The Determinants of Affect, Emotional Arousal, and Autobiographical Memories on Music-Evoked Nostalgia

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THE DETERMINANTS OF AFFECT, EMOTIONAL AROUSAL, AND AUTOBIOGRAPHICAL MEMORIES ON MUSIC-EVOKED NOSTALGIA

by

Alycia J. Sterenberg

A thesis submitted to the Graduate College in partial fulfillment of the requirements for the degree of Master of Music
School of Music
Western Michigan University
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Alycia J. Sterenberg
The purpose of this study is to further explore both person-level and context-level constructs established by Barrett et al. (2010) in relation to music-evoked nostalgia. This study also measures the strength of the relationship between self-reported arousal levels and electrodermal activity (EDA) as well as if they are good predictors of nostalgia. Methods include listening to personalized playlists to elicit feelings of nostalgia while electrodermal activity collects changes in arousal. Participants then answer questions of song familiarity, pleasure, arousal, and autobiographical salience to gather context-level constructs. Results indicate that both person-level and context-level constructs attribute to levels of nostalgia. The two strongest predictors of nostalgia include negative mood state (person-level construct) and autobiographical salience (context-level construct). Mean skin conductance level (SCL) did not correlate with self-reports of arousal. Therefore, this study supports the hypothesis that person-level and context-level constructs influence levels of nostalgia experienced; however, this study is not able to support the hypothesis that levels of EDA correlate with self-reports of arousal. Future research should continue to explore the use of arousal in relation to nostalgia.
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CHAPTER I

INTRODUCTION

Statement of the Problem

Music continuously influences mood by either validating emotions, changing them, and/or provoking new emotions (Juslin, Liljeström, Västfjäll, Barradas, & Silva, 2008). Nostalgia, being one of these emotions, has been classified as a bittersweet sentiment, usually attributed to a combination of positive and negative emotions (Wildschut, Sedikides, Arndt, & Routledge, 2006). Nostalgia is defined as a “sentimental longing or wistful affection for the past, typically for a period or place with happy personal associations,” (Michels-Ratliff & Ennis, 2016, p. 8). Because nostalgia is associated with words such as “yearning,” yet provokes feelings of joy and warmth, it elicits a sense of mixed emotions. With these mixed emotions, individuals tend to experience nostalgia more when in negative mood states and/or are lonely.

Loneliness is a universal phenomenon that can be felt at all stages of life across all cultures. This feeling is associated with negative emotions including unhappiness, pessimism, self-blame, and depression. Loneliness is felt when individuals experience feelings of disconnection and yearn for social connectedness. (Pinquart & Sorensen, 2001).

As individuals age, their proneness to experience loneliness increases. According to Pinquart and Sorensen (2001), 5-15% of individuals over the age of 65 state they experience feelings of loneliness on a frequent basis. In addition, 20-40% of the same age group state they occasionally have feelings of loneliness. However, within the age group of individuals over 80 years old, individual reports of loneliness increase to 50% (Pinquart & Sorensen, 2001).

This increase in proneness for loneliness within older adults may be due to the many losses one experiences during the latter stages of life (e.g. loss of significant others, family, sibling, friends, etc.). Individuals may also experience a sense of loss of social roles within the
community and physical limitations which impedes them from connecting with individuals they value. Levels of loneliness can also be predicted by the quality of social ties within one’s life, and what living environment the individual is residing in (e.g. nursing home, assisted living, etc.) (Pinquart & Sorensen, 2001).

The juxtaposition between loneliness and nostalgia is interesting. Zhou, Sedikides, and Wildschut (2008) summarized findings indicating that loneliness is relational to reducing the perception of social support. However, loneliness is also associated with stronger levels of nostalgia proneness. In turn, the use of nostalgia then creates higher levels of perceived social support (Zhou, Sedikides, & Wildschut, 2008).

The concept that nostalgia counteracts loneliness can then be used in a music therapy clinical setting with older adults to reduce loneliness and increase social connectedness. Music therapists utilize music to assist in the memory and recall of events within their life, (de l’Etoile, 2014). Within this intervention, music therapists may be able to provoke feelings of nostalgia and use those feelings to create experiences of social connectedness to counteract feelings of loneliness; in turn, improving mood states and quality of life.

**Rationale for the Research**

According to the literature, nostalgia induced by music-evoked autobiographical memories is dependent upon a person’s current mood state and familiarity, enjoyment, and emotional arousal in response to the music stimulus. Barrett et al. (2010) breaks these different constructs into two different measures (person – level and context – level constructs). Person – level constructs measure the person’s relationship to the song. This includes the individual’s mood state and his/her level of proneness for nostalgia. Context – level constructs measure the individual’s levels of familiarity, enjoyment, autobiographical association, and emotional arousal
in response to the song. The interaction between person – level and context – level is thought to increase an individual’s music-evoked nostalgia.

