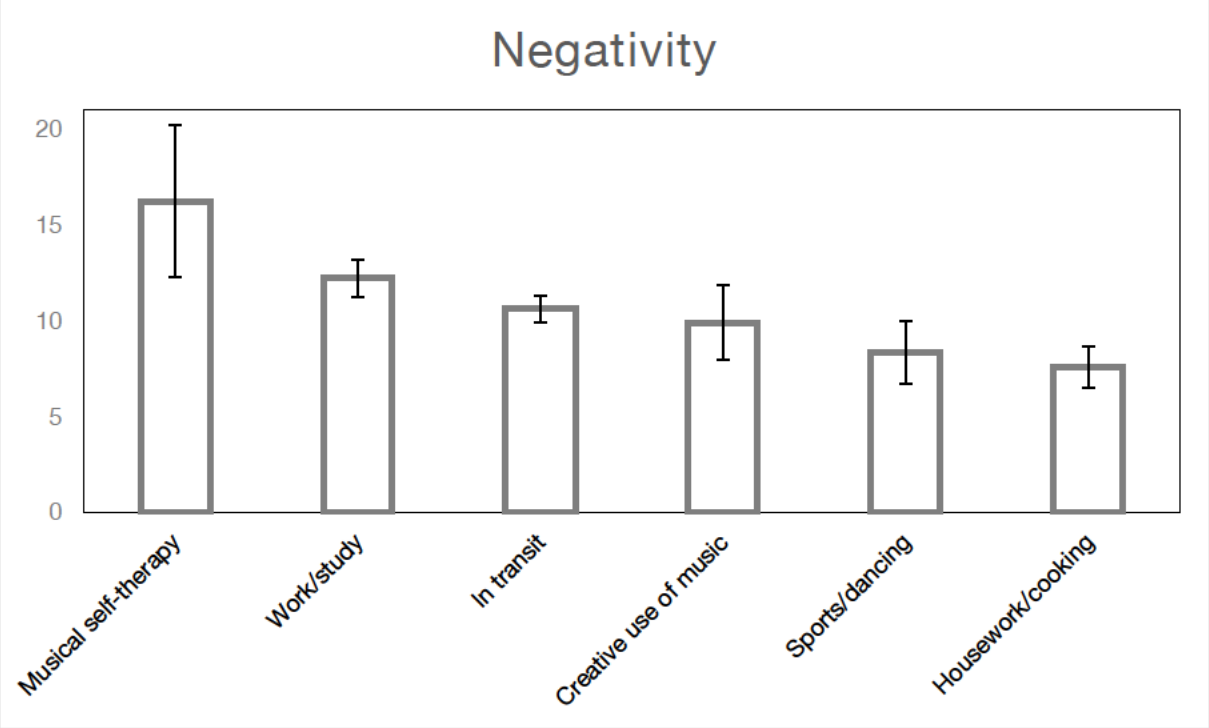


Figure G. Marginal means of Deception across activities, including confidence intervals

