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Can a Piece of Music with a Positive Emotional Elicitation Improve Dream Content and the Phenomenological Experience?

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APPENDICES

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Abstract

Dreams can be defined as a series of thoughts, ideas and sensations that occur involuntarily within our minds during the stages of sleep. As there is a current lack of research connecting music and its effects on dreams, this thesis will investigate if music can have a positive effect on dreaming. Longer lasting effects if music can positively alter our dreams, is a reduction in nightmares and stressful dreaming. Many of us dream or experience dreaming on a nightly basis whether it be wild, vivid experiences or just the recall of a sensation. First, five pieces of music across five different genres were assessed (using the BRECVEMA model of music psychology), and then presented to a group of participants to see how emotions were perceived across the five selected genres/pieces (scores attained from the Emotion Worksheets). It was found that the 'Musical Theatre' piece of music had the highest level of positive emotional elicitation within participants.

Then, various aspects of dreaming including dream contents and various experiences of dreaming (PANAS, vividness, coherence, recall and sensory information) were examined for two weeks, one week where the participants listened to the selected piece of music and one where participants listened to no music. Participants were given a dream journal to complete throughout the two weeks which included; pre-sleep questionnaire, a space to record dreams and a post-sleep questionnaire. It was found that when the participants were listening to music, they experienced significantly more positive contents of their dreams, whereas dreaming experiences were not altered in accordance with the music. Although, further research within this field is needed to fully assess whether all music as a whole can alter our emotions strong enough to change our dream content and our phenomenological experience. Other pieces of music within other genres and the same genre could be deemed more powerful and have more of a lasting effect.

Chapter 1: Literature Review

Introduction

The idea that music has the power to affect or modulate our emotion is a strong claim that has been discussed using various studies throughout years of research. For instance, recent research has explored the role of music therapy, which most commonly uses music as a tool to help those with memory loss due to dementias such as Alzheimer's Disease (e.g. Gomaa, Wittwer, Grenfell, Sawan, & Morris, 2018; Särkämö, 2018; Jauset-Berrocal, 2018). This research has focused on how music impacts on the cognitive and emotional functioning of the conscious brain. However, to date, no research has specifically focused on whether music can impact the unconscious brain, i.e. during sleep and dreaming. Therefore, this thesis aims to explore whether music can affect the emotions and information processing experienced during the brains unconscious state of sleep; specifically, it examines whether listening to music before sleep can affect the content and phenomenological experience of dreams, the remainder of this chapter reviews the relevant literature to this thesis. It begins by outlining and defining emotion and the different cognitive mechanisms that surround emotion. It then explores music, our emotional responses to music, and different cultural and general stereotypes surrounding various genres of music, before detailing various frameworks around the cognitive mechanisms that induce emotions when one listens to music. It then continues to explore the nature of sleep and dreaming, along with their connections to the waking state, such as autobiographical memories and working memory. Finally, it discusses pertinent issues related to dreamings, such as the various conceptualisations of dreaming, dream interpretations and dream recall.

Emotion

The mainstream definition of emotion refers to a feeling state involving thoughts, physiological changes, and an outward expression or behaviour (Zajonc & McIntosh, 1992). Five theories are surrounding the topic of how we understand emotion:

James-Lange Theory

This theory of emotion argues that an event causes physiological arousal first, and in turn then we interpret said arousal. Only after our interpretation may we experience emotion. If this arousal is not noticed or thought of, then no emotion occurs (Cannon, 1927).

Cannon-Bard Theory

The Cannon-Bard Theory argues that we experience physiological arousal and emotion at the same time, with no thought to our outward behaviour or thoughts at the time. An event triggers arousal and emotion simultaneously (Dror, The Cannon-Bard Thalamic Theory of Emotions: A Brief Genealogy and Reappraisal, 2014).

Schachter-Singer Theory

This theory claims that an event occurs which causes physiological arousal first, then you must identify a reason for the arousal, then you may experience and label that emotion (Dror, 2017).

Lazarus Theory

Lazarus Theory states that thought must come before any emotion or physiological arousal. One must first think about the situation you are in before you can experience an emotion (Yim & Byon, 2018).

Facial Feedback Theory

According to the theory of facial feedback, emotion is the experience of changes in our facial muscles. Therefore, when we smile, we experience pleasure or happiness. When we frown, we experience sadness. It is the changes in our facial muscles that cue our brain and provide the basis for emotions (Coles, Larsen, & Lench, 2019).

In addition to the four theories mentioned, a key model dominates the research into how emotions are organised, this is called the discrete emotions model, which assumes that there is a small number of distinguishable primary or basic emotions (Ekman, 1992). This model suggests how each emotion is activated and regulated through four different mechanisms and processes.

Emotional Experience

Subjective experience, or a feeling, is an essential element of the emotional system and has been for many years routed back to BC and Aristotle. This component combines all components mentioned within this model and serves as the basis for the conscious portrayal and regulation of emotions (Scherer, Why Music Does Not Produce Basic Emotions: A Plea for a New Approach to Measuring Emotional Effects of Music, 2003). Due to the subjective and individual nature of examining emotions, the best way to do this is through self-reports potentially using rating scales of phenomenological descriptions. The only way to measure subjective experiences is with self-reports. Using self-reports through these mechanisms, participants may answer questions to what they feel they are expected to and/or the most socially acceptable responses. (Lundqvist, Carlsson, Hilmersson, & Juslin, 2008).

Facial Expression

The face and facial expressions play a pivotal role in the manifestation of emotion and distinct facial expressions are created by the contraction and detraction of specific facial muscles (Hjortsjö, 1970). Activity over the muscle regions of *zygomaticus major* (smiling) and *corrugator supercilia* (frowning) can reliably indicate the degree of the valence of emotional imagery (Firdlund, Schwartz, & Fowler, 1984).

Autonomic Activity

This component lies within the Autonomic Nervous System (ANS), which provides the body with support to deal with behavioural demands, which includes an increase in heart rate. Some researchers have argued that at least some emotions can reflect specific autonomic activity (Levenson, Ekman, & Friesen, 1990). The extent to which various emotions integrate diverse patterns of the ANS activity is

quite a controversial issue. Measurements of autonomic activity in music listeners have for over 100 years been an attractive way to non-obtrusively explore how the mind processes music (Bartlett, 1996).

Response Coherence

Within this model, Response Coherence which is otherwise known as 'Response Synchronization', is an emotional reaction that leads to a corresponding response in all regions of the brain, this is an important characteristic of emotions (Scherer & Zentner, 2001). It is often relayed as an evolutionary perspective regarding emotion. It is debated how Response Coherence fits with the other emotional components, however, the absence of anyone component is uncommon for concluding whether or not an emotion has occurred. Similarly, there are often times when avoidance of one behaviour occur independently of any corresponding subjective feeling (LeDoux, 1996).

Individually and collectively each of these four components allows us to see how emotion is induced and controlled or moderated within the brain, therefore they can also help us to understand our emotional reaction to music alongside the pre-existing research surrounding how our minds process music into inducing emotion.

Music and Emotional Response

Music can generate strong, or 'peak' emotional experiences (Bullack, Buedenbender, & Roden, 2018; Whaley, Sloboda, & Gabrielsson, 2009; White & Rickard, 2016; Zentner, Zentner, Didier, & Scherer, 2008). Music can induce moments of happiness and fulfilment which is intensely enjoyable (Juslin P. , 2013). It is also self-validating; music can encourage self-justifying moments in connection to its intrinsic value and give a sense of wonder and awe (Whaley, Sloboda, & Gabrielsson, 2009). Music can create disorientation of time and space which can arguably, create a more positive view of the self, others and the world which then leads to possible therapeutic effects (Cespedes-Guevara & Eerola, 2018). Emotion is first and foremost a psychological construct given the 'mentalistic' nature of the construct and its relation to behaviour, other perspectives to look at emotion include philosophical and musicological too (Juslin & Sloboda, 2001). Contemporary conceptions of emotions influence the discussion of musical emotions. (Juslin & Sloboda, 2001). Emotions are organised into psychological and physiological reactions to monitor changes in our relationship to the world which can be; temporary, positive, negative or a mixture of both, emotional altering thought processes, trigger action tendencies and having only partial control (Bernstein, 2012). Studies that compare facial expression with and without music stimulus, found that that non-musical stimuli increased zygomatic activity to positively valenced music, and increased corrugator activity to negatively valenced music (Lundqvist, Carlsson, Hilmersson, & Juslin, 2008).

Music and Basic Emotions

Traditionally researchers that investigate how musical expression links to emotion have asked listeners to judge a set of 'basic emotions' such as; sadness, happiness, anger and peace. Subsequently, the majority concludes that these 'basic' emotions are expressed by, and within, music, therefore, is recognised by the listeners (Eerola & Vuoskoski, 2013). Music's capability to induce emotional responses has been revealed across a range of self-report and physiological measures (Gabrielsson, 2001). For instance, 'happy' music is generally related to a greater increase in the autonomic nervous system activity which includes increased heart rate and slight perspiration. Whether music is capable of inducing sad or happy emotional responses is a useful stimulus for studies that focus on the regulation of emotion. The types of emotion-inducing stimuli that have been used for such purposes typically lie within film and visual imagery, there are very few studies that focus on emotion regulation in which appear to supplement music as the stimulus over film. The emotional responses to music and the capability to regulate said response varies through context and the individuals. For example, individual differences for responses to music include things like gender and age (Nater, Krebs, & Ehlert, 2006). Music is used to symbolize a variety of meanings, all over the world, it is used from religious and political standings too personal, intimate connotations (Schubert, 2009). Music is omnipresent throughout everyday life from television to cinema and the internet. A popular opinion within society now is that music has become one of the most important strategies for creation, enhancement and the modulation of emotions (Juslin & Laukka, 2004). The emotional power of music has been debated and become a growing interest in research. The research that investigates the ability of music to affect emotions is focused around two phenomena's; the possibility and ability of music arousing emotions, and it's possibility and ability to express them (Cespedes-Guevara & Eerola, 2018). Whilst there is a mass of evidence to show how music relates to the listener's emotions (Harrer & Harrer, 1977; Gabrielsson A. , 2001; Juslin & Sloboda, 2001; Lavy, 2001), the research has not seemed to capture the variety of emotional and non-emotional meaning that music represents in the context of everyday life (Cespedes-Guevara & Eerola, 2018). Psychological research within music and emotion only seems to break-through the limited set of 'basic emotions', i.e. Happiness, Sadness and Fear (Krumhansl, 1997). The idea of 'basic emotions' eliminate the fact that several emotions traditionally share components, for instance, Happiness, Love and Enjoyment share a component of pleasure (Scherer, 2009). Despite all the research-based around music evoking 'basic emotions', music is much more capable of inducing a more varied assortment of emotions. Although these approaches to the research of music and emotion may be more valid phenomenologically, they have been extensive, with choice of emotional labels depending on the authors' particular views of musically induced emotions rather than on a systematic founded taxonomy of music-relevant emotional terms (Scherer, 2004). Ratings within studies revolving around musically induced emotions vary exceptionally according to the type of music that is being rated.

Findings for positive emotions were assorted and were more reliant on the nature of the music, for example, amazement and peacefulness were reported far more within Classical and Jazz music (Zentner, Grandjean, & Scherer, 2008). A possible explanation behind this is that music may symbolically express emotions by mimicking a wide range of expressive human behaviour. One of the most used functions of music in daily life is a reminder of a valued past (North, Hargreaves, & Hargreaves, 2004). It is possible that the emotions felt in response to listening to music are just an example of a much larger varied category of emotions relating to everyday experiences (Zentner, Grandjean, & Scherer, 2008).

To understand emotion and listeners within music, we look to the listener's relationships to music. Within music and emotion, there are four basic assumptions of a listeners-centred approach (Lavy, 2001). The four basic assumptions concerning listeners and their relationship to music are;

1. Music is heard – Non-conscious monitoring for danger
2. Music is heard as a human utterance – Humans very sensitive to the sound of a human voice
3. Music is heard in context – Context = knowledge, thoughts, environment
4. Music is heard as narrative – Humans construct narratives to make sense of things

The listeners-centred approach is based on the idea that sound/utterance makes a connection with narrative and/or context, then narrative/context are pushed into arousal. Cognitive components which, together alongside arousal, constitute emotional responses to music. A listeners state of physiological arousal is a part of the listening context and arousal affects the speed of narrative formation (Lavy, 2001). Also, when looking into music and the listeners' emotional response, we need to understand the relationship between emotion and structure (Gabrielsson & Lindström, 2011). The relationship between emotion and musical structure within listeners is understood by one of four ways;

a. Analysing the musical score concerning perceived expression.
b. Having musical experts judge the selected pieces concerning structural properties.
c. Using various devices for measuring the acoustical properties of the music.
d. Using systematic manipulation of musical stimuli and noting the effects on perceived expression.

Induced emotions do not always correspond with perceived emotions (Kallinen & Ravaja, 2006). Many researchers believe that induced emotions = perceived emotions + arousal. (Gaver & Mandler, 1996). Exercise-induced arousal increased intensity of induced but not perceived emotional responses. The line between music and subjective emotional experiences isn’t clear, as an example (Juslin & Sloboda, 2001) proposed two sources of emotion within the music; Intrinsic and Extrinsic. Extrinsic emotional meaning within music is reactions and arousals in connection with an outside experience or object, whereas Intrinsic emotional meaning within music is based on the learning of characteristics of music with expectancy (Juslin & Sloboda, 2010). Extrinsic emotional meaning has the potential to be completely subjective and unrelated to the music you are listening too, whereas Intrinsic emotional

meaning is seemingly controlled by the musical connotations in specific musical genres. (Kallinen & Ravaja, 2006). The distinction between the perceived emotion and the emotion that music arouses in listeners (emotion felt) isn't well established, as within research the distinction has not necessarily been made due to the lack of research revolving around the objective *and* subjective sides of music-elicited emotion (Kallinen & Ravaja, 2006). Few studies that do investigate this connection, believe that the relationship between perceived and felt emotion is different as a function or mechanism consequently relying on the listener's personality. There's not always a positive correlation between perceived and induced emotions, there are discrepancies between perceived and felt emotion due to listener characteristics and situation (Gabrielsson, 2001). Typically, there is a +ve correlation, however music that is considered fearful music perceived as -ve but felt as +ve. Some aspects of felt emotions are more closely associated with perceived emotions than others (Kallinen & Ravaja, 2006). Felt emotion contains six components that are considered pivotal, these include; Cognitive Appraisal, Subjective Feeling, Physiological Response, Expression, Action Tendency and Regulation.
Musical Structure contributes to both perceived and induced emotions, a connection between the two can happen, however, it is not likely (Gabrielsson, 2001). Musical features that seem to provoke emotional responses (Intrinsic) include things like; dynamic changes, harmonic features (e.g. Suspensions) and rhythmic features (e.g. Syncopation) (Sloboda, 1991; Juslin & Sloboda, 2010)
When delving into how emotion is perceived and felt whilst listening to music, the element of familiarity plays a pivotal role. If a listener has preference over certain artistic stimuli such as music, this is related to their individual 'arousal potential' (North & Hargreaves, 2008). Arousal potential within this area of research, familiarity and liking, is mediated by psychophysical variables e.g. 'ecological' variables and 'collative' variables (North & Hargreaves, 2008). Within familiarity, subjective complexity decreases, which then allows familiarity to gain greater access to thematic/structural understanding.

Music Emotional Stereotypes

Whilst looking at how music interacts with the brain and how the mind processes it, we must understand how various genres of music can and if they affect the brains working mechanisms differently. Whilst the pilot study within this thesis discusses the potential of different musical genres increasing a positive emotional elicitation, it is important to discuss how this works and a few different theories centred around this area of research. It is easy to say that sad music is equivalent to unhappy emotions and happy, major music arouses happiness and potential excitement, however, the analysis of emotional stereotypes within music is much greater. Within music psychology, there have been an abundance of studies and investigations into music and their emotional stereotypes. Stereotyping refers to an unrefined, social-constructed association and is highly relevant to various aspects of music (Reeves, Gilbert, & Holman, 2015). Stereotyping within music psychology is

focused on the stereotypes that connect music fans to musical genres and musical preference. Musical fans of one particular genre can be judged, for example, Heavy Metal followers are often labelled as aggressive and violent, and are often associated with alcohol or drug use, as their music choice appears so. These types of relationships are explained by social identity and related theories (Smith, 2014), in assessing the cognitive processing of an 'in-group' (e.g. Western white and middle-class) against an 'out-group' (African-Americans) and the music the out-group is stereotypically believed to prefer (e.g. Hip-Hop). Stereotypes like these can affect the listener's judgment of musical genre. Previous research into this suggests that when participants are briefed with a credible generalisation about a genre, this stereotyping trains the participant's responses to a particular musical pattern of that same genre (Negut & Sârbescu, 2014). These stereotypes contribute to how the music will be interpreted, and so forth contributes and trigger stereotyping of other music from the same musical genre (Susino & Schubert, 2019). Alongside generalised stereotypes associated with musical genres, there have also been investigations into emotional responses to music amongst distinct musical preferences (Zentner, Grandjean, & Scherer, 2008). This investigation concluded that different musical genres are cognitively and stereotypically connected to various connotations, for example; Jazz and Classical music were correlated to the feelings of longing, spirituality and peace whereas Pop/Rock music was associated with emotions of aggression, isolation and anger. The consistency within these emotional associations due to musical genres raises the question of stereotyping acting as a predictor and instigator of emotional responses to any one musical genre. Might the emotional label for a musical genre have its roots set in the stereotyped emotion of the culture attached to the music in addition to but not limited to the psychophysical aspects that characterize the music of each genre? (Susino & Schubert, 2019). A model for emotional perception in music in which emotion is mediated by either the psychophysical cues of music, the culture-specific cues or both were proposed (Balkwill & Thompson, 1999).

Stereotype Theory of Emotion in Music

Whilst exploring music and the emotional responses that vary from genre to genre lies the Stereotype Theory of Emotion in Music – STEM (Susino & Schubert, 2017). This theory presents the idea that listeners can perceive emotion in music-based stereotyped associations that are held by the listeners about the encrypting culture. According to STEM, a listener who reports a stereotyped association with the encoding culture is almost guaranteed to filter out the 'intended' emotion within the music, and instead activate a stereotyped emotion (Susino & Schubert, 2017). Throughout this, some musical genres may be spontaneously paired with a small set of emotions that derive directly from the stereotype that is previously held. If this kind of Evaluative Conditioning within music and emotion is credible, it can compete with the emotions generated by the psychoacoustical cues of the music or autobiographical associations (Susino & Schubert, 2019). According to STEM, listeners who perceive

emotion through stereotyped association alongside cultural appropriation will otherwise filter out the 'intended' emotion within the music and instead activate a stereotyped emotion (Susino & Schubert, 2017). Throughout the process that is proposed within STEM, limited familiarity with the culture of the music that is being stereotyped should produce a much stronger stereotyped response than an individual who is exceedingly familiar with the object (culture) in question, consequently, lower familiarity within genres would more than likely produce a stronger stereotyped emotional response. There is well-established research for how emotion is expressed by both psychophysical cues and cultural cues, however, to better understand where it fits within the social construction of stereotyping, we look to the BRECVEMA framework of emotion within music. Within STEM, the ease of processing is represented by a filter which can be bypassed if the listener has an adequate level of familiarity for the musical genre that is in question (Susino & Schubert, 2017). The bypassing is possible due to the knowledge that the listener has gained about the genre of music, the higher the familiarity means that the simplified automated stereotyped cues need not be activated to make such assessments. (Susino & Schubert, 2017).

Music-Evoked Autobiographical Memories

Whilst this thesis focuses on looking at the unconscious brains emotional responses to music, to understand the unconscious mind, we must comprehend how the conscious brain responds emotionally to music. Throughout recent years, many studies surround music therapy and music's advance on memory, specifically, recall of memories due to music within dementia patients (Gomaa, Wittwer, Grenfell, Sawan, & Morris, 2018; Jauset-Berrocal & Soria-Urios, 2018; Baker & Yates, 2018; Särkämö, 2018).