Though there is a large amount of literature published on the relationship between music and memory, there are few publications on the interactions between music and memory in relationship to provoking nostalgia (Wildschut, Sedikides, Arndt, & Routledge, 2006). The purpose of this research is to further explore a variety of constructs and their relationship to nostalgia, and to understand specifically what elicits feelings of nostalgia.

The primary research uses a self-assessment of the level of emotional arousal in response to the music-evoked nostalgia. However, the research does not indicate the validity of the self-assessment in terms of actual emotional arousal. *Electro-dermal activity* (EDA) is a proxy measure to determine the strength of emotional arousal through skin conductance levels (Braithwaite, Watson, Jones & Rowe, 2013). Elevated emotional arousal levels may be due to a high level of familiarity and increased pleasure of the piece (Bosch, Salimpoor, & Zatorre, 2013). However, according to Trost, Ethofer, Zentner and Vuilleumier (2011), nostalgia is considered a low-arousal emotion activating different areas of the brain in comparison to high-arousal emotions such as joy and power. This study will then also explore the relationship between music-evoked nostalgia and emotional arousal responses through EDA.

**Purpose**

The purpose of this study is to further explore both person – level and context – level constructs established by Barrett et. al (2010) in relation to music-evoked nostalgia. This study will also determine the strength of the relationship between self-reported arousal levels and EDA as well as if they were good predictors of nostalgia.
**Research Questions**

The following research questions serve as a basis for this study:

1. How do person-level constructs (mood state and nostalgia proneness) along with context-level constructs (familiarity, enjoyment, autobiographical association, and emotional arousal) influence levels of music-evoked nostalgia?

2. Is music-evoked nostalgia emotionally arousing?
   a. Does EDA correlate with individuals’ self-assessments of emotional arousal?
      i. Is the use of self-assessments for emotional arousal a valid measurement?
      ii. Is EDA a better representation for emotional arousal in relation to nostalgia?
   b. If emotional arousal is not a good indicator of predicting nostalgia, what is the purpose of exploring emotional arousal?
CHAPTER II
REVIEW OF RELEVANT LITERATURE

Overview of Memory

Per Revlin (2012, p. 119), memory is “the mechanism that allows us to retain and retrieve information over time.” It allows us to develop schemas of both ourselves and the world around us. The different types of memory can be broken up into two main categories: short-term and long-term memory. Short-term memory is responsible for moment to moment memory with the ability to recall seven items at a time, plus or minus two, while long-term memory is memory that can be recalled later. Long-term memory has two subcategories: implicit and explicit memory. Implicit memory encompasses information that the body subconsciously stores. This would include the completion of motor tasks (e.g. riding a bike) within procedural memory and memory of one’s surroundings (e.g. smell of roses) within perceptual memory. Explicit memory includes factual knowledge (e.g. water is made up of hydrogen and oxygen) within semantic memory and event specific knowledge (e.g. first concert attended) within episodic memory. Further, autobiographical memories are events stored in relation to one’s self that pulls from both semantic and episodic memories (Janata, Tomic, & Rakowski, 2007).

Autobiographical Memory

Autobiographical memories are memories wrapped up in the identity of one’s self (Gurr, Foxhall, Shinoda, & Baird, 2014; Janata, Tomic, & Rakowski, 2007). Rosenwald and Ochberg (1992, p. 1) share that these “personal stories are not merely a way of telling someone (or oneself) about one’s life; they are the means by which identities may be fashioned.” Individuals with neurologic impairments who suffer from memory loss begin to lose a sense of self-identify, which in turn may influence mood (Gurr, Foxhall, Shinoda, & Baird, 2014).
According to Conway and Rubin (1993, p. 103), autobiographical memory is “memory for the events of one’s life.” These memories can be strong in sensory detail, allowing the individual to feel like they are reexperiencing the moment. Autobiographical memories can be reexperienced through the lens of the observer’s eyes or from the lens of someone outside of the situation. The purpose of autobiographical memories includes increased self-identity, social bonding, and problem solving for future situations. (Holland & Kensinger, 2010)