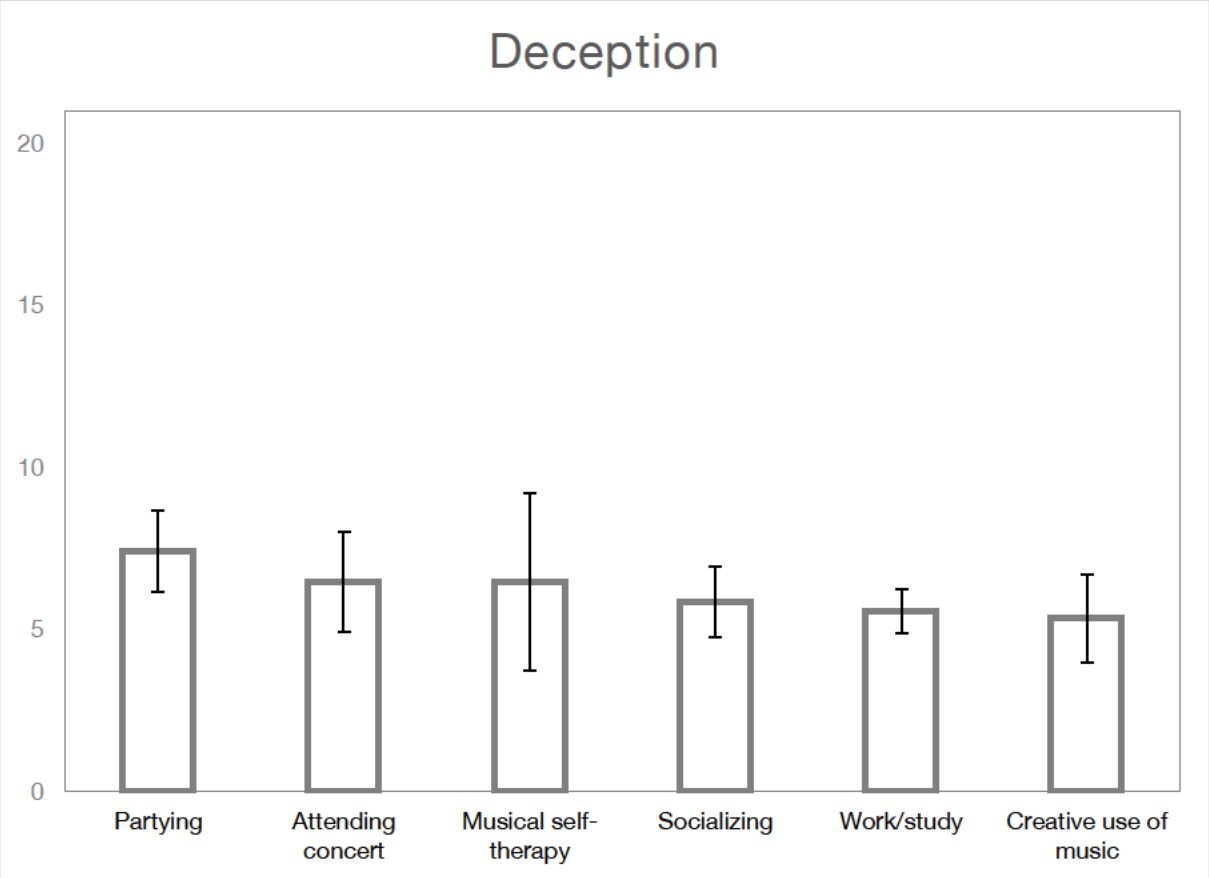
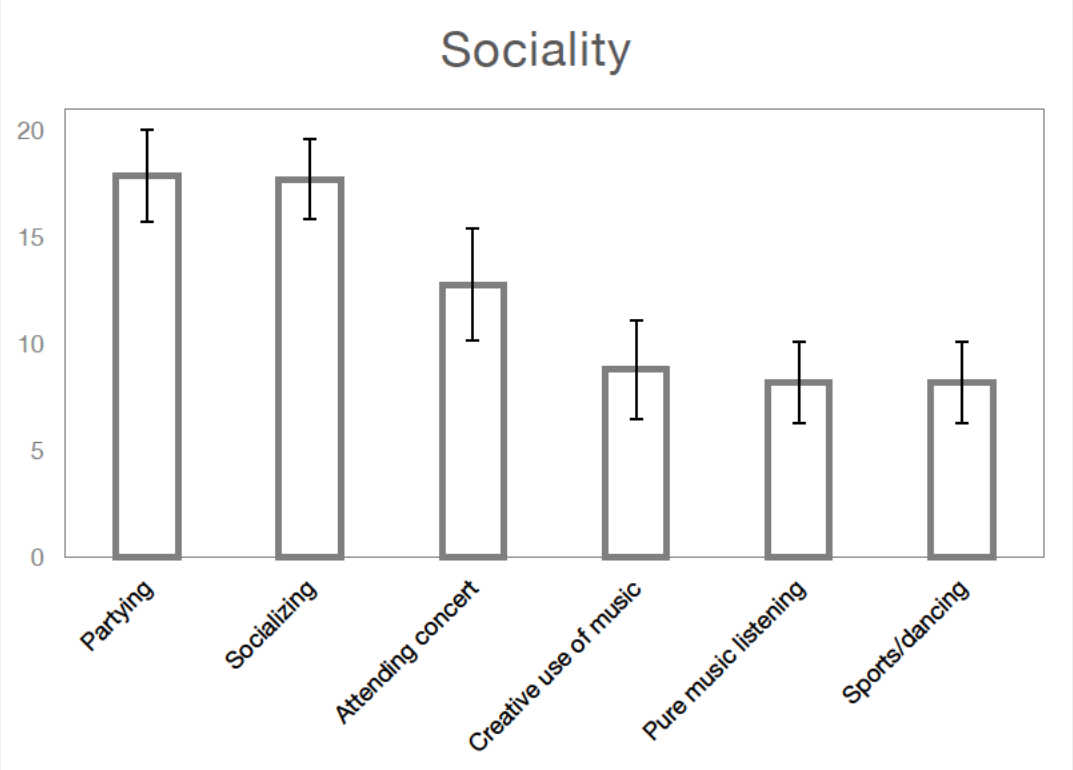


Figure H. Marginal means of Sociality across activities, including confidence intervals



3. Musical parameters as significant predictor variables for function factors of music listening

Table A. Musical parameters as predictors for music listening functions

	Estimate (Standard Error)			
Musical attribute	Intellectual Stimulation & Self-Awareness	Mood Improvement & Background Listening	Movement & Personal Fitness	Staying in Tune
Depressing	0.304 (0.041)		-0.131 (0.04)	
Aggressive	0.097 (0.041)		0.084 (0.041)	
Danceable	-0.170 (0.035)		0.523 (0.035)	0.184 (0.034)
Enthusiastic		0.079 (0.04)	0.352 (0.040)	0.13 (0.04)
Happy	-0.114 (0.04)	0.153 (0.04)	0.313 (0.04)	0.133 (0.04)
Inspiring	0.579 (0.035)			
Intense	0.445 (0.039)		0.209 (0.04)	
Mellow	0.21 (0.042)	0.096 (0.042)	-0.131 (0.043)	
Sophisticated	0.581 (0.034)		-0.12 (0.034)	