> Most studies suggest that we hear music around 37-38% of our everyday life (Juslin, Liljeström, Västfjäll, Barradas, & Silva, 2008),

this is due to music being a part of the culture and cultural events and rituals, ceremonies and festivals and unforgettable moments in one's life (Gregory, 1997). The phenomenon in which songs trigger the recall of self-defining moments in one's life or past is called Music-Evoked Autobiographical Memories (MEAMS) (Cady, Harris, & Knappenberger, 2008). MEAMS are a part of our autobiographical memory, which refers to the memories that are moments within one's past. (Cady, Harris, & Knappenberger, 2008). MEAMs are special due to the relation of autobiographical memories, as they are self-defining memories associated with various pieces of music, the piece of music associated with memory then becomes a cue to trigger the retrieval of said memory and then, in turn, receiving emotions (Janata, Tomic, & Rakowski, 2007). Music plays an important role within memory, as an example, young people consider a piece of music to be meaningful when they associate it with a positive experience or memory and elderly people associate music to a positive memory that may evoke emotion from their past (Laukka, 2007). As a clinical example, elderly who

suffer from Alzheimer's disease may rely on music to evoke autobiographical memories more easily (Haj, Fasotti, & Allain, 2012). Music and emotions combine naturally (Juslin & Sloboda, 2010), and emotion regulation is one of the crucial functions of music. (Schäfer, Sedlmeier, Städtler, & Huron, 2013). When autobiographical memories are recalled, we may feel similar emotions to the ones we felt at the time of the actual event. Music is a leader within the realm of emotional recall in part, as humans respond reflectively to music rather than experiencing conscious thought or relations to other stimuli (Cady, Harris, & Knappenberger, 2008).

BRECVEMA Model

Within the psychology of listeners and musical emotion, the 'BRECVEM model' created in 2008 by Juslin and Västfjäll is a pivotal framework to explain the mechanisms behind our emotional responses to music. The original framework consists of seven different ways that music can draw out an emotion in listeners, then following a further investigation an eighth aspect was added to the original model by (Juslin, 2013), thus creating the 'BRECVEMA model'. Mechanisms of emotion induction are regarded as *information-processing devices at different levels of the brain, which utilize distinct types of information to guide future behaviour.* (Juslin, 2011).

Firstly, comes *'Brain Stem Reflex'* which reflects the brain responses caused when listening to a piece of music, for example, sounds that are loud and dissonant induce unpleasant feelings in listeners. A piece of music will induce emotion due to brain stems taking on one or more fundamental acoustic characteristics of the music to signal a potentially important and urgent event. Brain stem reflexes may increase arousal and evoke feelings of surprise for the listener(s).

'Rhythmic Entrainment' is the process of a piece of music with an external strong rhythm that can reflect on the internal bodily rhythm of the listener (e.g. pulse). So much so the internal rhythm syncs and 'locks itself' into the external rhythm and arouses feelings of communion, making the listener feel connected and emotionally attached to the music.

Next is *'Evaluative Conditioning'*, which is a process where a piece of music is paired with a piece of positive or negative stimuli then the emotion evoked reflects that of the attached stimuli. For example, a piece of music that was repeatedly played at a specific time/event in the listeners' life, then over time the repeated nature of the two, the music itself will eventually arouse happiness within listeners. Evaluative Conditioning involves both the subconscious, unintentional processes that can be subtly affected by 'mundane musical events' (Razran, 1954). Evaluative Conditioning can also be used to

explain emotional stereotyping of musical genres, a stereotype can occur through repeated pairings of a musical genre and the culture in which it is derived.

'Emotional Contagion' is the process of an emotion being induced by a piece of music due to the listener distinguishing the emotional expressions of the music, therefore 'mimicking' that expression internally. This stems from the idea of listeners becoming aroused by voice-like tendencies of music then causing the brain to respond to a certain stimulus as if those tendencies were coming from a human voice expressing the emotions through some kind of 'mirror-neuron system' (Rizzolatti & Craighero, 2004).

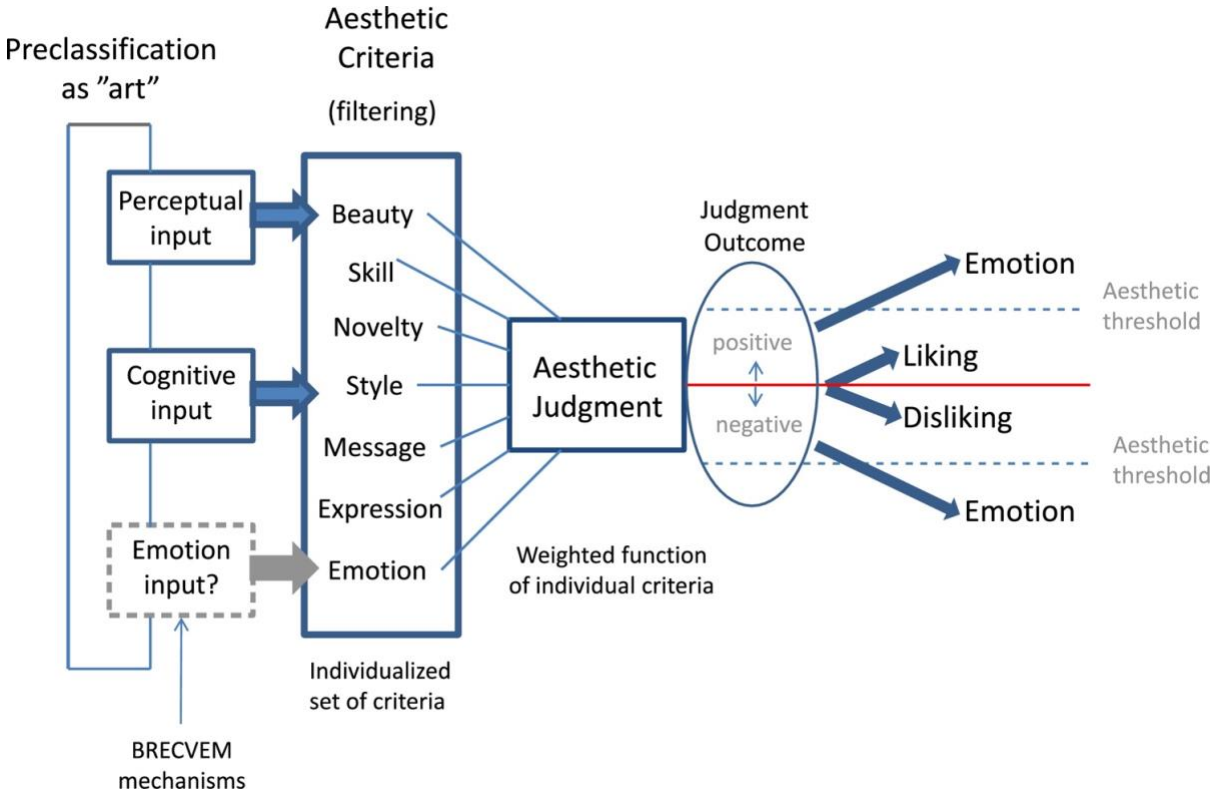
If a listener can conjure up an inner image (e.g. a stormy day or a beautiful landscape) whilst listening to music that is evoked by emotion this is called *'Visual Imagery'.* This process is referring to a listener hypothesising the musical structure and mentally mapping the music alongside the imagery that is provoked routed in the bodily experience. Music has always been excellent in stimulating visual imagery even though it is a very personal experience and can vary from each individual, however, when it occurs it may arouse feelings of pleasure (Juslin, Liljeström, Västfjäll, Barradas, & Sliva, 2008).

'Episodic Memory' is the sixth process in the BRECVEMA model which has also been referred to as the 'Darling, they are playing our tune' phenomenon (Davies, 1979). Episodic memory is a part of autobiographical memory. Within this framework, it relies on the process of an emotion being induced by a piece of music which in retaliation evokes a personal memory of a specific event in the listeners' life. Studies show that episodic memories linked to music are more likely to arouse the feeling/emotion of nostalgia (Janata, Tomic, & Rakowski, 2007). This feeling gives listeners pride and sense of belonging to the music and the 'bitter-sweet longing for something valuable that is gone but might one day return is strongly linked to episodic memory (Juslin, 2013).

The final aspect of the original 'BREVEM' model is *'Musical Expectancy'*. This is about the process where emotion is induced due to a feature within the music that delays or confirms the listeners' expectancies about the continuation of the music. The expectations are based on the listener's previous experience of the same musical style (Pearce, Ruiz, Kapasi, Wiggins, & Bhattacharya, 2010). The best example to use of Musical Expectancy is the unexpected emotional reactions to harmonic progressions in a Bach Chorale (Sloboda, 1991).

As explained above, the extension of the 'BRECVEM' model is the concept of *'Aesthetic Judgement'*. This mechanism refers to the process of the listener(s) deciding personally if the piece of music is positive or negative therefore deciding whether they 'like' or 'dislike' it which then evokes emotions.

Aesthetic Judgement is a longer process [Figure 1] than all other aspects of the 'BRECVEM' model, firstly beginning with an initial classification of the music as art whether it be 'Perceptual Input', 'Cognitive Input' or 'Emotion Input (BREVEM mechanisms)', this is then filtered through Aesthetic Criteria which can range between beauty, skill and expression. The listener will then perform aesthetic judgement, decide upon a judgement outcome (like or dislike) resulting in a certain emotion above the aesthetic threshold.



[Figure 1] (Juslin, 2013) – Aesthetic Judgment within the BRECVEMA Model

After focusing on how emotions and music are linked, and how these are related to the conscious state and memory. This thesis aims to discuss how music can affect emotions during the unconscious state that is sleep and dreams.

Sleep

Neuro-physical studies have shown that REM sleep is an essential part of brain function, and therefore dreams (Empson, 1989). We do not generally respond when spoken to or initiate any coherent actions whilst asleep (Empson, 1989). The distribution of brain activity in REM sleep is not homogenous (Maquet, 2000). For instance, brain imaging studies have found increased regional brain activity in the limbic and paralimbic structures, pontine tegmentum, thalamus and basal forebrain during REM sleep as compared to wakefulness (Braun, et al., 1997). Taking this into consideration, most of the regions of the brain that are involved in emotional encoding are also activated during a

REM sleep cycle. Some researchers suggest that these structures may be responsible for the reprocessing and consolidation of emotional experiences during REM sleep (Hobson & Pace-Schott, 2002).

Dreaming

Dreaming is a universal human experience that offers a unique view of consciousness and cognitions (Hobson, Pace-Schott, & Stickgold, 2000). Dreams happen to us, rather than being a product of conscious control. When we dream, we are spectators of an unfolding drama and ordinary logic is suspended (Empson, 1989). Freud put forward the opinion that dreams cannot be regarded as a neurotic symptom unless everybody and everyone is neurotic (Freud, 1955). Freud argued that dreaming represents a fascinating experience linked to emotional processes so much so that they are to be considered as a key to 'access' the human inner world. Rapid-eye movement (REM) is the ideal stage of sleep for dreaming, this is when dreams are at their most vivid and memorable, dreams can occur during other stages of sleep but then may falter in vividness and recall (Hobson J. , 2009). REM sleep is a physiologically defined stage of sleep (Michael & Zyphur, 2005). The link between REM sleep and dreaming has been established through various experimental studies (Hobson, 1988). It is argued that dreams convert slight sensations perceived in sleep into intense sensations (Gruppe, 1906). Dreaming refers to 'the subjective conscious experiences that we have during sleep' (Revonsuo, 2000).

Early accounts of dream interpretation suggested that dreams could predict the future (Artemidorus, 1975), or reflect the current state of one's mental health (Bond, 1753). The ancients used to divide dreams into two classes. The first class was believed to be influenced by the past or the present and regarded as unimportant concerning the future. However, the second classification of dreams was influential for the future and believed to be related to direct prophecies 'received' from dreams or the foretelling of the future and/or symbolic dreams to be interpreted (Gruppe, 1906). The theory of classification of dreams lasted for many centuries as dreams, in general, were expected to yield important solutions (Freud, 1955). This theory stood for so long due to the explanations attempted by psychology at the time were too inadequate to cope with the material that had been collected. The problem with dream interpretation being personal can be traced back, within recorded history to almost 2000 B.C. (Schweitzer, 1996). Dreams were regarded in the Bible as being significant. The Old Testament records that dreams were one of the legitimate channels by which God revealed his will to chosen individuals, such as kings and prophets (Buttrick, 1962). On the other side, researchers investigating dreams in non-western cultures have not considered the meanings of dreams from within the unique meaning-structure of the person in his or her social context (Fabian, 1996). It is evident that in Western-Psychology, the 'dream-experts' have been influenced by their respective

epistemological bases. This is well exemplified in Sigmund Freud's theory, which was firmly based within the natural scientific framework (Schweitzer, 1996). According to the activation-synthesis hypothesis, (Hobson & McCarley, 1977), dreams are the result of the forebrain responding to random activity initiated at the brainstem. This theory posits that the bizarre nature of dreams is attributed to certain parts of the brain attempting to piece together a story out of what is essentially random information (Michael & Zyphur, 2005). Neuropsychological evidence points towards our tendency to engage in stories that we believe to be true to fit together various pieces of information (Gazzaniga, 1985). Large samples of dream reports from numerous studies point towards the fact that individuals see the majority of dreams as realistic and containing a connected storyline (Foulkes, 1985; Domhoff, 2000a; Hall & Castle, 1966).

Some findings provide convincing evidence for the relationship between brain activity and dream contents (Bourget, 2017; Dresler, et al., 2011; Vogelsang, Anold, Schormann, Wuebbelmann, & Schredi, 2016). These studies look at the continuity between music and dreams in specific and how the music affects the brain during waking life in similarity to dreaming, and if the musical activities in waking life that people take part in can have a continuing effect on the brain, almost forcing you to dream about or of music. Whilst only a few studies were aiming to directly investigate the electroencephalogram (EEG) correlations of dreams containing 'day-residues', this is an electrophysiological monitoring system in which it records electrical brain activity typically used to diagnose disorders like epilepsy and sleep disorders. If there is a method to diagnose sleep disorders, then it could potentially be used to track and record brain activity whilst dreaming. This could then allow us to recall dreams without relying on our memory to do so. There are only a few studies around this topic possibly due to the difficulty to study 'incorporation'. Incorporation is known as dream contents from REM sleep that show a higher probability to integrate incorporated waking-life experiences (Schredl, 2006). We are aware that we are dreaming or have dreamt, however, we do not know what we have been dreaming of, we are so used to this fact that the dream is liable to be forgotten. Even though there have been studies to show the connection between memory and dreams, the waking state and the unconscious state of dreaming, this includes the previously mentioned MEAMs and the continuity between waking life musical activities and musical dreams. (Blais-Rochette & Miranda, 2016; Vogelsang, Anold, Schormann, Wuebbelmann, & Schredi, 2016; Scarpelli, Bartolacci, D'Atri, & Gennaro, 2019) the content of dreams is subjective to that of the dreamer. As previously mentioned dreams are seen as the connection to the unconscious mind even though typically out of control of the dreamer, and prominent theories that look into the content of dreams, say they can assist in memory formation, problem-solving, or they can simply be a product of random brain activation (Morewedge & Norton, 2009). Robb (2018) argued that if we ignore dreams, we can forgo some powerful benefits, showing our dreams attention allows us to access ideas and concepts that would otherwise vanish. Discussing dreams is also a powerful thing to do, dreams can clue us into mental and physical issues that may go unnoticed. More recently, studies into human

neuroimaging have gained a vital role in the research of dreams. Revonsuo discovered that PET (Positron Emission Tomography) and fMRI (functional Magnetic Resonance Imaging) is used in the measurement of functional changes within the brain through REM sleep. Dreaming is not restricted to REM sleep, however, dreaming during REM sleep increases characteristics such as vividness, bizarreness and emotions. According to earlier research, it should be theorised that Dream Experience could potentially be important in emotional encoding and regulation (Revonsuo, 2000).

Phenomenological Characteristics within REM Sleep Cycle

Many of the qualities within dreams are similar to our waking experiences. Such similarities include multimodal sensory qualities, colourful visual imagery, occasional realistic pain perception and special organisation (Mutz & Javadi, 2017).

Narrative: as mentioned above, rich and emotionally vivid dream experiences have been reported after awakenings from REM sleep (Foulkes, 1962; Dresler, 2015). Various studies show that dreaming during the REM cycle typically follows loose, sometimes bizarre narratives, relating to personality, mood and social interactions (Hall & Castle, 1966; Domhoff, 2003; Fox, Nijeboer, & Solomonova, 2013; Underwood, 2013). The dream reports tend to be the most bizarre and elaborate after waking up from the last period of REM sleep (Hobson, 2009).

Sensation and Perception: The properties within dreams are similar to experiences during wakefulness, this is due to the perceptual modalities that are utilized during waking hours, therefore, dominating dreams (Hobson, 1988). Experiences during dreams are typically characterised by a range of visual and auditory sensations, including physical activities and written/spoken language (Desseilles, Dang-Vu, & Sterpenich, 2011). Significantly more dreams recalled throughout the REM sleep cycle contain higher counts of sensory experiences (Carr & Nielsen, 2015). Contrary to these findings many studies show that odours, tastes, pleasure and pain are less reported following REM sleep cycles (Hall & Castle, 1966; Domhoff, 2003; Foulkes, 1985).

Emotion: Dream reports made after the REM sleep cycle contain consistent and substantial more emotional content than other cycles of sleep. (Wamsley, Hirota, & Tucker, 2007). Many studies show that ‘dreamers’ tend to report elevated levels of joy, surprise, anger, fear, and anxiety, commonly known as ‘basic-emotions’ (Foulkes, Sullivan, Kerr, & Brown, 1988; Strauch & Meier, 1996; Fosse, Stickgold, & Hobson, 2001). The results that show REM sleep dream reports frequently contain fear-related elements, (Valli & Revonsuo, 2009), it is suggested that the representations of fear in dreams and nightmares serve as a threat simulation in a harmless environment to prepare individuals for dangerous situations for and in real life (Revonsuo, 2000; Valli, Revonsuo, & Pälkäs, 2005). It has also been revealed that several periods of dreaming for one night may/can be related to the same emotional conflict (Offenkrantz & Rechtschaffen, 1963).

Dreaming and the Waking State

The dream is often defined as the psychic activity of the sleeper (Freud, 1955). Some scientists decided to look at dreams and sleep in conjunction with one another in a psychopathological nature alongside other phenomena's that were like dreams such as visions and hallucinations. However, as time progressed, scientists decided to separate the theory brought by the ancients and think of dreams concerning the waking state.

Dreams are said to be completely divided from reality during the waking state. One may call it an existence hermetically sealed up and insulated from real life by an unbridgeable chasm (Freud, 1955). Dreams free us from reality and put us into another world or even a different life which essentially has nothing shared with real life, still, the waking consciousness and the dreaming state connect through the content, whatever the dream presents to us derives from reality, however extraordinary the dream may seem, it can never detach itself from the real world (Hildebrandt, 1875). Incorporations are known as dream contents from REM sleep that show a higher probability to integrate incorporated waking-life experiences (Schredl, Factors Affecting the Continuity Between Waking and Dreaming: Emotional Intensity and Emotional Tone of the Waking-Life Event., 2006). The factors that induce forgetfulness in the waking state also induce forgetfulness of dreams. Much like dreaming, in the waking state we commonly forget a lot of sensations as they are too minimal to remember with minimal connection to emotional feeling (Freud, 1955). Other factors derived from the relation of dreams to the waking state are even more effective in causing us to forget our dreams. The forgetfulness of dreams established by the waking consciousness is the counterpart of the fact already mentioned, that the dream hardly ever takes over an orderly series of memories taken from the waking state (Strümpell, 1877). A lot of research shows that the regions involved in emotional processes during the waking state are also reliable for the neurophysiological background of REM sleep (Maquet, et al., 1996). First of all, a posterior system involved the TPJ (Temporo-Parieto-Occipital Junction) and lesions located within this region alter both waking mental imagery and sleep (Solms, 2000). Many of the afferent and efferent fibres of these two systems are connected to the limbic system and the ventromedial frontal white matter seems to play a role in the interplay between basal forebrain and limbic structures (Gennaro, Marzano, Cipolli, & Ferrara, 2012). Dream contents that revolve around negative emotions (fear) are more common than positive ones and are also more likely to be related to waking-life experiences (Foulkes, Sullivan, Kerr, & Brown, 1988).