Authors code autobiographical memories into levels of recall specificity (micro) and pattern of retrieval (macro) (Cady, Harris, & Knappenberger, 2008; Ford, Addis, & Giovanello, 2011; Janata, Tomic, & Rakowski, 2007). During autobiographical memory recall, one level of specificity tends to build upon the other. The three levels of specificity include: lifetime period, general memory, and event specific memory. Though all three levels pull from both semantic and episodic encoded memories, lifetime period details will entail more factual information (e.g. time period, place, people, etc.), while event specific knowledge will narrow the information more to a detailed event (Cady, Harris, & Knappenberger, 2008; Janata, Tomic, & Rakowski, 2007). Figure 1 is a graphic representation of the three levels of detail within autobiographical memory.
Footnote: This figure displays the three levels of specificity. Top levels pull more information from semantic memories. As memories move towards event specific knowledge, details increase, and information is pulled from episodic memories.

Figure 1. Autobiographical Levels of Detail

Autobiographical memory can also range within importance and emotional connection (Cady, Harris, & Knappenberger, 2008). Increased emotions during encoding may lead to a stronger preservation of the memory and easier retrieval through associative memory (Caddy, Harris, & Knappenberger, 2008; Gurr, Foxhall, Shinoda, & Baird, 2014; Jäncke, 2008). Memories with high emotions result in higher arousal, leading to the formation and maintenance of the memory (Canli, Zhao, Brewer, Gabrieli, & Cahill, 2000; Holland & Kensinger, 2010). This occurs within flashbulb memories or memories with high emotion; memories with high arousal leads to high recall though accuracy of details may not be retained (Cahill et al., 1996; Canli, Zhao, Brewer, Gabrieli, & Cahill, 2000; Holland & Kensinger, 2010). Instead, details important to the narrator’s experience and the emotions felt are stored over accuracy (Holland & Kensinger, 2010). The amygdala is responsible for storing emotionally arousing experiences.
(Cahill et al., 1996; Cahill & McGaugh, 1998; Hamann, 2001). Similarly, it is also responsible for storing emotional responses while listening to music (Omar et al., 2011).

**Music and Emotions**

Music can influence many psychological functions including: emotion, memory, attention, and imagery (Jäncke, 2008; Juslin & Västfjäll, 2008). Further, music is said to evoke strong emotional responses (Blood & Zatorre, 2001; Jäncke, 2008), though the complexity of the emotions experienced has been debated (Juslin, Liljeström, Västfjäll, Barradas, & Silva, 2008; Trost, Ethofer, Zentner, & Vuilleumier, 2011). According to Juslin & Västfjäll (2008), there are six ways in which music can induce emotions including: brain stem reflexes, evaluative conditioning, emotional contagion, visual imagery, musical expectancy, and episodic memory.

The brain stem is responsible for regulating both motor and physiological processes including heart rate, breathing, emotional arousal, and movement. Because of this, the brain stem is responsible for both feelings of arousal and relaxation while listening to music. Evaluative or emotional conditioning refers to classical conditioning one’s self to a particular piece of music when in a specific situation or mood. Therefore, one correlates the song to a particular mood state when listening at a later time. Emotional contagion is when the listener perceives the emotion of music based on the different elements (i.e. tempo, pitch, harmonies, etc.). Therefore, the listener may be interpreting the expressions of the music that are portrayed. Visual imagery occurs when the listeners create visual images based on the music heard, in turn, eliciting specific emotions. Music expectancy occurs when the music deviates from what is expected (i.e. not resolving to the tonic), which results in a surprise related emotion. Finally, episodic memory can be elicited when music from a specific time in one’s life is also associated with a particular emotion. (Juslin & Västfjäll, 2008)
Juslin, Liljeström, Västfjäll, Barradas, & Silva (2008) explored how individuals emotionally react when listening to music. Past studies had debated on whether music was only able to elicit basic emotions (i.e. happy, sad, etc.) or could elicit complex emotions. The study requested that participants measure their emotional experiences in the moment through a carried device. The device sounded at random intervals of the day and asked the participant whether music was present or not. Further, participants were asked questions of what emotions were associated with the music listened to. Results of the study exhibited that 37% of the samples collected were associated with musical experiences and of those musical experiences, 64% of the music had influenced the way the participant felt. Juslin and Laukka (2004) state the most common emotions felt while listening to music include happiness, relaxation, nostalgia, calm, pleasure, love, sadness, and longing.