Dreaming and Memory

In current years, scientists have learnt how to improve our dream recall and how it is related to our short-term memory. During waking life, an administrative function within our brain translates long-

term memory into something consistent with checking reality (Tarnow, 2003). Long-term memory is structurally and functionally different from short-term memory or working memory. How our brains process memories derived from our long-term memory can influence the way we remember dreams. Dream images are often quickly forgotten although the dreamer may see them as vivid, whereas the imagery that is retained in our minds and memory is cloudy, colourless and unmeaning (Calkins, 1889). Mostly, dream images are of unique experiences and reoccurring dreams containing these same dream images have been observed repeatedly making them more memorable (Freud, 1955). So those feelings, representations, ideas and all things likewise all obtain a certain degree of memorability, these mustn't remain isolated but they should develop into connections and associations of the appropriate nature (Strümpell, 1877). The dream-composition, therefore, has no place within the community of the psychic series which in fact fills the mind (Freud, 1955). In this manner, the structure of dreams 'rises' from the soil of our psychic life, and floats in the space of the psychic like a cloud in the sky, quickly dispelled by the first breath of waking life (Strümpell, 1877). Some of the cognitive functions of dreaming will go on no matter what, providing we get a normal night's sleep, dreams will help us learn new information and assimilate new experiences into long-term memory (Robb, 2018).

Dream Recall

Although possible to recall dreams, they tend 'fade-away'. Even after dreams are recalled, it is very often believed we do not recall dreams in their entirety, we can observe how the memory of a dream, although vivid upon waking, fades throughout the day leaving only a few important details (Freud, 1955). Nevertheless, it often happens that dreams find a way to manifest a way inside our minds, therefore we have the potential to remember them for months, this happens often with reoccurring or repeated dreams particularly within childhood or dreams of fear (nightmares) (Freud, 1955). The forgetting of dreams is treated as a complex phenomenon and is not seen as a single cause, but a number of them (Strümpell, 1877). In most cases, dreams lack sense and order, the composition of dreams are insusceptible of being remembered by their nature and are forgotten so easily as a rule as they fall to pieces the next moment (Calkins, 1889; Schredl & Schmitt, 2019). Two other reasons behind forgetting our dreams are; (a) that the difference of the general sensation in the sleeping and waking state is unfavourable to mutual reproduction, and (b) that the different arrangement of the material in the dream makes the dream 'untranslatable' for the waking consciousness (Benini, 1898). Despite all the reasoning behind us forgetting dreams, many dreams are retained by our memory. Certain peculiarities relating to remembering our dreams have attracted particular attention, for example, the fact a dream that is believed to be forgotten in the morning upon waking may be recalled throughout the day or the course of perception which accidentally 'touches' upon the content of the said 'forgotten' dream. (Radestock, 1878). However, if this appears to be true, one may question the

memory, which omits so much from the dream may falsify that of which it retains. Unintentionally and unconsciously we seem to ‘fill in the gaps’ and supplement the so-called ‘forgotten’ dream imagery (Jessen, 1856; Scarpelli, Bartolacci, & D'Atri, 2019). The human brain so greatly tends to perceive everything in a connected form that it intentionally supplies the missing links in any dream that is to some degree incoherent (Jessen, 1856). It is believed that even the most truth-loving individual can barely relay a dream without the possibility of embellishment and/or exaggeration, even if we are retrieving the most vivid of memories, there is always a possibility of error or embellishment (Jessen, 1856; Sierra-Siegert, Jay, & Florez, 2019). Only in the attempt to reproduce the dream that may have been forgotten we then bring order and arrangement into the loosely associated dream-elements, adding the process of logical connections which appear or are absent in the dream (Spitta, 1892). Since we can test the reliability of our memory by objective means, and such a test is impossible in the relation to dreams, which are very much our personal experiences, and for which we know no other source than our memory, what value do the recollections of our dreams possess? (Freud, 1955). As we cannot directly obtain access to Dream Experience, most research relies on the retrieval of the contents of dreams upon waking (Scarpelli, D'Atri, Gorgoni, Ferrara, & Gennaro, 2015a).

Common Conceptions within Dreams

Dreaming is a cognitive activity, and Jung argued that a dream is a visual representation of the dreamer's conceptions or misconceptions (Jung, 2001). Dream interpretation is subjective and consists of delving into the dreamer's conceptions that lie behind the dream images. Conceptions that represented in dreams usually fall into one of the following categories: (a) self-conceptions, (b) conceptions of other people, (c) conceptions of the world, (d) conceptions of impulses, prohibitions and penalties, (e) conceptions of conflicts. Conceptions are organised into conceptual systems. These systems are the predecessors of behaviour, dreams provide excellent material for the analysis of conceptual systems since they portray unconscious and prototypic conceptions. This conceptional theory presented, portrays an extension of ego psychological approach to include dreaming as a function of the ego. (Lee & Mayes, 1973)

Self-Conceptions

A dream can be seen as a mirror that reflects conceptions about one’s self as a dreamer, ideas of ourselves are revealed within a series of dreams (Lee & Mayes, 1973). In theory, no other medium gives us a more candid picture of what a person thinks about themselves than dreams do.

Conceptions of Others

These conceptions, like those of self, are symbolised in the roles played by the various ‘characters’ (the others you are dreaming of). These ideational or cognitive networks are conceptual systems, and it is one of the aims of dream analysis to delineate these conceptual systems (Lee & Mayes, 1973).

Conceptions of the World

Within worldly conceptions, the world can be seen hostile, turbulent or even lonely depending on the feelings of the dreamer. If a dreamer feels that the world is cold and bleak, he may materialise this conception in the form of a cold climate. A feeling that the world is benign and peaceful can be scenically represented within dreams by serene natural settings (Lee & Mayes, 1973).

Conceptions of Impulses or Prohibitions

Dreams are filled with impulse gratification, in particular sex and aggression. Wish-fulfilment is the essence of dreaming (Freud, 1955). Dreams are sometimes a way of the dreamer receiving gratification for their urges. Dreams can also show a person's conceptions of the obstacles that stand in the way of gratification. The conceptual system which is assumed to be detached from the ego contains the moral ideology of the person (Lee & Mayes, 1973).

Conceptions of Problems or Conflicts

Dreams have the potential to show us an inside view of our problems. The inside view is a prerequisite for a clear understanding of human conduct. As we have shown in another place, the delineation of a person's conflicts may be made by analysing a dream series (Hall C. , 1953). In other words, these personal cognitions are the real antecedents of behaviour (Lee & Mayes, 1973).

Music and Dreams

Throughout this thesis, the connection between emotion, music and dreams and whether music has an impact on emotions resulting in positive dreams will be discussed and investigated. The connection between music and dreams is not an area of research that has been investigated at length. A study investigating the continuity between waking musical activities and musical dreams says that engaging in musical activities (e.g. singing in choirs, playing an instrument) throughout the daytime should be related to the occurrence of dreaming of music or musical activities (Vogelsang, Anold, Schormann, Wuebbelmann, & Schredi, 2016). Vogelsang et al concluded that the amount of time invested in musical activities throughout the day is directly correlated to the percentage of musical dreams. Rather than exploring the possibility of a connection between music and dreaming on a 'moderate' level, there have been studies that investigate the relationship between waking musical activities and lucid dreaming. Within lucid dreaming, the dreamer understands that he or she is dreaming and can often deliberately carry out activities (Schädlich & Erlacher, 2018). Schädlich and Erlacher began investigating this connection and its possible effects as well as the quality of experiences within these lucid dreams, however, once the original study had been conducted, the participants were more interested in the exploration of how the activities within these dreams affected their emotions and how

it improved upon it. This study discovered that activities within lucid dreams could positively or negatively alter their emotions dependent on the activity that is taking place.

Aims and Rationale of Thesis

Previous literature has shown that music can affect and alter our mood and as a result, our emotions. Our conscious state can be affected by music, giving us a chance to experience happiness or sadness dependent on the stylistic nature of the music we listen too. Music is proven to affect our conscious state negatively and positively since music possesses this capability, then this thesis will use the literature discussed to conduct an investigation which shows the effects of music on the unconscious state, specifically focusing on dreaming. Many people particularly young people experience 'stress' dreams whilst under pressures from school or exams, many people also suffer from sleep disorders such as insomnia, lucid dreaming and nightmares. If music can positively impact our dream contents and experiences of dreaming, this may illuminate said negative experiences.
Due to the lack of research connecting music and dreams and their relation to emotional improvement, this thesis aims to join these topics. Can dreams be influenced by music? And can music have an improvement on emotions and dream content?

This thesis aims to investigate if a selected piece of music, that has been tested to have a high positive emotional elicitation, may impact our unconscious state of dreaming and positive dream experiences. This thesis will test if a positive dream can improve our emotional outlook throughout the day, a piece of music has the power to alter our emotions then, in turn, it may alter our dream content to something more positive.

Chapter 2: Pilot Study - Choosing the Music

Before the effects of music on dream content could be investigated in an empirical study, it was essential to choose the music for use in this study. Therefore, an initial pilot study was conducted

whereby five pieces of music were assessed for their emotion elicitation. Whilst the song choices are a random selection of songs from five different styles, they have all been chosen using the BRECVEMA model (Juslin, 2013), and an informed opinion. Different musical genres cause various emotions and effects on the brain as shown in various studies; (Wilkins, 2014; Barrett, 2010; Brattico, et al., 2011; Feinerer; J. Abraham; J. S. Rahman, 2019). The five different musical genres decided upon were; Pop, Musical Theatre, Classical, Jazz and House. Each of the five pieces of music chosen is a random selection yet based upon the justification of the musical choices which will now be considered.

No Friend – Paramore (Pop)

When choosing the piece of Popular music, each of these studies was taken into consideration, (Bigand, 2005; Dijick, 2009; Kahn, 2017; Brattico, 2013). Each of the studies named supports the decisions made and the reasons for choosing the music stated below. Whilst emotions evoked from popular music are generally revolved around the lyrics, lyrics of a popular song can influence more emotions than necessary, and whilst there are popular songs that use no lyrics, these tend to cross-genres therefore not fitting solely into the category of 'popular music'. 'No Friend' however, uses a spoken word which blends into the music, making it barely noticeable whilst listening.

During the beginning of the song, the mood is quite relaxed and there is minimal dissonance or surprise, therefore not triggering any brain stem reflexes. However, further into the song allows the music and the emotion to build, which is reflected in the tone of voice used for the spoken word. This appears to be the only aspect of the song that may be considered potentially important and urgent to the brain so that it needs attention.

The bpm for this song is set at 121, making it ever so slightly faster than the average human heart rate, therefore forcing the music's rhythm to drive and push the listeners' internal rhythm ever so slightly increasing the possibility of emotional arousal, particularly creating an emotional bond with the music.

Despite this study assessing the positive emotional power of music, the tone of the spoken word within the music paired with the visual cue of the word 'no' in the title, the process of evaluative

conditioning may push the brain to associate this song with negativity or an unfriendly interaction, therefore subconsciously making the listening process a slightly negative one.

Similarly, the results of emotional contagion may reflect that of evaluative conditioning. As emotional contagion mirrors the voice-like features of the music, the spoken word and the emotional expression during the delivery throughout may activate regions of the brain associated with the pre-motor representations for vocal sound production, consequently resulting in negatively evoked emotions.

Visual Imagery is the one component of BRECVEMA which is fully personal and subjective to each person. Music can be quite effective in stimulating visual imagery (Kövecses, 2000), though there is a wide individual difference among listeners in the way that some listeners can experiences regularly whereas others, very sparsely. Very similarly to visual imagery, Episodic Memory is also very subjective and relies on the personal memories of individuals.

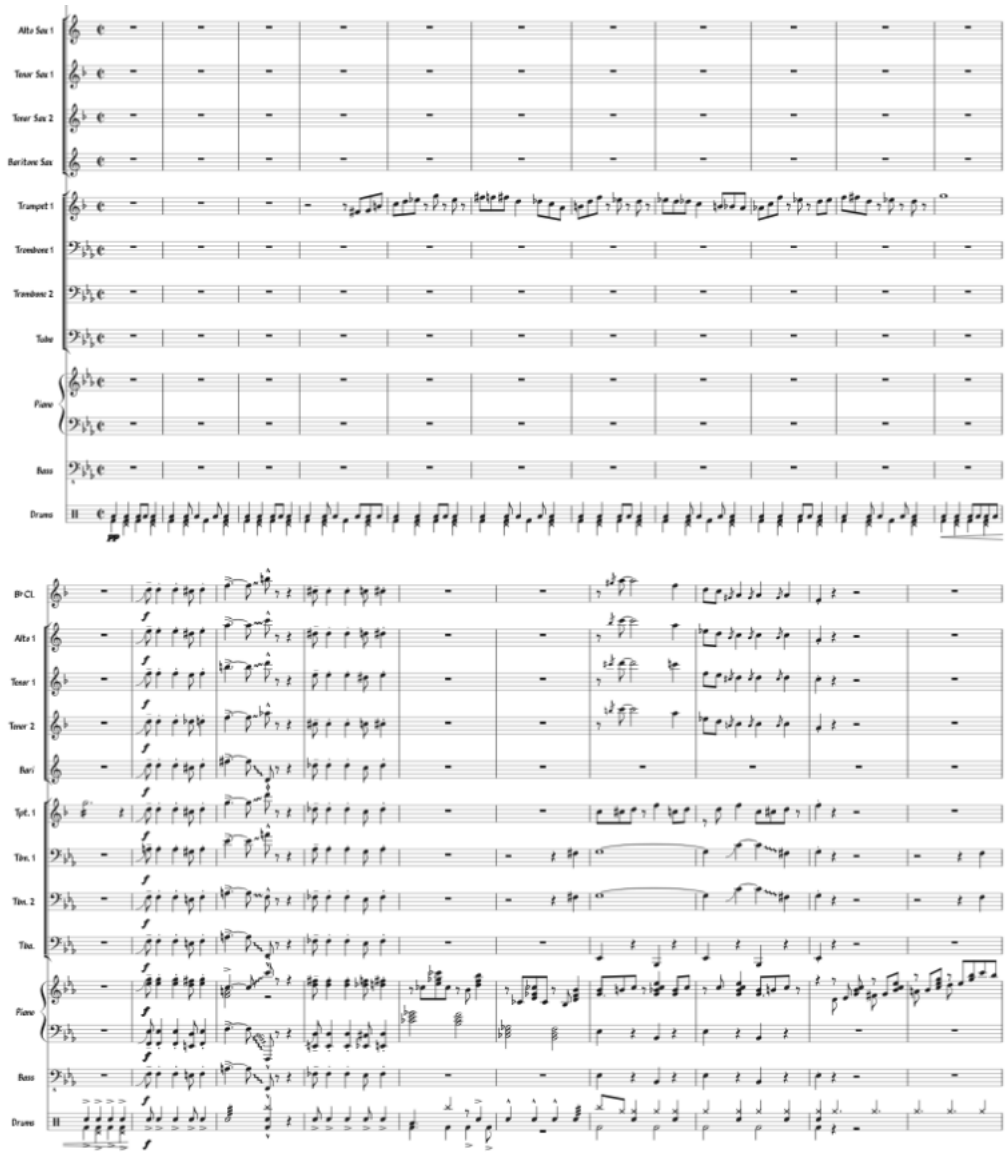
Playing on the idea of repetition, 'No Friend' is a great example to show Musical Expectancy, with the repeated melody and short phrases on the guitars and simple drum beat throughout paired with the monotone blend able voice-over, the musical emotion of boredom can be aroused within listeners.

Aesthetic Judgement is another tricky mechanism to pinpoint as that is also very subjective to the listeners and their musical preferences. If a listener listens to popular music of a similar nature, they may believe that this song is likeable therefore evoking positive emotions over negative ones.

Overture – Chicago Orchestra (Musical Theatre)

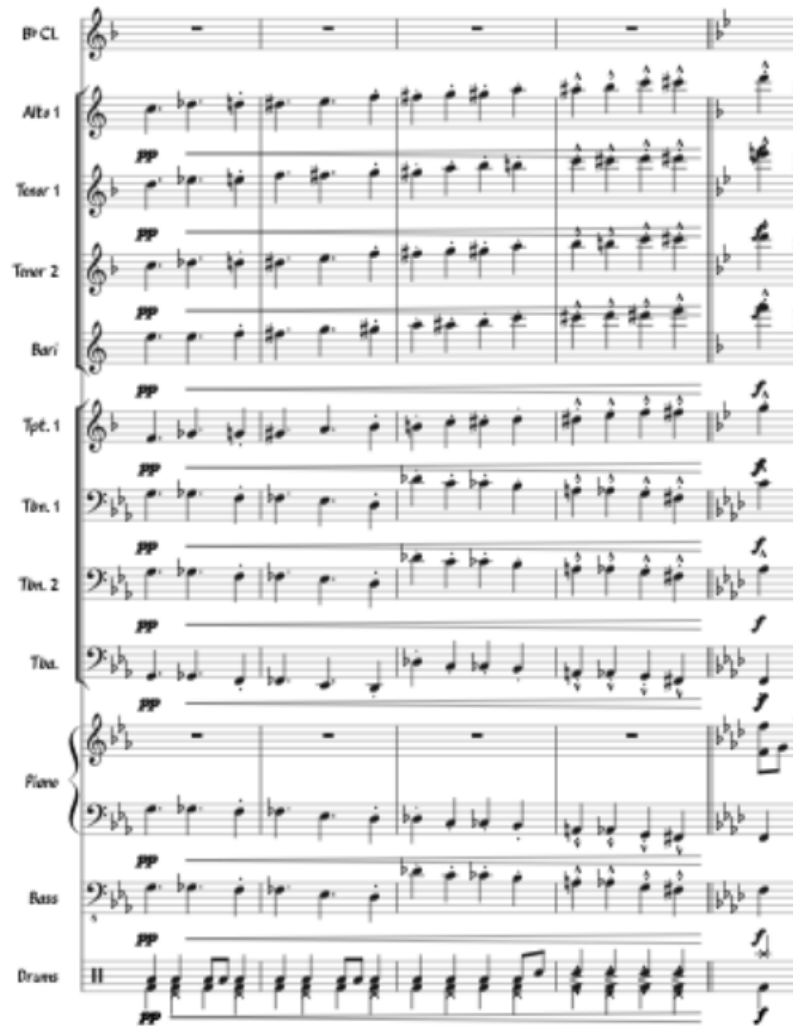
Whilst selecting this piece of music, the following studies were taken into account; (Cohen, 1990; Cohen, 2016; Taylor, 2010; López-González., 2015; Cohen, 2001). Each of the studies named supports the decisions made and the reasons for choosing the music stated below. For the musical theatre selection, following on from the 'no lyrics' rule set for this particular investigation, the Overture was decided upon. Even though the musical 'Chicago' appears to be cross-genre with Jazz, it is also a very familiar musical. The piece begins with a simple yet stimulating trumpet solo [Figure 2], followed by a count of '5,6,7,8' then the whole band enters before dropping out to a piano motif.

[Figure 2]



These accelerating features that are loud and sudden, are a perfect example of instigating brain stem reflexes. This particular type of brain stem reflex due to the intense dynamic changes is proven to increase arousal and evoke emotions of surprise, therefore inducing a positive effect on the listener(s). Another example of many throughout this song that reflect brain stem reflexes is the chromatic rise [Figure 3] which is shown to crescendo, meaning the rise in volume within the music, can reflect the rise in intensity of emotion perceived by the listener.

[Figure 3]



Although this piece appears to be more energetic and livelier than the others selected, it is in fact at the relatively moderate speed of 113 bpm, which is even closer to the average human heart rate of 100 bpm. This slight increase of tempo as said above can induce more positive emotions, and with the buoyant nature, rhythmic entrainment and brain stem reflexes appear to pleasantly work together. This adjusted heart rate doesn't just evoke emotions but can extend to other components of emotions, such as feelings, through 'proprioceptive feedback' (Harrer & Harrer, 1977).

Not all Emotional Contagion has to take place due to 'voice-like expression', this process can take place due to the expression of the players and how that expression is perceived by the listeners. With the brass/horns section of the orchestra playing this particular piece and playing with such high energy and in a slightly vigorous manner, the music is well paired with its corresponding emotional

expression. This piece appears to be fast-paced and lively therefore, listeners may feel livelier and more upbeat upon hearing it, therefore inducing positive arousal of emotion.

Visual Imagery can be high with a piece of music that is familiar, in particular film music (which is a strand of this particular piece), therefore triggering potentially strong and vivid items of visual imagery, the more vivid and vibrant the visual imagery is, the more positive the emotional arousal is more likely to be.

Chicago was first premiered on Broadway in the year 1975, with many revivals throughout the years and its most recent revival being in the year 2018. As a result of this, the feeling of nostalgia is more likely to be produced during the process of Episodic Memory. Also, if a listener feels connected to the music in an intensely emotional way, the listeners are more likely to feel a sense of self-identity and belonging (Huron, 2009).

The nature of this piece is very much in a Jazz styling consequently resulting in the harmonic progressions sounding more 'jumbled' and extravagant, making musical expectancy a strange and potentially difficult process to undergo whilst listening. The idea of musical emotions related to the violation of expectancies (music not doing/feeling like how we expect it to) can arouse feelings of anxiety and unpleasant surprise rather than positive reactions.

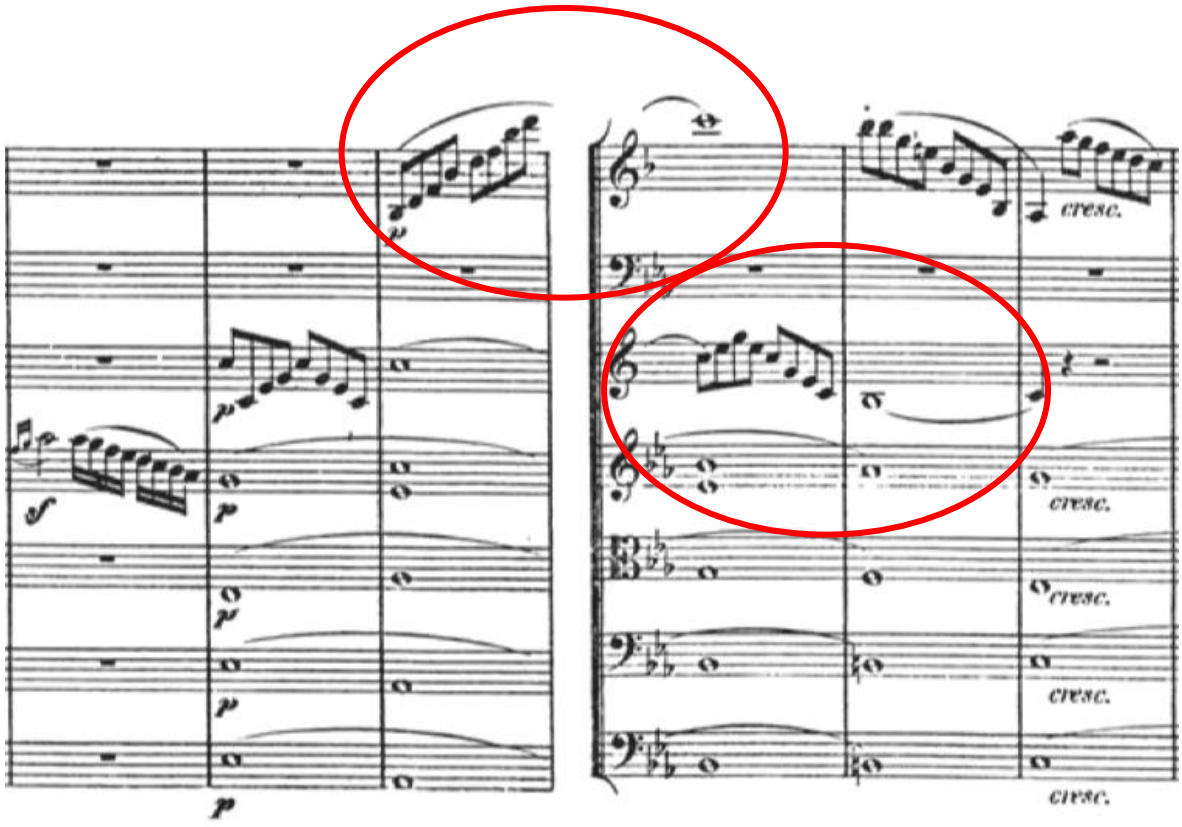
Once a listener has processed the song for aesthetic judgement and reaches the aesthetic criteria, it is, as previously mentioned, a particularly personal and subjective set of criteria. However, generally speaking, this piece resonates skill due to its technical and difficult instrumental scales and chords, it rates high for novelty, albeit sounding child-like and quite playful and the powerful expression from the players is enjoyable. All this comes into play for this mechanism, subsequently tipping the scales to a positive judgment outcome, therefore improving arousal of positive emotion.

Septet in E-Flat Major, Op. 20 Movement I – Ludwig Van Beethoven (Classical)

Various studies support the decisions made in selecting this piece of music; (Baumgartner, 2006; Pereira, 2011; Trost, 2012; McKinney, 1997; Tsai, 2013). Each of the studies named supports the decisions made and the reasons for choosing the music stated below. The reaction caused in the brain to classical music is relaxed and varied individually. The instrumentation of this piece plays on the

contrast of relaxed effortless sounding strings (primarily Violin), and the harsh yet mellow sound of a Clarinet in a game of call and response. Arousal in the brain is caused when the surprise of a motif is introduced [Figure 4] on one instrument then familiarity causes the brain to be aroused and evoke positive emotions once it's heard once more on a different part of the orchestra.

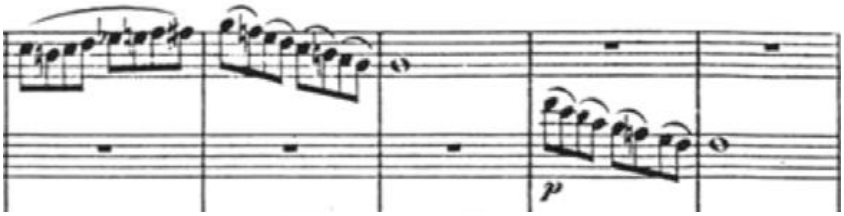
[Figure 4]



Classical music is a prime representation of optimum Rhythmic Entrainment. The seemingly calming nature of classical music, regardless of the theme, makes the brain adapt more easily in the way of Rhythmic Entrainment. The tempo of the Beethoven Septet in E-Flat Major (after the introduction) is set at 96 bpm. With the average resting heart rate of a human being between 60 – 100 bpm, the 96 bpm of the Beethoven sits comfortably for an ideal process of Rhythmic Entrainment. The strong pulse that is usually affiliated with classical music and in particular this piece allows the listener's heart rate to easily 'lock-in', then allowing the adjusted heart rate to spread to the arousal of other emotions such as feelings through position and movement of the body and increasing the feeling of emotional bonding (Levitin, 2010).

There are many points within this piece in which the process of Evaluative Conditioning comes in to play due to the melodic themes that reoccur throughout, similar to Wagner's *Leitmotif* strategy (Bolders, Band, & Stallen, 2012). One of the main points of interest within this piece which is an ideal candidate for Evaluative Conditioning is at bar 69 [Figure 5] where the clarinet plays a two-bar chromatic ascend then descend before the bassoon mimics the descent in the next bar. The chromaticism played throughout this melody is pleasing to the ear causing arousal in the brain due to the effortless nature of the motif.

[Figure 5]



This piece was written mainly for the Violin and Clarinet, both being associated with 'voice-like' instruments in different forms. The Violin is an instrument that can mimic human emotion and 'voice-like' emotions fairly easily through expression. As an example of human-like expression and emotion within the Violin to trigger Emotion Contagion is at bar 81 [Figure 6] where the Violin goes from an A-Flat down two octaves then quickly plays an ascending melody from the first A-Flat up to a top G.

[Figure 6]

The contrast in descents and ascents within these four bars is drastic but pleasant to the ear as the Violin expresses happiness, therefore arousing happiness in the form of the process *Emotional Contagion'.*

During this section of the analysis, the discussion of how the BRECVEMA model is traditional and common to arouse emotions within the brain and *Visual Imagery* is no exception. Soothing classical

music, much like this Septet is, commonly arouses happiness and calmness due to the peaceful beautiful imagery the melodies release to the brain. Due to the recapitulative nature of this piece, the ongoing familiarity of melody and harmony gives a continuous pleasant visual image, unlike pieces that may change quickly in these areas where visual imagery becomes scattered.

Episodic Memory is one of the least likely processes to happen whilst listening to classical music. The typical feeling evoked by Episodic Memory is nostalgia, and it's usually only musicians that have matured listening to classical music, therefore it's only this demographic who would possibly experience the arousal of nostalgia. Beethoven is, of course, a popular well-known composer to most generations; however, this particular piece is not that very distinguished dissimilar to the likes of Beethoven's 5th Symphony.

Much like Episodic Memory, the process of *Musical Expectancy* within classical music is very similar in the way that it is most likely musicians that will experience this in a knowledgeable and advanced manner. Individuals who haven't had any training in classical music will be able to pick out the melodic patterns that are expected. This Septet is in a Sonata Form [Figure 7], traditionally a sonata form follows one idea that is presented in Exposition, then that idea is melodically advanced within the Development then the idea is 're-presented' during the Recapitulation. The fact that an idea is first presented during the Exposition then re-presented during the Recapitulation, there is a feeling of familiarity during the music, therefore, making it easier for listeners brains to undergo the process that is *Musical Expectancy*.

[Figure 7]

Exposition	**Development**	**Recapitulation**
First Subject		First Subject
Transition		Retransition
Second Subject		Second Subject

Codetta	Modulation of subjects through related or unrelated keys	Coda

Space is the Place – Ezra Collective (Jazz)

Fewer studies show the effects of Jazz music on the brain however each of the studies named supports the decisions made and reasons for choosing the music stated below; (McPherson, 2016; Pope, 2017; Vuust, 2008; Engel, 2011). A brain stem flex is triggered typically when the brain becomes familiar with a melodic passage. In this case, the opening saxophone motif is repeated many times on the alto sax. Then after four times being repeated on the alto, a tenor saxophone joins in and they play the melody together at the same octave however, both supplying different tones. The difference in tone between these instruments may also cause brain stem reflexes.

As mentioned above with the average human heart rate being between 60-100bpm, 'Space is the Place' is particularly soothing and more likely to perform the mechanism of Rhythmic Entrainment. If Rhythmic Entrainment takes place whilst listening to this song it won't be such a drastic change and it would be quite a soothing change, as it's still within the average heart rate bracket.

Typically, people believe the saxophone to be a soothing instrument and have positive connotations, with this in mind, even though Evaluative Conditioning is subjective to the listeners and if stimuli are presented, the positive connotations from the saxophone could increase the chance of the brain performing this mechanism.

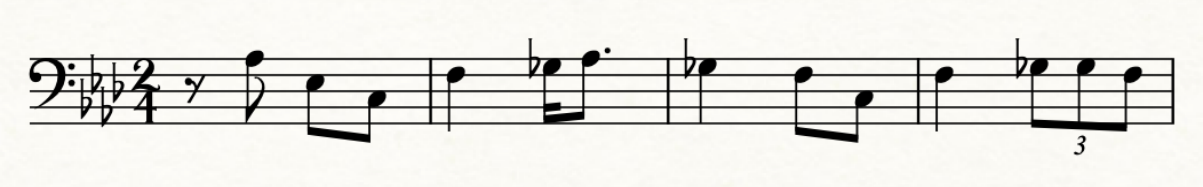
The contrast of tones in the two saxophones playing the melody together as mentioned before can trigger the mechanism of 'Emotional Contagion'. The stereotypical 'feminine' tone of the Alto Saxophone in comparison to the rich slightly more 'masculine' tone of the Tenor Saxophone contrasts nicely and allows the brain to mimic the cheerful expression through emotion.

The stylistic characteristics of Jazz music are often associated with the visual imagery of the rustic streets of New Orleans, with one of the key instruments of this imagery being the saxophone. However, though visual imagery is subjective to each listener and their imaginative capacity.

As previously mentioned, ‘Episodic Memory’ is also subjective to the listener and whether or not they have listened to this piece before which can trigger nostalgia. However, with the stylistic nature of this piece, false nostalgia could come into play. If a listener experiences ‘Visual Imagery’ whilst listening to a piece, this can sometimes be mistaken for ‘Episodic Memory’ as if transporting the listener slightly too vividly into imagery.

The Saxophone riff as previous mentioned [Figure 8] is repeated frequently and is very prominent therefore becomes a key feature in the mechanism ‘Musical Expectancy’. With this melody being repeated so often the music becomes predictable for the listeners. Later on within the piece, the saxophone changes melody to sustained notes of minims and semibreves, then after, this is repeated numerous times also, therefore causing the listener to expect this. The transition between the two melodies is unpredictable which strikes surprise in the listener's brain and arouses positive emotions as the change occurs.

[Figure 8]



The extension of the BRECVEMA Model, ‘Aesthetic Judgement’ comes into play if and when the listener thinks the piece is beautiful or skill-full, with this particular piece containing a lot of repetition, it runs the risk of being classified as unskilful. However, the stylistic nature of jazz pieces stereotypical lie within the range of happiness, serenity and relaxation, therefore a listener could classify this piece as beautiful. Aesthetic Judgement as previously mentioned is the mechanism of like and dislike, therefore also being completely subjective.

Little by Little – Lane 8 (House)

Few studies show the effects of House/Dance music on the brain/emotions; (Trevarthen, 2000; Koelsch, 2010; Zentner, Grandjean, & Scherer, 2008). Each of the studies named supports the decisions made and the reasons for choosing the music stated below. With this style of music, it is quite difficult for the brain to signal any important or urgent events within the music, as typically house music doesn't contain any sudden, dissonant sounds or any fast changes within harmony or tempo. Especially within this piece of music, it contains a lot of monophony (single repeated musical lines), there is also no true melody line, distinguishing any possible melodic interest. However, when referring to Brain Stem Reflexes, typically the changes in music induces feelings of unpleasantness within listeners as the reflexes reflect the impact of auditory impressions.

House music is one of the only styles of music that the BRECVEMA model doesn't attach itself too. Rhythmic Entrainment is no difference to this, this mechanism relies on a powerful external rhythm, and although there is a clear driving beat within this piece with its tempo set at 121 bpm, it isn't an interesting beat that arouses emotion. This being said, the metronome style beat allows the listener's heart rate to easily adapt and 'lock-in' to the rhythm.

House music doesn't contain many expressions on an emotional or musical level, therefore if this piece is lacking in emotional expression, muscles cannot gain peripheral feedback and internally mimic. Nevertheless, there is no denying that this piece isn't positive in the aura, which can activate a more relevant and direct emotional representation in the brain.

House music is often associated with summertime, especially within young people, consequently with this piece Visual Imagery could potentially be strong and not only strong Visual Imagery but strong and positive imagery. As an example, if a listener sees themselves in a car driving down a long road on a summers day, the brain will induce happiness through this imagery.

Episodic Memory is a mechanism that relies heavily on nostalgia, however, with this piece being fairly new and also not very well known to a large audience, therefore proving that this mechanism would be difficult to engage.

Musical Expectancy is a process that is engaged when the music confirms the listeners' expectations about the continuation of the music. As previously mentioned, this piece's driving rhythm is in a

‘metronome’ style and every melodic aspect is based around repetition and familiarity, therefore this piece is strong within the process of Musical Expectancy.

Aesthetic Judgement is a personal process as previously explained. This relies on each individual and their metric for the music’s aesthetic value. This is all about personal preferences within musical characteristics for example, a message that is conveyed within the music or skill presented. With the repetitive nature of house music in general, in particular this piece of music, it is unlikely that listeners will convey a strong message or present skill.

Method

Participants

38 participants (10 males, mean age=20.47, SD = 1.33) were recruited from the undergraduate and postgraduate student population at the University of Hull. 20 were psychology students and 18 were music students. All participants were required to be sound of hearing and sight due to the nature of listening to the music and reading the emotion worksheets and instructions. Participants were drawn on a volunteer basis and the psychology students were rewarded with credits needed for their course and all participants were given light refreshments for taking part, but no participant received a financial incentive to participate in this study. Ethical approval for this study was given by the University of Hull Faculty of Health Sciences Ethics Committee.

Materials

Musical Pieces

Five pieces of music were played to participants. These were:

- No Friend – Paramore (Pop)
- Overture – Chicago Orchestra (Musical Theatre)
- Septet in E-flat Major – Ludwig Van Beethoven (Classical)

- Space is the Place – Ezra Collective (Jazz)
- Little by Little – Lane 8 (House)

They were played in the above order to every participant through a computer at an individual work station through headphones. Every participant listened to the same version of all the pieces via the Spotify streaming platform.

Emotion Rating Scales

Participants provided ratings of the emotions elicited by the pieces of music using an adaptation of the Positive and Negative Affective Schedule – Short Form (Karim, Weisz, & Rehman, 2011). This inventory contains 18 items, of which 9 are positive and 9 are negative. For each piece of music, participants were asked to rate the extent to which the music elicited each emotion listed, using a Likert type scale of 1 (unaffected) to 5 (intense). Scores for positive affect and negative affect were created by summing the respective items; a higher score indicated higher levels of positive or negative affect elicited by that piece of music.

Design

The independent variable was the style of music, presented within-subjects, which had five levels: Pop, Musical Theatre, Classical, Jazz and House. The dependent variable was positive affect and negative affect elicited by the music, as ascertained by the Emotion Rating Scales.

Procedure

Participants were tested in groups, with a maximum of five participating at any one time. All participants were seated at an individual computer workstation within a laboratory setting. They were instructed that they would hear five pieces of music and they were to indicate how that piece of music made them feel. Each participant listened to the five pieces of music through headphones, in order to fully submerge into the music than in the order presented to them then complete the emotion rating scales to indicate how that piece of music made them feel. The order in which the pieces of music were played was randomised.

Results

The mean positive and negative emotion ratings for each piece of music can be seen in Table 1.

Table 1. Mean positive and negative affect scores (S.D in parentheses)

Piece Title	**Positive Affect Score**	**Negative Affect Score**
No Friend – Paramore (Pop)	15.79 (5.65)	17.37 (6.14)
Overture – Chicago Orchestra (Musical Theatre)	26.85 (5.36)	10.4 (1.5)
Septet in E-flat Major – Beethoven (Classical)	24.82 (6.4)	12.9 (2.85)
Space is the Place – Ezra Collective (Jazz)	22.26 (6.64)	11.7 (3.2)
Little by Little – Lane 8 (House)	20.62 (7.6)	13.5 (3.91)

Two separate one-way ANOVAs assessed differences in emotion elicitation (positive and negative) for the five pieces of music.

The One-Way ANOVA assessing positive affect was significant, $F(4,19) = 17.22$, $p < .001$. Tukey's HSD post-hoc comparisons shared that the Overture from Chicago elicited significantly greater positive affect compared the all other pieces (all $p < .015$) apart from the Septet by Beethoven, there was no significant difference between the positive emotion elicited by the Overture from Chicago and the Septet by Beethoven ($p = .63$).

The next One-Way ANOVA test assessing the negative effect was also significant, $F(4,19) = 19.95$, $p < .001$. Tukey's HSD post-hoc comparisons shared that the Paramore pop piece elicited negative emotions significantly greater compared to the other piece of music (all $p < .015$). The difference in negative elicited emotions between the Paramore, which proved to elicit negative emotions, and the Overture from Chicago, which proved to elicit the greatest positive emotions, is significant.

Results and Discussion

Throughout this investigation, it is found that all but one piece of music has a significantly higher positive impact than negative. The 'Pop' piece of music, even though according to the stereotype

theory of music would appear to be more popular within young people, showed that participants found this piece of music to have a significantly more negative impact on emotions. The ‘Pop’ piece of music scored with higher levels of negative emotions when participants were using the Emotion Rating Scales. Higher levels of ‘negative’ emotion scores mean that the ‘Pop’ piece of music must have low levels of aspects of the BREVEMA model, this means less brain stimulation.

In relation to the literature discussed and the BREVEMA model, traditionally, the ‘Classical’ piece of music would be deemed to have a more positive impact on emotion, this is due to a predicted higher level of Brain Stem Reflexes and Musical Expectancy. However, the ‘Musical Theatre’ piece of music has shown to contain the highest level of positive emotion elicitation. This is due to the high energetic nature of the piece and the high level of musical skill that is presented and explained. The cross-genre nature of this piece (Musical Theatre of a Jazz styling), may provide a higher positive elicitation also.

Chapter Three: Main Study – Music and Dreaming

After the piece of music had been chosen, a group of participants took part in the main investigation, to complete these study participants were asked to listen to the selected piece of music for one week and record their dreams and answer the pre/post-sleep questionnaires. Once this week is complete, participants will listen to no music before sleep and record their dreams and answer the same pre/post-sleep questionnaires. The differences between the music and non-music conditions were then compared and assessed.

Music Effects on Dreaming Hypotheses

Concerning the current research surrounding music and emotions and how the brain processes these things in connection with one another, as highlighted in the literature review, music can significantly

alter your mood and emotion. Since music can adjust our mood and our emotions, therefore this capability should be transferable to the unconscious state. The effect of music being able to change the unconscious state is a likely proposal, as music can affect emotion whether it be positively or negatively during the conscious state.

Previous research on dreaming and dreaming conditions tell us that we can control our dreams through 'Lucid Dreaming', if we can control the content of our dreams throughout this state, we can, therefore, control the content of our dreams using specific stimuli, i.e. music.

It is hypothesised that when individuals listen to music before sleeping, their dream content will be improved positively and the content of which will be that of a more positive nature. Listening to music before sleep will also improve the phenomenological experiences that occur throughout dreaming, this means participants will experience more vivid dreams that tell a coherent story when recalled and has a greater amount of sensory information when listening to music as opposed to listening no music before bed.

Method

Participants

21 participants (10 male, mean age=20.44, SD=1.42) were recruited from the undergraduate and postgraduate student population at the University of Hull. 14 participants studied music or a music-related subject (Creative Music Technology) and 7 participants studied a non-music course. All participants that were recruited were required to be sound of hearing and sight due to the nature of listening to the selected music and reading the instructions of completion and filling in the dream journals provided. All participants were drawn on a volunteer basis, no participant received financial incentive to participate in this study. Ethical approval for this study was given by the University of Hull Faculty of Health Sciences Ethics Committee.

Materials

Music

Each participant was given a .mp3 and .wav copy of the piece of music selected (Musical Theatre) alongside a link to a YouTube version and a Spotify version. Each participant, when listening to the music, was requested to use headphones and listen to the piece in full at least once.

Dream Journals

The dream journal provided is split into five different sections.

Each participant was provided with a booklet to complete during this study. The dream journal provided is split into four different sections, these are as follows;

- Instructions for completion
- Pre-sleep questionnaire
- A space to record their dreams
- Post-sleep Questionnaire

The instructions for completion indicated to the participant whether they were listening to music or not to begin with, how to fill in the questionnaires and how to record their dreams (what details to include) alongside some tips on how to get to sleep. The instructions explain that the study will last approximately 14 days/nights, however, a minimum of 10 days/nights data is required for completion, allowing participants two days from either week to abstain from filling in the booklets for social activities they may have planned. As an example, the first seven days for half of the participants that are listening to the selected piece of music should follow this schedule:

1. Listen to the selected piece of music (preferably with headphones) at least an hour before sleep.
2. Complete the pre-sleep questionnaire provided.
3. Sleep.
4. Once you wake up, complete an entry for the dream journal.
5. Complete the post-sleep questionnaire provided.
6. Repeat these instructions for seven days.

The sleeping tips attached to the bottom, these tips are said to improve sleep quality and give participants a greater chance at recalling their dreams. These are as follows;

1. Before sleep, take a walk around your bedroom, concentrating wholly on every step and relax your mind.
2. Take long, deep breathes to relax your mind and body.

The pre-sleep questionnaires are made up of two questions; Indicate the extent you have felt throughout the day?, Indicate the extent you feel this very moment?. Both of these questions were answered using an adaptation of the Positive and Negative Affect Schedule – Short Form (Karim, Weisz, & Rehman, 2011). This inventory contains 10 items, of which 5 are positive and 5 are negative. For each day of the test, participants were asked to rate the extent to how they have felt throughout the day and in that very moment, using a Likert type scale of 1 (not at all) to 5 (extremely). Scores for positive affect and negative affect were created by summing the respective items; a higher score indicated higher levels of positive or negative effect of emotion.

Participants were given a space in which to record their dreams, every night for two weeks, in any amount of detail they could recall. Participants were asked to recall their dream, and if the retrieval of the entirety of the dream was not possible then to write any details however small that they can recall. Participants were asked to refrain from using names to allow anonymity and as a substitute use the terms ‘Person A’ or ‘Person 1’.

The post-sleep questionnaires are made up of two PANAS-SF questions identical to the pre-sleep questionnaire; Indicate the extent you have felt throughout the day?, Indicate the extent you feel this very moment?. Both of these questions were answered using an adaptation of the Positive and Negative Affective Schedule – Short Form (Karim, Weisz, & Rehman, 2011). Scores for positive affect and negative affect were created by summing the respective items; a higher score indicated higher levels of positive or negative effect of emotion. This inventory contains 10 items, of which 5 are positive and 5 are negative. For each day of the test, participants were also asked to rate the extent to how they have felt throughout the day and in that very moment, using a Likert type scale of 1 (not at all) to 5 (extremely). The next element of the post-sleep questionnaire is four questions as follows;

- The events that occurred in my dream are…
- The events I can recall tell a coherent story and are clear…
- The recall of my dream brought sensory information with it (images, sounds, tastes, and smells etc) …
- When I recall my dream, I can 'transport' myself back into it vividly…

Each of these questions was rated using a Likert scale of -3 (not at all) to 3 (extremely). Scores for phenomenological experiences were created by summing the respective items; a higher score for each of the questions indicated higher levels of vividness, accurate recall, coherence and sensory information

Design

This study is a within-subjects design with two levels of the independent variable (music vs, no music). A within-subjects design was used due to the fundamental differences between the variables, therefore, the results reflect no differences when one variable is changed to the other, e.g. Week 1 of Music and Week 2 of No Music. The dependent variables are the emotional content of dreams based on Thematic mind maps (Braun & Clarke, 2008) and chi-squared tests, the phenomenological (vividness/recall) of dreams based on the rating scales (Likert scales of -3 (not at all) to +3 (extremely)) of the pre and post-sleep questionnaires.

Procedure

All participants were given two weeks to complete the study, ten days of data were required allowing participants two days in either week for pre-planned social activities or a break if needed. These 'off-days' were to be taken whenever the individual sees fit and were not assigned for a particular time to the participants.

21 participants were split into two groups, those with an odd participant number were to listen to no music for the first week, and those with an even participant number were to listen to the selected

music. No matter whether the participants were listening to music or no music they all followed the same schedule. Participants were instructed to listen to the selected music or no music of any kind up to an hour before sleep, then each participant would complete the post-sleep questionnaire for that day. Once participants have awoken, they shall record their dreams/details of dreams on the page provided for that day, then complete the post-sleep questionnaire. Throughout the booklet, every day was labelled and separated, and a reminder as to whether the participants were to listen to music, or no music was placed at the top of each separate booklet.

Results

Pre-sleep

The mean positive and negative emotion ratings for question 1; 'Indicate the extent you have felt throughout the day.' Can be seen in Table 2 (SD in parenthesis).

Week	**Positive Affect Score**	**Negative Affect Score**
Music	11.55 (3.3)	6.77 (1.5)
No Music	12.11 (2.8)	7.44 (1.83)

The mean positive and negative emotion ratings for question 2; 'Indicate the extent you feel at this moment.' Can be seen in Table 3 (SD in parenthesis)

Week	**Positive Affect Score**	**Negative Affect Score**
Music	7.69 (1.7)	6.11 (1.18)
No Music	7.9 (2.3)	6.2 (1.17)

Four separates One-Way ANOVAs assessed differences in emotion (positive and negative) for the pre-sleep questionnaire.

The One-Way ANOVA assessing positive emotions throughout the day was not significant, $F(1,34) = .301$, $p = .587$. This test shows the positive emotions of participants throughout the day throughout the music week.

The next One-Way ANOVA test assessing the negative emotion was similar in result, $F(1,34) = 1.423$, $p = .241$. This test shows the negative emotions of participants throughout the day during the music week.

Then a One-Way ANOVA test assessing the positive emotions at the very moment, $F(1,34) = .062$, $p < .805$. The One-Way ANOVA test that was used to assess the negative emotions at the very moment shows, $F(1,34) = .045$, $p < .833$. Both of these tests show the positive and negative emotions the participants felt 'at that very moment' in comparison to the music and non-music conditions. There is no significant difference between positive and negative emotions throughout the music and non-music conditions in 'that very moment'.

Dream Journals

To begin the analysis of the dream journals, we must run a simple overall thematic analysis of all entries from every participant. Whilst reading through the journal entries we can pick out general themes that appear within the language and content spoke about.

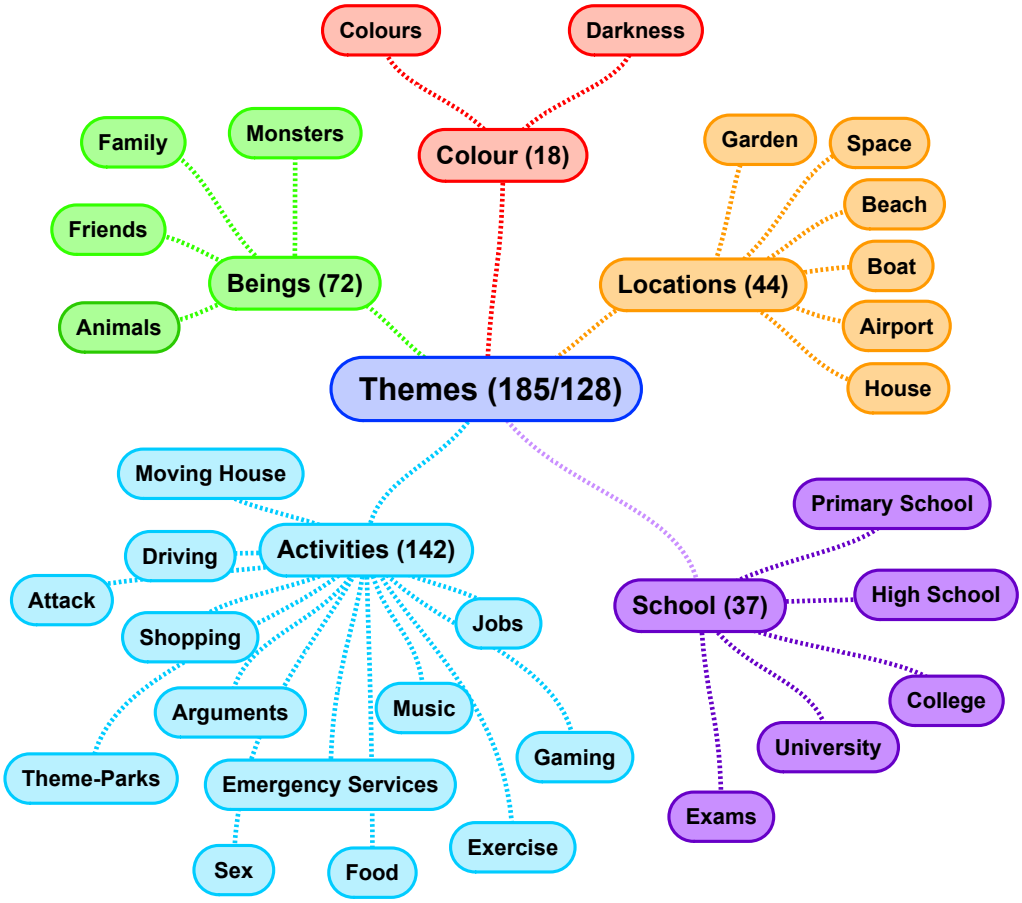
Overall 313 dreams were recorded by participants, 185 after listening to music, 127 in the non-music condition. Of the 17 participants, they reported a range of dreams, the least reported was 4 and the most was 14.

Regardless of whether the participants were listening to the music or not, all themes were gathered into the following list. Themes occurred in the following frequencies among the 313 dreams. In the table below, the first number in parenthesis shows the frequency in the music condition and the second number in parenthesis shows the frequency in the non-music condition.

Colour (8/4)	**Darkness (4/2)**	**Space (0/2)**
Ducks (0/1)	**Monsters (0/3)**	**Driving (25/11)**
Shopping (8/10)	**School/University (14/12)**	**Beach (5/4)**
Arguments (5/11)	**Music (16/7)**	**Moving House (2/5)**

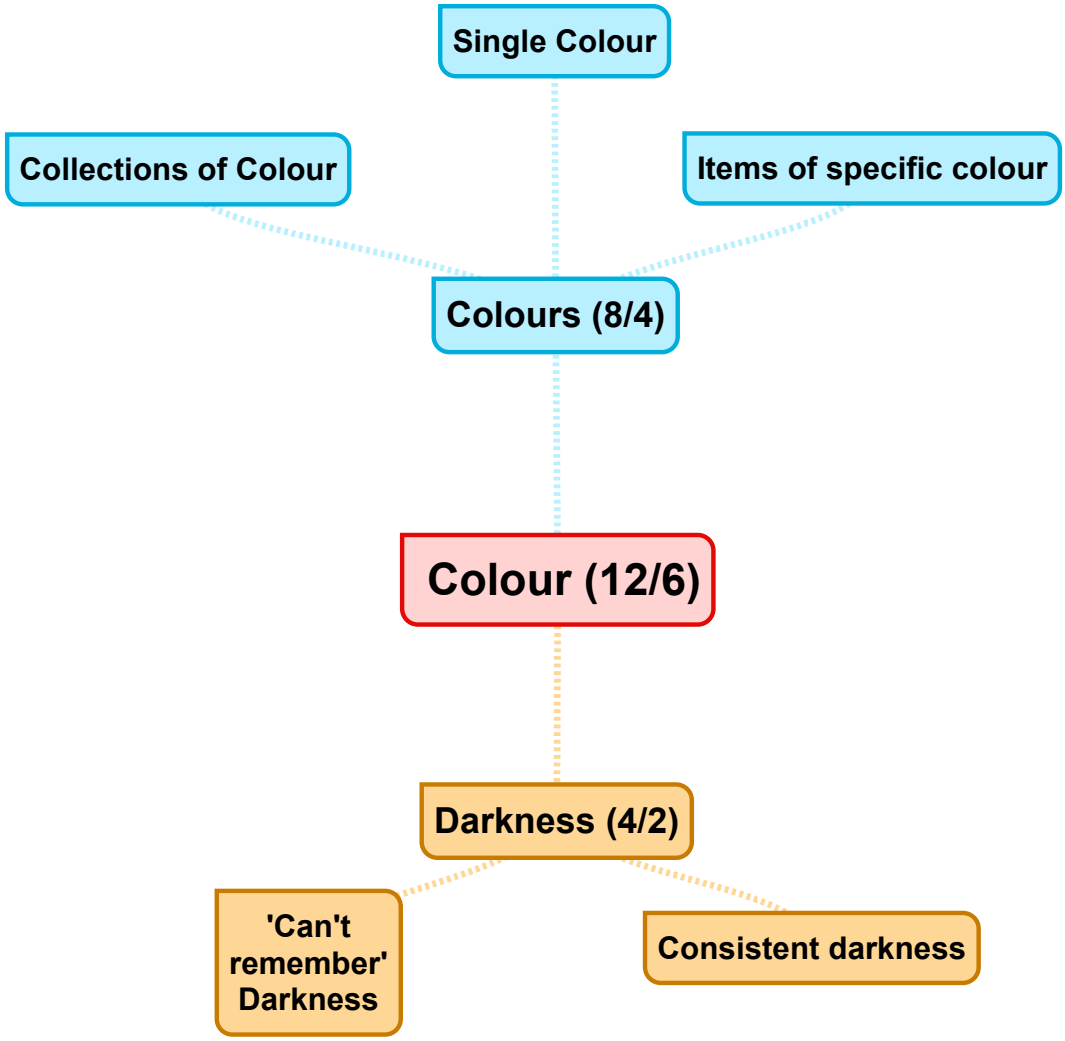
Exams (5/2)	**Boats (1/3)**	**Jobs (0/1)**
Hospital/Dentist (1/1)	**Money (0/1)**	**Kidnapping/Murder (1/5)**
Party(1/0)	**Games (6/3)**	**Animals (18/5)**
Flying (3/5)	**Pilgrims (1/0)**	**Sex (5/0)**
Food (8/7)	**Sadness (0/1)**	**Exercise (6/4)**
Water (4/9)	**Army (1/1)**	**Gardens (1/2)**
Celebrities (6/4)	**Family (5/10)**	**Friends (11/8)**
Kitchen (1/1)	**Hair/Makeup (3/1)**	**Drinking (4/3)**
Rollercoasters (2/0)	**Theme-parks (2/0)**	**Zombies (0/1)**

Once a list like the one above has been produced, we can then make that list smaller, and combine it to create a thematic map. This can be seen in Figure 9.



[Figure 9: Overall Dream Content Thematic Map (Music/Non-Music Dream Recorded)]

Once this thematic map of the overall themes has been created, we then break down each strand of the overall map, into smaller maps to assess each theme and what each dream was about. These maps can be seen in Figures 10-14.



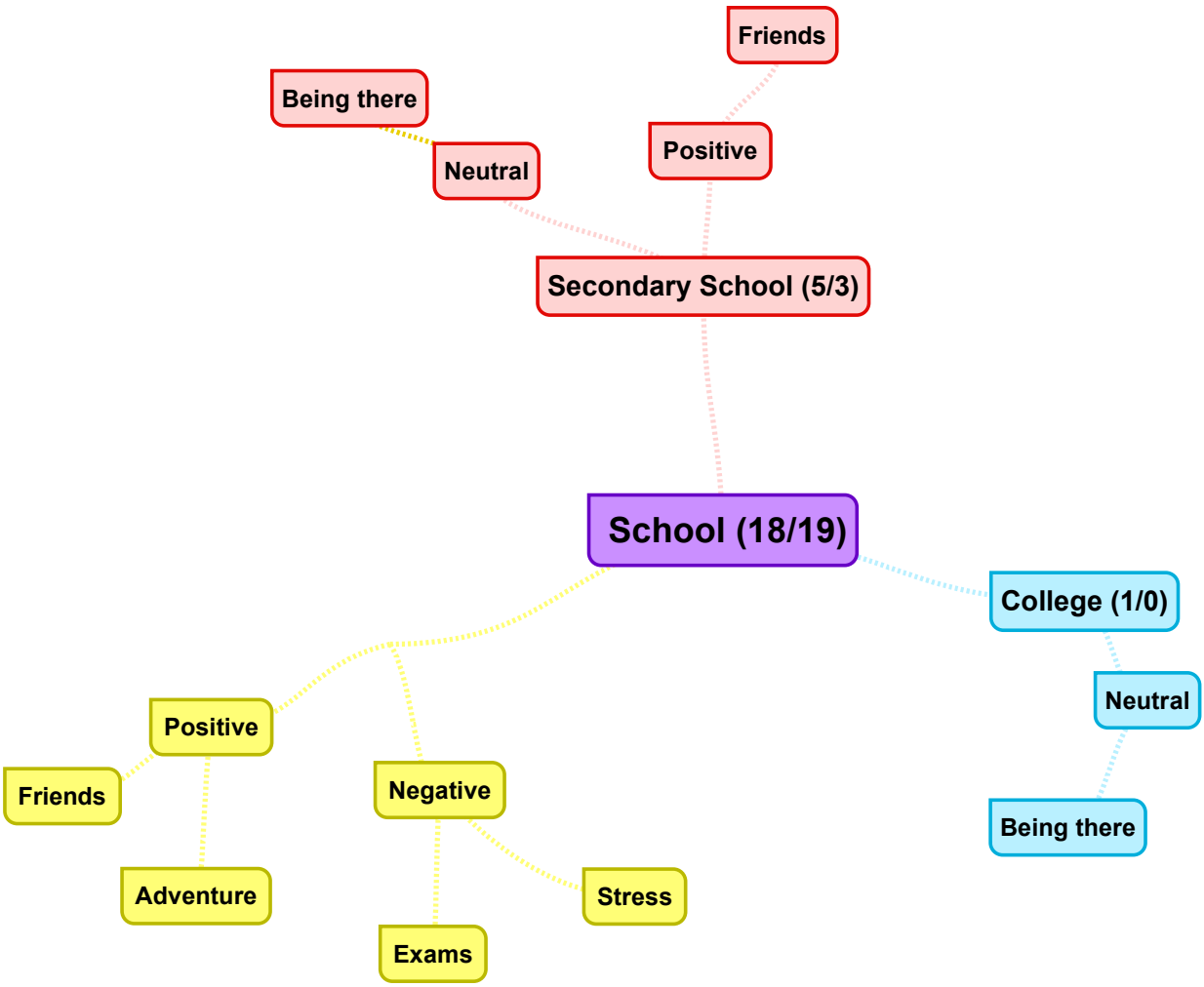
[Figure 10 – Colours Thematic Map – Music/Non-Music Reported Dreams in Parenthesis]

Once the mind map was produced it was observed that none of the themes could be rated as positive or negative, all themes were rated more neutrally, therefore splitting into colour and darkness. Within the category of ‘Colours’, the following number of ratings are seen:

COLOURS	Music	No Music
Darkness	**4**	**2**
Colour	**8**	**4**

There was no significant association between condition (music/no music) and the number of colour and darkness rated dreams (χ_2=.00, df=1, p=1.00). Participants within both conditions (music and non-music) reported that two-thirds of their dreams contained colours, and one-third of their dreams contained darkness.

The category of 'School' was split into three sections; University, Secondary School and College.



[Figure 11 – School Thematic Map - Music/Non-Music Reported Dreams in Parenthesis]

Within the category ‘University’ the following number of ratings are seen:

UNIVERSITY	Music	No Music
Positive	**8**	**0**
Negative	**4**	**16**

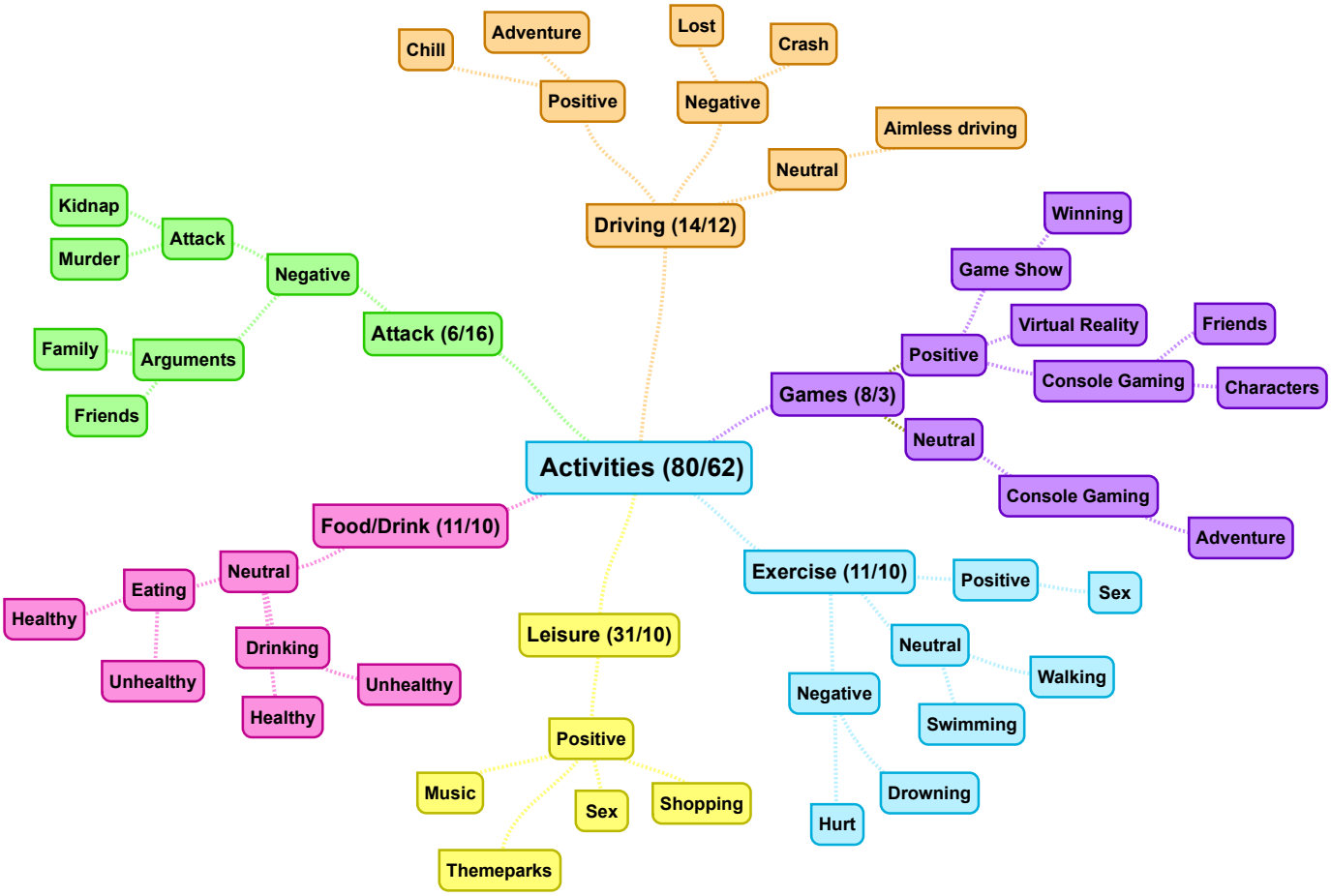
There was a significant association between condition (music/no music) and the number of positive and negatively rated dreams (χ_2=14.93, df=1, p<.05). Participants in the Music condition were more likely to report positively rated ‘University’ dreams than participants in the non-music condition, and participants in the non-music condition were more likely to report negatively rated ‘University’ dreams.

The ‘Secondary School’ theme only contains positively rated dreams, the following number of ratings in comparison to the other 313 dreams recorded are seen:

SCHOOL	Music	Non-Music
Secondary School	**6**	**3**
Non-Secondary School	**179**	**125**

There was no significant association between theme (Secondary School/Non-Secondary School) in all dreams recorded (χ_2=.219, df=1, p=.640). Participants in the Music condition were slightly more likely to report ‘Secondary School’ associated dreams in the music condition than participants in the non-music condition.

The category of Activities is split into six sections: Driving, Games, Exercise, Leisure, Attack, Food/Drink.



[Figure 12 – Activities Thematic Map - Music/Non-Music Reported Dreams in Parenthesis]

Once the mind map was produced it was observed that almost all themes could be rated as positive or negative. Some themes were rated more neutrally. Within the category of activities, the following number of ratings are seen:

ACTIVITIES	Music	No Music
Positive	**51**	**13**
Neutral	**20**	**19**
Negative	**10**	**29**

Within the category of ‘Exercise’ the following number of ratings are seen:

EXERCISE	Music	No Music
Positive	**6**	**8**
Neutral	**3**	**0**
Negative	**2**	**2**

There was a significant association between condition (music/no music) and the number of positive, neutral, and negatively rated dreams (χ_2=9.78, df=2, p=.008). Participants in the Music condition were more likely to report positively rated ‘Exercise’ dreams than participants in the non-music condition, and less likely to report negatively rated ‘Exercise’ dreams.

Within the category of ‘Games’ the following number of ratings are seen:

GAMES	Music	No Music
Positive	**7**	**1**
Neutral	**1**	**2**

There was a significant association between condition (music/no music) and the number of positive, and neutrally rated dreams (χ_2=3.23, df=1, p=.072). Participants in the Music condition were more likely to report positively rated ‘Gaming’ dreams than participants in the non-music condition, and less likely to report neutrally rated ‘Gaming’ dreams.

Within the category of ‘Driving’ the following number of ratings are seen:

DRIVING	Music	No Music
Positive	**6**	**0**
Neutral	**5**	**6**
Negative	**2**	**5**

There was a significant association between condition (music/no music) and the number of positive, neutral and negatively rated dreams (χ_2=7.26, df=2, p=.027). Participants in the Music condition were more likely to report positively rated 'Driving' dreams than participants in the non-music condition, and less likely to report neutrally rated 'Driving' dreams. Whereas participants in the non-music condition were more likely to report neutral or negatively rated 'Driving' dreams than the music condition.

Within the category of 'Attack', the following number of ratings between Attack and Non-Attack Activity dreams are seen:

ATTACK	**Music**	**No Music**
Attack	**6**	**16**
Non-Attack	**74**	**46**

There was a significant association between condition (music/no music) and the number of Attack and Non-Attack 'Activity' dreams (χ_2=8.94, df=1, p=.003). Participants in the Music condition were more likely to report a 'Non-Attack' 'Activity' dream than participants in the non-music condition, and less likely to report 'Attack' themed 'Activity' dreams.

Within the category of 'Food/Drink', the following number of ratings between Food/Drink and Non-Food/Drink Activity dreams are seen:

Food/Drink	**Music**	**Non-Music**
Food	**11**	**10**
Non-Food	**69**	**52**

There was no significant association between condition (music/no music) and the number of Food/Drink and Non-Food/Drink 'Activity' dreams (χ_2=0.16, df=1, p=.692). Participants in the Music

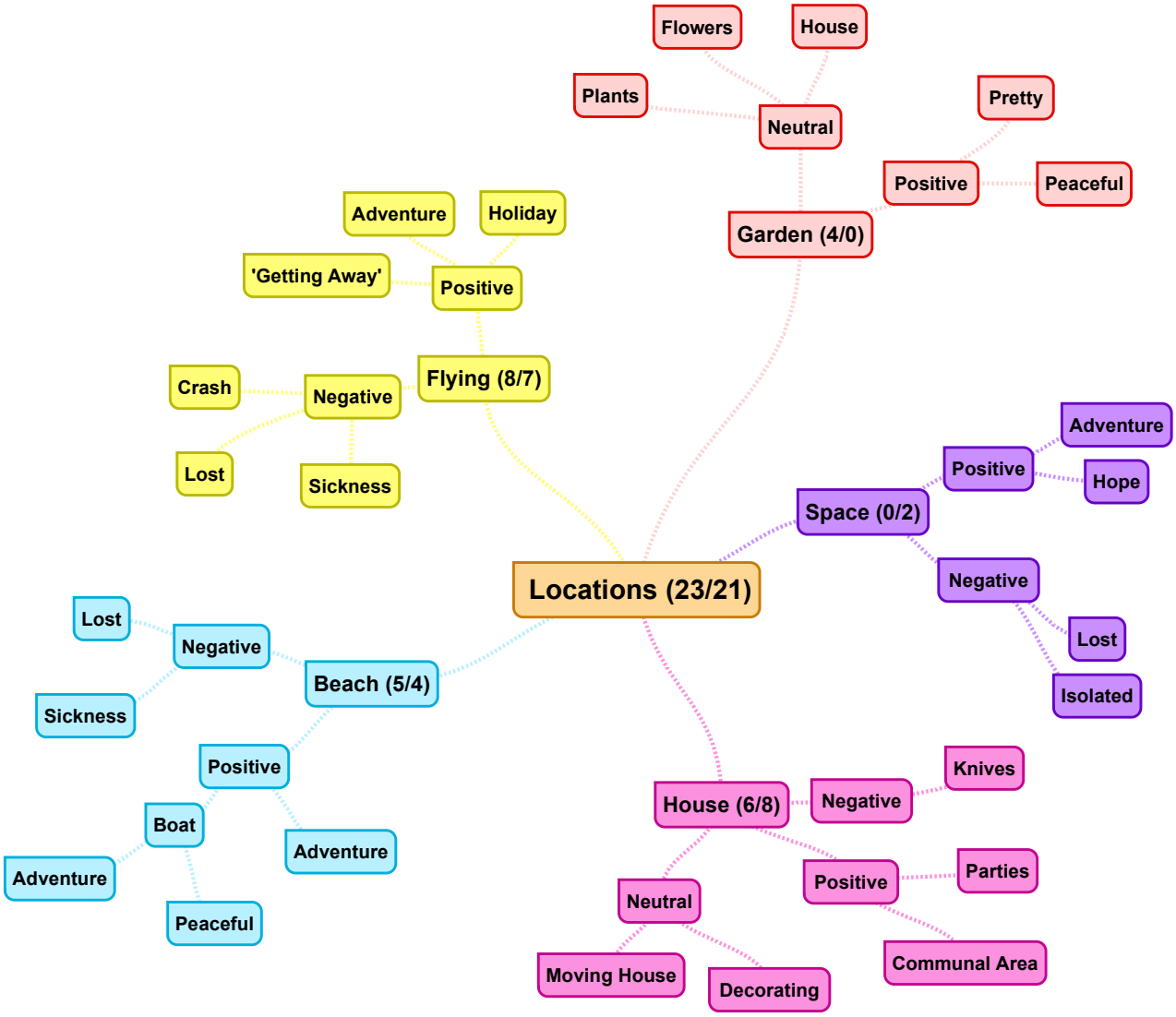
condition were slightly more likely to report a ‘Non-Food’ related ‘Activity’ dream than participants in the non-music condition and less likely to report ‘Food/Drink’ themed ‘Activity’ dreams.

Within the category of ‘Leisure’, the following number of ratings between Leisure and Non-Leisure related Activity dreams are seen:

LEISURE	**Music**	**No Music**
Leisure	**31**	**10**
Non-Leisure	**49**	**52**

There was a significant association between condition (music/no music) and the number of Leisure and Non-Leisure ‘Activity’ dreams (χ_2=8.70, df=1, p=.003). Participants in the Music condition were more likely to report a ‘Leisure’ related ‘Activity’ dream than participants in the non-music condition, and participants in the non-music condition are more likely to report ‘Non-Leisure’ themed ‘Activity’ dreams.

The category of ‘Locations’ is split into five categories; Garden, Space, House, Beach and Flying:



[Figure 13 – Locations Thematic Map - Music/Non-Music Reported Dreams in Parenthesis]

Once the mind map was produced it was observed that almost all themes could be rated as positive or negative. Some themes were rated more neutrally. Within the category of 'Garden' the following number of ratings were seen:

GARDEN	Music	No Music
Garden	**4**	**0**
Non-Garden	**19**	**21**

There was a significant association between condition (music/no music) and the number of Garden and Non-Garden located 'Location' dreams (χ_2=4.01, df=1, p=.045). Participants in the Music condition were more likely to report a 'Garden' located dream than participants in the non-music condition.

Within the category of 'Space', the following number of ratings were seen:

SPACE	Music	No Music
Space	**0**	**2**
Non-Space	**23**	**19**

There was no significant association between condition (music/no music) and the number of Space and Non-Space related 'Location' dreams (χ_2=2.29, df=1, p=.130). Participants in the non-music condition were more likely to report a 'Space' related 'Location' dream than participants in the music condition.

Within the category of 'House', the following number of ratings were seen:

HOUSE	Music	No Music
Positive	**3**	**2**
Neutral	**3**	**0**
Negative	**0**	**6**

There was a significant association between condition (music/no music) and the number of positive, neutral and negatively rated dreams (χ_2=9.10, df=2, p=.011). Participants in the Music condition were more likely to report positively or neutrally rated 'House' related dreams than participants in the non-music condition, and less likely to report negatively rated 'House' dreams. Whereas participants in the

non-music condition were more likely to report neutral or negatively rated ‘House’ dreams than the music condition.

Within the category of ‘Beach’, the following numbers are seen:

BEACH	Music	No Music
Positive	**5**	**0**
Negative	**0**	**4**

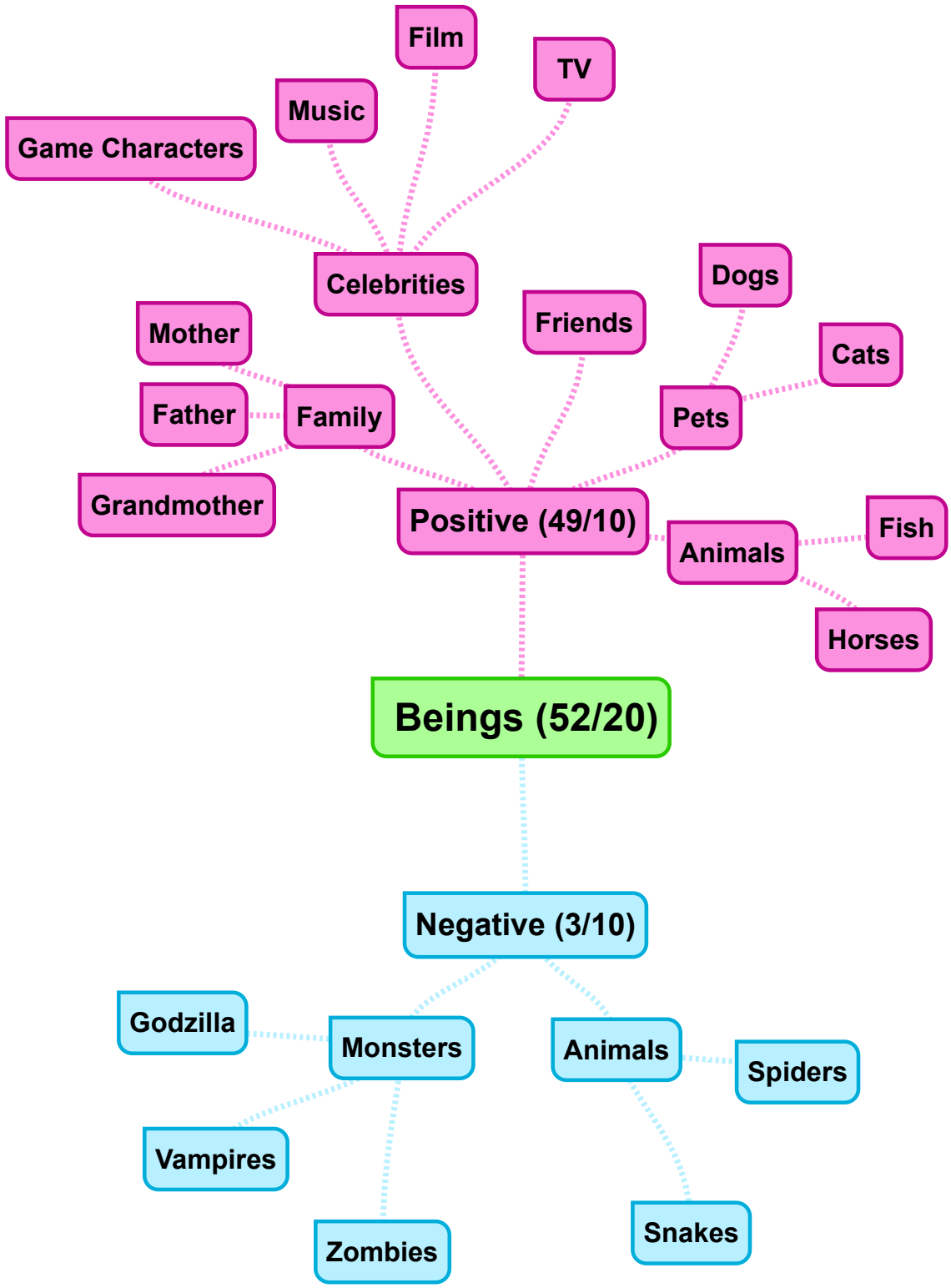
There was a significant association between condition (music/no music) and the number of positive and negatively rated dreams (χ_2=9.00, df=1, p=.003). Participants in the Music condition were more likely to report positively rated ‘Beach’ related dreams than participants in the non-music condition, and less likely to report negatively rated ‘Beach’ dreams. Whereas participants in the non-music condition were more likely to report negatively rated ‘Beach’ dreams than the music condition.

Within the category ‘Flying’, the following numbers are seen:

FLYING	Music	No Music
Positive	**6**	**3**
Negative	**2**	**4**

There was no significant association between condition (music/no music) and the number of positive and negatively rated dreams (χ_2=1.61, df=1, p=.205). Participants in the Music condition were more likely to report positively rated ‘Flying’ related dreams than participants in the non-music condition, and less likely to report negatively rated ‘Flying’ dreams. Whereas participants in the non-music condition were more likely to report negatively rated ‘Flying’ dreams than the music condition.

The category of ‘Beings’ is split into two categories: Positive and Negative.



[Figure 14 – Beings Thematic Map – Music/Non-Music Reported Dreams in Parenthesis]

Once the mind map was produced all topics are categorised as positive or negative. Within this category the following number of ratings were seen:

BEINGS	Music	No Music
Positive	**49**	**10**
Negative	**3**	**10**

There was a significant association between condition (music/no music) and the number of positive and negatively rated dreams (χ_2=19.10, df=1, p<.001). Participants in the Music condition were more likely to report positively rated 'Beings' related dreams than participants in the non-music condition, and less likely to report negatively rated 'Beings' dreams. Whereas participants in the non-music condition were more likely to report negatively rated 'Beings' related dreams than the music condition.

Post-sleep Questionnaires

The mean positive and negative emotion ratings for question 1; 'Indicate the extent you feel right now.' Can be seen in Table 21.0 (SD in parenthesis).

Week	Positive Affect Score	Negative Affect Score
Music	8.55 (1.93)	5.88 (1.07)
No Music	9.11 (1.95)	6.91 (2.03)

The mean positive and negative emotion ratings for question 2; 'Indicate the extent your dream made you feel.' Can be seen in Table 22.0 (SD in parenthesis).

Week	Positive Affect Score	Negative Affect Score
Music	7.69 (2.71)	6.13 (1.61)
No Music	7.61 (2.78)	8.00 (4.04)

A paired-samples t-test was conducted to compare the positive affect score in music and non-music conditions for question 1 of the post-sleep questionnaire: 'Indicate the extent you feel right now…' There was not a significant difference in scores for positive affect score during the music condition (M=8.55, SD=1.93) and the non-music condition (M=9.11, SD=1.95); t(17)=-1.63, p=.121.
A second paired samples t-test was conducted to compare the negative effect score in music and non-music conditions for question 1 of the post-sleep questionnaire: 'Indicated the extent you feel right now…'
There was a significant difference in scores for negative affect score during the music condition (M=5.88, SD=1.07) and the non-music condition (M=6.91, SD=2.03); t(17)=-2.61, p=.018. Participants within the non-music condition have a slightly, yet statistically larger negative affect score.

A paired-samples t-test was conducted to compare the positive affect score in music and non-music conditions for questions 2 of the post-sleep questionnaire: 'Indicate the extent your dream made you feel…'
There was no significant difference in score for positive affect score during the music condition (M=7.69, SD=2.71) and the non-music condition (M=7.61, SD=2.78); t(17)=0.154, p=.879.
A paired-samples t-test was conducted to compare the negative effect score in music and non-music conditions for question 2 of the post-sleep questionnaire: 'Indicate the extent your dream made you feel…'
There was no significant difference in score for negative effect score during the music condition (M=6.13, SD=1.61) and the non-music condition (M=8.00, SD=4.04); t(17)=-1.99, p=.062.

The last four questions of the post-sleep questionnaires tested the vividness, coherence, sensory information and recall of participants dreams. The first question of this section is 'The events that occurred in my dream are…', this question is answered by the participants using a Likert scale between the values of -3 (Cloudy & Imageless) to +3 (Extremely Vivid). A paired-samples t-test was conducted to compare the vividness of participants dreams in music and non-music conditions. There

was no significant difference in vividness for music (M=.4689, SD=1.08) and no-music (M=.5367, SD=1.26) conditions; t(17)=.196, p=.847. This result suggests that the use of music has no real significance on the vividness of dream content.

The second question assessing whether the participant's dreams told a more coherent story and were clearer whilst listening to the selected piece of music or without the selected piece of music. The question presented is; 'The events I can recall tell a coherent story and are clear…', this question is answered by the participants using a Likert scale between the values of -3 (Not at all) to +3 (Extremely). A paired-samples t-test was conducted to compare the coherence of participants dreams in the music and non-music conditions. There was no significant difference in the scores for music (M=.7196, SD=1.06) and non-music (M=.8722, SD=1.05) conditions; t(17) = 0.528, p=.604. This result suggests there is no real significance cause by music on the coherence of dream content.

The third question is 'the recall of my dream brought sensory information with it (images, Sounds, Tastes, and Smells etc…), this question is answered by participants using a Likert scale between the values of -3 (Not at all) and +3 (Extremely). A paired-samples t-test was conducted to compare if sensory information within dreams in music and non-music conditions. There was no significant difference in sensory information in music (M=.6044, SD=1.00) and non-music (M=.7611, SD=1.44) conditions; t(17).413, p=.685. These results show that within the non-music conditions participants recorded no significant association of sensory information between the two conditions (music and non-music) within their dreams.

In the final question of the post-sleep questionnaire, participants are asked 'When I recall my dream, I can 'transport' myself back into it vividly…' the participants are to answer this question using the Likert scale provided with the values -3 (Not at all) to +3 (Extremely). Apaired-samples t-test was conducted to compare the recall of dreams in music and non-music conditions. There was no significant difference between music (M=.6550, SD=1.05) and non-music (M=.7050, SD=1.25) conditions; t(17).136, p=.893. This result shows that there is no significant difference in dreaming experiences when participants listened to music before sleep in comparison to no music before sleeping.

Discussion

Summary of Findings

The research conducted has focused on the effects of a piece of music that has been selected and is certain for having a high positive emotional elicitation and applying it to studying the content of dreams and the experiences of dreaming and whether music can affect them.

The pre-sleep questionnaire showed that there was no difference in positive and negative affect score across the two conditions (music and non-music). Participants did not go to bed in a different mood or experience a different mood throughout the day regardless of music or no music, this means all participants started the study in a comparable state before listening to the music.

The post-sleep questionnaires concerning the mood and experiences of dreaming (mood on waking, mood elicited by the dreams, and the phenomenological experiences of the dreams) also did not differ in relation to the two conditions (music and non-music), except for question 2 'Indicate the extent you feel right now' of the post-sleep questionnaire, there was a significant association of negative affect score between the two conditions, showing that participants within the non-music condition have a slight, yet statistically larger negative affect score. Overall, listening to music before going to bed does not influence the recalled phenomenology and emotional experiences of participants dreams.

The dream journals showed a statistical difference in the positive content throughout the music week comparable to the non-music week. Almost all of the themes withdrawn from the dream journals could be seen as positive, neutral or negative. All themes except 3 proved to have a significant positive association throughout the music week in comparison to the non-music week. One possible reason for this statistical difference found between music and non-music might be that whilst listening to the piece of music participants generally dreamt about more positive content than when not listening to the piece of music. The following categories had a significant positive association in favour of the music condition;

- 'University'
- 'Exercise'
- 'Games'

- ‘Driving’
- ‘House’
- ‘Beach’
- ‘Beings’

Out of all categories that have been rated as ‘positive’, ‘neutral’ or ‘negative’, the category which contained the highest amount of positive outcomes is ‘Beings’. A large number of categories could not be rated as positive, neutral or negative, therefore these were rated as themselves and then not (e.g. Attack/Non-Attack), the categories that were rated in this way which showed significant outcomes in favour of the music condition are;

- ‘Non-Attack’
- ‘Leisure’
- ‘Garden’

Out of the three categories that showed a significant association in favour of the music conditions, ‘Non-Attack’ dreams have a substantial amount of recordings, particularly throughout the music condition. Although this category is not rated positively, neutrally or negatively, it is easy to deduce that ‘Non-Attack’ dreams can be categorised as a positive outcome whilst listening to the selected piece of music.

Implications of Findings

Overall, a piece of music that was selected to have a high level of positive emotional elicitation does to some degree have the ability to alter our dream contents and our phenomenological experience whilst asleep including vividness, dream recall, whether the dream tells a coherent story or not, and whether the dream contained strong sensory information such as sounds and tastes. Listening to the selected piece of music before sleep can positively impact our emotions before sleep, therefore having a lasting effect that is then impacted on our dreams and dream contents to some degree as explained within the results, there is a mixture of significant and non-significant results throughout the two conditions.

There is a substantial amount of research documenting and investigating music, in regard to it emotional power including basic emotions and music and memory, dreams and sleep and their relation to the waking state in comparison memory.

It is interesting to see that the four t-tests that were conducted surrounding phenomenological experiences of dreams (sensory information, coherence etc) all show to the non-significant, however, the selected piece of music has a positive significant impact on the content within participants dreams. As discussed within the literature, Lavy (2001) discusses and investigates listeners relationships towards music using the four basic assumptions (Lavy, 2001). The four-basic assumption within music and emotion is that 'music is heard as narrative', where we as humans construct narratives around the music to make some sort of sense of what we're listening to and therefore to categorise it into emotions. Whether a piece of music has lyrics or not it still contains a narrative, just a rhythmic or melodic narrative, similarly, dreams are seen to have a narrative too but much more in the way of story-telling or emotional narrative. A piece of music that contains a melodic or rhythmic narrative only is completely subjective to the listener as is the narrative within dreams. The emotional responses within the music that was felt by the participants could be married to the narrative within the dream, therefore answering to the significant positive associations that were recorded. The content of dreams that are non-significant or negative could be deduced as an undesirable 'match' of narratives between the music and the dream. Regardless of the emotional response in relation to the narrative, it is proved that the selected piece of music is not relative or has any impact to/on the coherence of the participant's dreams. It is interesting to find that the subjective narrative of the music can have an impact on the narrative of participants dreams, however, it has little to no impact on how coherent the said dream narrative is.

Discussed also within the literature surrounding musically induced emotions, is how these emotions vary dependent on the style/genre and type of music that is being emotionally rated, for example, finding that a piece of music showing positive induced emotions is relative to the nature of that music. Jazz music (which is a sub-genre of the selected piece of music), is seen to be associated with only positive emotions. Therefore, the stereotype of the selected piece of music has the potential to have had the desired impact on the participant's dreams (Zentner, Grandjean, & Scherer, 2008). As

previously discussed, the reasoning behind this is the music is symbolically expressing emotions which are mimicked by the participants then expressed within human behaviour, or in this case, the participant's dreams.

It is also interesting to find that listening to music appeared to have no impact on the recall and vividness of the participant's dreams. As previously discussed within the literature, many studies have been conducted that prove that even after the recall of a dream, it is unlikely that the dream has been remembered in its entirety. As dreams appear vivid upon waking, will likely fade throughout the day and leave but only a few small details, however, this is not evident within the post-sleep questionnaire. Dreams were not recalled more or less avidly or appeared more or less vivid whilst participants were under the music condition. As stated previously even the most vivid and memorable of dreams have the possibility within their recall, alongside this, listening to the selected piece of music did not have any alteration in relation to recall or vividness upon waking.

The main aim of this thesis was to address the lack of research and evidence centred around music and dreaming. We have done so by asking participants to directly report their dreams and answer a pre and post-sleep questionnaire over two weeks under two different conditions; music and non-music. This allows us to focus more solely on the emotional content of the dreams and to see the comparison of emotional content between music and non-music.

Accordingly, the first major contribution of the present research is that it provides the empirical data of music’s emotional effect in relation to our waking state and our emotions, induced and perceives. The literature discussed is important given that the only comparable studies are that which focus on our interpretation of dream content and how stimuli (in this case, music) can alter and affect this. Our findings on the effects of music on dream content are in line with those discussed within the hypothesis and literature review, in that music can lead to emotional differences in relation to dream content and phenomenological characteristics. As mentioned previously there is limited research-based around the effects of music on the unconscious state dreaming. Studies discussed within chapter one show to us how we understand emotion using the five theories; James-Lange Theory, Cannon-Bard Theory, Schachter-Singer Theory, Lazarus Theory and Facial Feedback Theory. Using these theories in conjunction with each other we can understand how we perceive emotion and the

mechanisms in which it is activated then we can proceed to manipulate these processes using stimuli, which in this case is the music presented. A great deal of research into music and it's emotional responses prove that music can generate strong emotional experiences, as previously discussed comparing facial expressions with and without music stimulus found that non-musical stimuli were more likely to produce negative emotional experiences as opposed to musical stimuli. In some ways, the results echo elements of what has previously been reported in the literature such as Music-Evoked Autobiographical Memories (MEAMs) (Blais-Rochette & Miranda, 2016). This study examines various types of MEAMs and how the music affects or if it impacts emotion regulation, and therefore having a positive effect on internalising symptoms and happiness. As a result, this study developed the Music Evoked Memory Orientation Scale (MEMOs), which was designed to assess the phenomenological characteristics of MEAMs. The results of this study on the phenomenological characteristics of MEAMs reflects the results from the main study in that the music seemingly had no effect on the phenomenological characteristics (vividness, coherence, accessibility, sensory details) on memory as it did on dreaming for this dreaming.

Looking back towards the literature, the curiosity and research that surrounds the music affected mood and emotions within our conscious stat, is heavily related to the aims of this thesis in which music also has the power to affect our unconscious state. The stylistic nature and emotional impact of music are proven to possess said capability; therefore, this thesis is proving that dreams can also be altered using music. As previously mentioned, a multitude of people experience or suffer from sleep disorders such as insomnia, lucid dreaming, night terrors and stressful experiences whilst sleeping e.g. grinding of teeth. With the use of the selected piece of music and the fact it is proven to have a high positive emotional level, and that it is proven to positively alter the content of dreams, the occurrence of night terrors/stressful dreaming experience and/or lucid dreaming, can to some extent be suppressed.

Limitations and Further Directions

There were various limitations within this study, which may draw focus on potential future investigation and research. One shortcoming is that this study only examined the emotive power of one piece of music from one genre, although this piece of music was tested to have a high impact on positive emotions, to discuss the full potential of music and the effects on dreaming, it may be that a more varied selection of music is tested with participants as different genres of music or different pieces of music within the same genre may have varied effects on the brain, therefore having varied effects on dreaming.

Another limitation of this study is the education orientation of students. Although this study focuses on a mixture of musicians and non-musicians. Research suggests that musicians can be known to process music differently to non-musicians, therefore potentially allowing them to be more open to various perceived emotions.

Another limitation to this study is the participants were allowed two days within each condition as an ‘off-day’ to the experiment to not interfere with any of the participant's social activities or unplanned events, however, whilst it is not guaranteed that all participants will recall all dreams throughout the experiment, each participant, therefore, has different levels of completion of the dream journals. This could potentially eliminate various categories that could be included within the thematic maps. As an example, if a participant appeared to dream of positive events throughout the ‘music’ condition, yet only recalled three out of seven days’ worth of dreams, there is a chance the dreams that could not be recalled were negative, therefore negatively impacting the thematic maps for the music condition as a result.

Another limitation is the statistical tests that were conducted, many statistical tests were conducted for the completion of this study, however, every statistical test conducted had the same significance level ($p<.05$.) This significance level means that roughly 5% (one in 20) of the tests conducted are most likely to report a spurious level of significance. Ideally a lower significance level (for example; $p<.01$ or less) which is seen as more conservative. However, repeatedly using this significance level is within the exploratory nature of this study where these differences are no certain and repeatable, but rather they are promising and require further study.

Finally, the contents of dreams and whether they hold positive or negative value to that individual is subjective, for example, two participants could potentially have the same dream, yet based on opinion may think differently on whether this is negative or positive. Although all dream journals/thematic maps were based on the whole group of participants' dreams, it is a subjective experience, personal to that individual and their emotions.

Although further research may be needed to fully examine the effects of music on dream content and the phenomenological experience of dreaming, the findings indicate that a piece of music that is proved to have a positive emotional elicitation can be used as a positive stimulus throughout the dreaming and sleep experience to impact the contents of dreams optimistically. However, one selected piece of music being powerful enough to affect both the contents of dreams *and* the phenomenological experience of dreaming is uncommon, therefore further testing on various pieces of music of the ongoing long-term effect could have a significant impact towards both the contents of dreams and the experiences of dreaming. Although further research into this could improve these significantly, these findings prove that music is powerful enough to positively alter the contents of dreams and what we experience within our dreams, subsequently potentially affecting said experiences with further persistent use.

In relation to the literature surrounding dreaming, memory, dream recall and music-evoked autobiographical memories, the difference between the general sensation within sleeping and the waking state makes it easier for us to forget our dreams. A piece of music can evoke memories, further research can be conducted where participants listen to a piece of music before sleep, then before answering the post-sleep questionnaire and filling in the dream journals, participants will listen to the same piece of music again to see if the repetition of the music cam improves and evoke a more powerful if not vivid recall.

In consideration of the aims of this experiment and the potential suppression of sleep/dreaming disorders, further directions and experiments can take place, and use this experiment clinically to do so. A positive influence of dream content may have the capability to alter these disorders or possible suppress them enough, so individuals do not experience them.

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PRIVATE AND CONFIDENTIAL
Charlotte Durham
Faculty of Health Sciences
University of Hull
Via email

12th February 2019

Dear Charlotte

REF FHS115 - What are the Effects of Music on Dream Content?

Thank you for your responses to the points raised by the Faculty of Health Sciences Research Ethics Committee.

Given the information you have provided I confirm approval by Chair's action.

Please refer to the Research Ethics Committee web page for reporting requirements in the event of any amendments to your study.

I wish you every success with your study.

Yours sincerely

Professor Liz Walker
Chair, FHS Research Ethics Committee

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FHS RESEARCH ETHICS COMMITTEE

RISK ASSESSMENT

Title of the research	What Are The Effects of Music on Dream Content?
Name of Principal Investigator	Miss Charlotte May Durham
Location of research	University of Hull Campus

Brief description of research activity

A pilot study will be conducted to choose one piece of music that has the most positive emotion elicitation. Once the piece of music has been chosen, a main study will be conducted to see what the effects of that piece of music is, on dreams. 50 participants will take it in turns to listen and not listen to the music before bed and complete a pre/post-sleep questionnaire and a dream diary.

RISK IDENTIFICATION

Please identify all risks related to this research and indicate WHO is at risk and the measures that are in place or are required to mitigate these.

RISK(S)	**MEASURES IN PLACE / REQUIRED** *(e.g. alternative work methods, training, supervision, protective equipment)*
Training / supervision: *(e.g. information or training required, level of experience, supervisor's input and oversight)*	In preparation for this investigation, the Principal investigator has undergone training in the form of the Research Intergrity module as part of The Modern Researcher. Also taken a module named 'Introduction to Research Design and Methodology'.
Location: *(e.g. remote area, laboratory, confined space, entry or exit, level of illumination, heating etc.)*	Pilot study will be conducted on the University of Hull campus. All meetings with the participants (PIS & Debrief & Pilot Study) will be within the Psychology laboratories.
Research processes: *(e.g. use of electrical systems, gas, liquids, tissue, potential for contamination, flammability etc.)*	Use of potentially loud music with the use of electronic speakers. If any participants prove to be hard of hearing they will be recommended to not take part in either the Pilot Study or the Main Study.
Equipment use: *(e.g. manual handling, operation of emergency controls etc.)*	Use of electronic speakers.
Violence / upset / harm: *(e.g. potential for violence, sensitivity of topic, previous incidents etc.)*	A participant could have an emotional attatchment to a certain piece of music that is played therefore causing them to potentially have recall of bad memories or unwanted feelings. Each participant will receive the phone numbers and email addresses of people/organisations they can speak to if they experience any issues around this topic.

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CONTINUED…..	
Individuals: *(e.g. medical condition, young, inexperienced, disability etc.)*	Both the pilot study and the main study will have 50 particiapnts with a mix of 25 musicians and 25 non-musicians, all students of 'average' young student age (18-25). I must exclude participants who are hard of hearing or deaf, for the sake of listening to the music and participants who are hard of sight or blind, for the sake of completing the provided worksheets.
Work patterns: *(e.g. lone working, working out of hours, working off site, isolated or remote location etc.)*	The participants information sheet, debrief and consent form for both studies will be undertaken on University campus. The pilot study will be conducted on university campus during the day and the main study will be conducted as lone study in the participants homes.
Other:	

Name of Principal Investigator:	Miss Charlotte May Durham
Signature:	
Date:	24/01/2019
Name of Supervisor (if relevant):	Dr. Rachel Anderson
Signature:	
Date:	24/01/2019

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PARTICIPANT INFORMATION SHEET

Study Title: Music and Emotion Elicitation

Researcher: Miss Charlotte May Durham

Supervisor: Dr Rachel Anderson (Psychology, University of Hull)

Purpose of the Study
You are invited to voluntarily participate in a study investigating different styles of music and the emotions that they elicit. You will receive a debriefing sheet containing more details about the study's aims after you have participated.

Procedures
You will be asked to listen to five pieces of music that represent different styles of music (Classical, Jazz, Pop, Musical Theatre, House). For each piece of music you will be asked to complete a number of ratings about how listening to each piece of music makes you feel.

Time Commitment and Compensation
This experiment should approximately last 30-45 minutes

Students recruited from the Psychology Research Participant Scheme will receive credits towards their course in return for participation. Alongside this *all* participants that take part will receive light refreshments in return for their time and participation.

Potential Risks and Ethical Considerations
During this experiment, some of the pieces of music could be familiar to you and you could have some emotional attachment to them. You are free to withdraw from this study at any point during the participation session. Once you have completed the session your data will be anonymized and we will not be able to identify which data is yours. If you would like to talk with somebody about any concerns or issues raised, then the appropriate contact details are supplied on the debriefing sheet. No other risks are known to the investigator at this time.

Confidentiality & Anonymity
All information collected from this study is anonymous and will with kept private and confidential. No personal information will be published, and in the event it should it will be in a form that you cannot recognise. On participation in this study you will be assigned a 'participant number' by which the researcher will organise all information collected. The researcher will have a separate record of all participants' names on the attached consent form and in a password protected electronic datafile. This is to keep record of consent and, because this study is a pilot study for a larger study that require potentially different participants, this will keep track of who has taken part in which study. However, the participant names will not be linked in any way to the data collected within the study.

All hard copies of responses, consent forms and received data will be kept in a separate folder kept by the researcher and any electronic files are kept in a private password protected electronic medium. Any participation in this study is voluntary and you are free to choose whether or not to complete it.

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What Happens Next?

The researcher will answer any questions you may have in relation to taking part in this study. If you are happy to take part in this study, then please complete the attached consent form. The researcher will give you more specific instructions. Do not sign the consent form if you do not wish to take part.

Contact for Further Information

You are free to keep this information sheet and the debrief sheet which will be given to you after your participation. However, if you would like to ask any further questions or need any further information about this research experiment, in terms of its aims, procedures and findings, then please don't hesitate to contact the researcher/investigator on *C.M.Durham@2015.hull.ac.uk* **or** *rachel.Anderson@hull.ac.uk*

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PARTICIPANT INFORMATION SHEET

Study Title: Music and Dream Content

Researchers: Miss Charlotte May Durham

Supervisor: Dr Rachel Anderson

Purpose of the Study
You are invited to voluntarily participate in a research study investigating music and dreaming. You will receive a debriefing sheet containing more information about the study's aims after you have participated.

Procedures
This study will take part across two weeks. You will be asked to keep a Dream Journal, which you need to complete for 10/14 nights across this time.
At the beginning of this study you will receive the Dream Journal. The journal has sections that need to be completed before sleep and in the morning after sleep. This includes:
1) A pre/post sleep questionnaire that asks about your mood and feelings throughout the day, how're you're feeling after sleeping.
2) A space in which to describe the content of any dreams you may have had and some questions to be completed about the dream.

When filling out the section about dreams in the journal, please write anything you recall, it does not have to be a full and wholly coherent account of a dream.

Time Commitment and Compensation
This study should last approximately *30 minutes every day* over the course of 14 days.

Students recruited from the Psychology Research Participant Scheme will receive credits towards their course in return for participation. Alongside this *all* participants that take part will receive light refreshments in return for their time and participation.

Potential Risks and Ethical Considerations
The piece of music you are asked to listen to could be familiar and you could have some emotional attachment to it. Also, this experiment causes you to focus intently on your dreams. The experience of recalling dreams can be an emotional experience. You are free to withdraw from this study at any point during the participation stage. Once the diaries have been returned to the researcher, the data is anonymised and therefore we cannot identify your data to withdraw. If you wish to speak with somebody about any issues raised by the study then the appropriate contact details are supplies on the debrief sheet. No other risks are known to the investigator at this time.

Confidentiality & Anonymity
All information collected from this study is anonymous and will be kept private and confidential. No personal information will be published, and in the event it should it will be in a form that you cannot recognise. Each dream journal that the participant will receive will have a 'participant number' assigned to it, this is so the researcher can organise all information collected. The researcher will have a separate record of all participants' names on the attached consent form and in a password protected electronic datafile. This is to keep record of consent

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and to keep track of participants across the duration of the study. As soon as a participant has completed the study their name will be deleted from the electronic datafile.
All hard copies of responses, consent forms and received data will be kept in a separate folder held by the researcher and any electronic files are kept in a private password protected electronic medium. Any participation in this study is voluntary and you are free to choose whether or not to complete it.

What Happens Next?
The researcher will answer any questions you may have in relation to taking part in this study. If you are happy to take part in this study then please complete the attached consent form. The researcher will give you more specific instructions. Do not sign the consent form if you do not wish to participate.

Contact for Further Information
You are free to keep this information sheet and the debrief sheet which will be given to you after your participation. However, if you would like to ask any further questions or need any further information about this research experiment, in terms of its aims, procedures and findings, then please don't hesitate to contact the researcher/investigator on C.M.Durham@2015.hull.ac.uk or rachel.Anderson@hull.ac.uk

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CONSENT FORM

Study Title: Music and Emotion Elicitation (Pilot Study)

Researchers: Miss Charlotte May Durham

Investigators: Dr Rachel Anderson, Miss Charlotte May Durham

The participant should complete the following questions. Please cross out as necessary:

- ☐ Have you read and understood the participant information sheet? YES/NO
- ☐ Have you had the opportunity to ask questions and/or discuss the study? YES/NO
- ☐ Have all of your questions been answered? YES/NO
- ☐ Have you received enough information about the study? YES/NO
- ☐ Do you understand that you are free to withdraw at any point during the study, and that you do not need to give a reason for doing so?
  YES/NO
- ☐ Do you agree to take part in the study? YES/NO

By signing here I agree to voluntary take part in the study. The study has been explained to me sufficiently and I understand that I am free to withdraw at any point.

Signature of participant: ……

Name (PRINT): ……

Date:……

RESEARCHER COMPLETION ONLY
I have explained the study to the participant and he/she has agreed to take part.

Signature of Researcher:……

Name (PRINT): ……

Date:……

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CONSENT FORM

Study Title: The Effects of Music on Dream Content

Researchers: Miss Charlotte May Durham

Investigators: Dr Rachel Anderson, Miss Charlotte Durham

The participant should complete the following questions. Please cross out as necessary:

- Have you read and understood the participant information sheet?
  YES/NO
- Have you had the opportunity to ask questions and/or discuss the study?
  YES/NO
- Have all of your questions been answered?
  YES/NO
- Have you received enough information about the study?
  YES/NO
- Do you understand that you are free to withdraw at any point during the study, and that you do not need to give a reason for doing so?
  YES/NO
- Do you agree to take part in the study?
  YES/NO

By signing here I agree to voluntary take part in the study. The study has been explained to me sufficiently and I understand that I am free to withdraw at any point.

Signature of participant: .....

Name (PRINT): .....

Date:.....

RESEARCHER COMPLETION ONLY
I have explained the study to the participant and he/she has agreed to take part.

Signature of Researcher:.....

Name (PRINT): .....

Date:.....

Participant Number: Piece: 'No Friend' by Paramore					
Emotion	1 (Unaffected)	2	3	4	5 (Intense)
Happy					
Sad					
Relaxing					
Tranquil					
Exciting					
Love					
Annoying					
Anger					
Energetic					
Aggressive					
Romantic					
Boring					
Joy					
Cheerful					
Gloom					
Miserable					
Afraid					
Neutral					

Participant Number: Piece: 'Overture' by Chicago Orchestra					
Emotion	1 (Unaffected)	2	3	4	5 (Intense)
Happy					
Sad					
Relaxing					
Tranquil					
Exciting					
Love					
Annoying					
Anger					
Energetic					
Aggressive					
Romantic					
Boring					
Joy					
Cheerful					
Gloom					
Miserable					
Afraid					
Neutral					

Participant Number:

Piece: ‘Septet in E-Flat Major, Op. 20’ by Ludwig van Beethoven

Emotion	1 (Unaffected)	2	3	4	5 (Intense)
Happy					
Sad					
Relaxing					
Tranquil					
Exciting					
Love					
Annoying					
Anger					
Energetic					
Aggressive					
Romantic					
Boring					
Joy					
Cheerful					
Gloom					
Miserable					
Afraid					
Neutral					

Participant Number: Piece: ‘Space is the Place’ by Ezra Collective					
Emotion	1 (Unaffected)	2	3	4	5 (Intense)
Happy					
Sad					
Relaxing					
Tranquil					
Exciting					
Love					
Annoying					
Anger					
Energetic					
Aggressive					
Romantic					
Boring					
Joy					
Cheerful					
Gloom					
Miserable					
Afraid					
Neutral					

Participant Number: Piece: ‘Little by Little’ by Lane 8					
Emotion	1 (Unaffected)	2	3	4	5 (Intense)
Happy					
Sad					
Relaxing					
Tranquil					
Exciting					
Love					
Annoying					
Anger					
Energetic					
Aggressive					
Romantic					
Boring					
Joy					
Cheerful					
Gloom					
Miserable					
Afraid					
Neutral					

Music and Dream Content

Dream Journal

Instructions for Completion

This study should last approximately 14 days. It is important to note that this study requires at least 10 days of data, any social activities you may have planned will not be effected/not effect this study, therefore, allowing two 'free' days during each week. However, if you can participate in all 14 days then please do so.
Before you begin you will be given this journal and a piece of music through email. For the first 7 days you should follow these instructions:

1. Listen to no music for an hour before you sleep
2. Complete your pre-sleep questionnaire
3. Sleep (tips below)
4. Once you wake up, complete dream diary and post-sleep questionnaire
5. Repeat for 7 days

Once the first 7 days are complete, then follow these instructions for the next 7 days:

1. No personal music for an hour before sleep
2. Listen to the designated piece of music at least once (Preferably with headphones)
3. Sleep (tips below)
4. Once you wake up, complete dream diary and post-sleep questionnaire
5. Repeat for 7 days

After 14 days have been completed, I will arrange to collect your dream journal at your nearest convenience. You are free to withdraw from this study at any point, if you wish to do so, please use the contact details on the participant information sheet.

Sleeping Tips

1. Before you sleep, take a walk around your bedroom, concentrating wholly on every step to relax your mind and body.
2. Lie in bed and close your eyes. Concentrate on relaxing each individual part of your body start from your toes working up to your head.
3. Lay on your back, nice and straight. Take a deep breath in, then hold and breathe out and repeat to relax yourself.

Pre-Sleep Questionnaire

Before you go to listen to the designated piece of music/go to sleep, please answer the following questions as honestly as possible:

Indicate the extent you have felt throughout the day:

	1 Not at All	2 A Little	3 Moderately	4 Mostly	5 Extremely
Upset	☐	☐	☐	☐	☐
Hostile	☐	☐	☐	☐	☐
Alert	☐	☐	☐	☐	☐
Ashamed	☐	☐	☐	☐	☐
Inspired	☐	☐	☐	☐	☐
Nervous	☐	☐	☐	☐	☐
Determined	☐	☐	☐	☐	☐
Attentive	☐	☐	☐	☐	☐
Afraid	☐	☐	☐	☐	☐
Active	☐	☐	☐	☐	☐

Indicate the extent you feel at this very moment:

	1 Not at All	2 A Little	3 Moderately	4 Mostly	5 Extremely
Upset	☐	☐	☐	☐	☐
Hostile	☐	☐	☐	☐	☐
Alert	☐	☐	☐	☐	☐
Ashamed	☐	☐	☐	☐	☐
Inspired	☐	☐	☐	☐	☐
Nervous	☐	☐	☐	☐	☐
Determined	☐	☐	☐	☐	☐
Attentive	☐	☐	☐	☐	☐
Afraid	☐	☐	☐	☐	☐
Active	☐	☐	☐	☐	☐

Recording Your Dreams

In the empty space below, once you have woken up, please record your dreams. If you cannot recall the entirety of your dream, then please write any details (however small) that you may remember. Please refrain from using any names whilst recording your dreams, as a substitute please use names such as ‘Person A’ or ‘Person 1’

Post-Sleep Questionnaire

One you've woken up and recorded your dreams, please answer the following set of questions.

1. **Indicate the extent you feel right now:**

	1 Not at All	2 A Little	3 Moderately	4 Mostly	5 Extremely
Upset	☐	☐	☐	☐	☐
Hostile	☐	☐	☐	☐	☐
Alert	☐	☐	☐	☐	☐
Ashamed	☐	☐	☐	☐	☐
Inspired	☐	☐	☐	☐	☐
Nervous	☐	☐	☐	☐	☐
Determined	☐	☐	☐	☐	☐
Attentive	☐	☐	☐	☐	☐
Afraid	☐	☐	☐	☐	☐
Active	☐	☐	☐	☐	☐

2. **Indicate the extent your dream made you feel:**

	1 Not at All	2 A Little	3 Moderately	4 Mostly	5 Extremely
Upset	☐	☐	☐	☐	☐
Hostile	☐	☐	☐	☐	☐
Alert	☐	☐	☐	☐	☐
Ashamed	☐	☐	☐	☐	☐
Inspired	☐	☐	☐	☐	☐
Nervous	☐	☐	☐	☐	☐
Determined	☐	☐	☐	☐	☐
Attentive	☐	☐	☐	☐	☐
Afraid	☐	☐	☐	☐	☐
Active	☐	☐	☐	☐	☐

3. The events that occurred in my dream are…

-3	-2	-1	0	1	2	3
Cloudy & Imageless						Extremely Vivid
☐	☐	☐	☐	☐	☐	☐

4. The events I can recall tell a coherent story and are clear…

-3	-2	-1	0	1	2	3
Not at all						Extremely
☐	☐	☐	☐	☐	☐	☐

5. The recall of my dream brought sensory information with it (Images, Sounds, Tastes, and Smells etc.)…

-3	-2	-1	0	1	2	3
Not at all						Extremely
☐	☐	☐	☐	☐	☐	☐

6. When I recall my dream, I can 'transport' myself back into it vividly…

-3	-2	-1	0	1	2	3
Not at all						Extremely
☐	☐	☐	☐	☐	☐	☐

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DEBRIEFING INFORMATION SHEET

Study Title: Music and Emotion Elicitation

Researchers: Miss Charlotte May Durham

Supervisor: Dr Rachel Anderson (Psychology, University of Hull)

Thank you for your participation in this study. The participant information sheet you were provided with gave you a general overview of this study. Now you have completed the study we can provide you with more detail about this project.

This study forms part of a larger project. The aim of this main study is to whether music can affect dream content and how individuals experience those dreams. The aim of this pilot study is to select a piece of music to use within the main study. The five pieces of music for this study were of very different styles and we wanted to establish which leads to the most positive emotions. The main study involves recording dreams over a course of two weeks with a mix of listening and not listening to the selected piece to see the effect on the contents of the participants' dreams.

During the study you completed you were given a list of 20 emotion-related words, each with a rating scale (1-5) beside them. You were then asked to rate each piece of music using all 20 words. The results from this pilot study will be analysed to then choose which of the five pieces of music has a positive effect and will be used for the main study.

Contacts for further information:

If you have any further questions or concerns about this experiment, then please contact the researcher on C.M.Durham@2015.hull.ac.uk

Whilst we have tried to pick pieces of music that will elicit positive emotions, it is possible that they may have elicited other emotions. If you wish to discuss any issues you have had whilst participating then the following contacts may be useful:

University of Hull Health & Wellbeing Services: 01482 462222 or studentwellbeing@hull.ac.uk

Let's Talk (Depression & Anxiety Services Hull): 01482 335627 or pas.letstalk.hull@nhs.net

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DEBRIEFING INFORMATION SHEET

Study Title: Music and Dream Content

Researcher: Miss Charlotte May Durham

Supervisor: Dr Rachel Anderson (Psychology, University of Hull)

Thank you for your participation in this study. The participant information sheet you were provided with gave you a general overview of this study. Now you have completed the study, we can provide you with more detail about this project.

The main aim of this study is to examine the effects that listening to music before bed has on dream content and the subjective experience of those dreams. The selected piece of music was chosen by a pilot study as the piece of music that elicited the most positive emotion from a selection of different music styles.

During the study you were asked to answer questions and record your dreams. Some of these times you had been asked to listen to music before bed, and other times you'd been asked not to listen to music. The content of the dreams will be analysed for emotional content. In addition, the questions you answered will be analysed to see if music leads to dreams that differ on rated dimensions such as vividness, coherence, and emotional intensity.

Contacts for further information:

If you have any further questions or concerns about this experiment, then please contact the researcher on C.M.Durham@2015.hull.ac.uk.

This study has asked you to listen to music and also to focus on your dream content. Both of these processes may elicit emotion. If you wish to discuss any issues you have had whilst participating, then the following contacts may be useful:

University of Hull Health & Wellbeing Services: 01482 462222 or studentwellbeing@hull.ac.uk

Let's Talk (Depression & Anxiety Service, Hull): 01482 335627 or pas.letstalk@nhs.net