Juslin, Liljeström, Västfjäll, Barradas, and Silva (2008) also reported participants listened to preferred music 62% of the time and 76% of the time the music was familiar. This supports the findings from Sammler, Grigutsch, Fritz, and Koelsch (2007) stating that increased pleasantness of the music increases frontal midline (Fm) theta power, reflecting an increase in emotional processes. Trost, Ethofer, Zentner, and Vuilleumier (2011) explored the complexity of emotions felt while listening to music. Participants listened to 27 excerpts of music while in an fMRI and reported experienced emotions. The purpose of the study was to map musical emotions felt (not perceived) within the brain. This study was the first to preliminarily map both emotional valence and arousal levels within the brain. Interestingly, the study was also able to identify mixed emotions (exhibiting both positive and negative valence) such as nostalgia.

Due to emotional conditioning (mood influencing the music), and the emotional contagion (music influencing mood), the influence of emotions may depend on the goal of the listener to whether the emotions experienced are perceived, changed, or validated (Juslin &
It may also be difficult to say if the emotion experienced was encoded or if it is being recalled (Holland & Kensinger, 2010; Spreng, Mar, & Kim, 2009). Autobiographical knowledge is stored within associative networks as memories with strong emotional valence and emotional arousal can be used to enhance memory to assist with recall (Jäncke, 2008).

**Music-Evoked Autobiographical Memories**

Music is intertwined in many specific episodes of life due to society’s use of music within events or rituals. In addition, individuals tend to spend about 37-38% of each day listening to music (Juslin, Liljeström, Västfjäll, Barradas, & Silva, 2008). Though most music listening is done individually, a large portion of music-evoked autobiographical memories (MEAM’s) are from social interactions (Janata, Tomic, & Rakowski, 2007).

Early in one’s life, an individual’s music preference reflects his or her parent(s)’ preferences. Cultural transmission is the “passing of knowledge, skills, abilities to communicate, and social norms in a social context rather than biologically” (Krumhasl & Zupnick, 2013, p. 2057). This is seen within a music context when music passed down from generation to generation shapes an individual’s autobiographical memories, preferences, and emotional responses (Krumhasl & Zupnick, 2013).

Sixty-two undergraduate participants listened to a series of 11 music clips and rated their familiarity, enjoyment, emotional responses, and personal memories they had with the music. Results revealed a trend for increased personal memories at two peak points, one of listening to music with their parents, and one of listening to their own music preferences. In addition, personal memories correlated with whether the individual enjoyed the song (Krumhasl &
This may indicate that music-evoked autobiographical memories (MEAMS’s) may be distributed differently over an individual’s lifetime in comparison to other memories.

The reminiscence bump is coined as a period in which an individual past the age of 40 recalls the largest number of memories between the years they were 10 and 30 years old (Janssen, Chessa, & Murre, 2005). This may be due to the many important “first time” events (e.g. graduation, marriage, children, etc.) that occur during this period (Krumhasl & Zupnick, 2013). Therefore, because of both the cultural transmission and the reminiscence bump phenomenon, it may be difficult to delegate certain songs within one’s life to provoke MEAM’s.

Music-evoked autobiographical memories (MEAM’s) are songs that trigger these self-defining moments of one’s past (Janata, Tomic, & Rakowski, 2007). North, Hargreaves, and Hargreaves (2004) report that 10.1% of music listening is used to bring back memories. MEAM’s have been found to be associated with familiar songs (Ford, Addis, & Giovanelle, 2001; Janata, Tomic, & Rakowski, 2007) and positive valence in comparison to negative (Janata, Tomic, & Rakowski, 2007; Jäncke, 2008; Juslin, Liljeström, Västfjäll, Barradas, & Silva, 2008). Primarily, older adults reported higher emotions correlated with MEAM’s from their youth (Schulkind, Hennis, & Rubin, 1999), which supports the reminiscence bump phenomenon.

Beneficial to individuals with memory impairments, MEAM’s do not require high levels of cognitive processing (El Haj, Mohamad, Fasotti, & Allain, 2012; Ford, Addis, & Giovanello, 2001; Gurr, Foxhall, Shinoda, & Baird, 2014). Studies observed individuals with memory impairments could use music to assist with the recall. This indicates that autobiographical memories are involuntary and associated with emotional memories that are cued through sensory stimuli including music (El Haj, Mohamad, Fasotti, & Allain, 2012). MEAM’s also contain more details in comparison to other retrieved autobiographical memories and were associated with positive emotions, in turn, increasing positive affect (El Haj, Mohamad, Fasotti, & Allain, 2012).
This positive affect then serves as a retrieval for memories of similar emotions, (Schulkind, Hennis, & Rubin, 1999). Bower’s Associative Network Theory supports this idea that specific thoughts and events of a particular emotion are linked to similar emotions during the encoding process, stating that music can then change our mood when accessing emotions of positive valence (Holland & Kensinger, 2010). The most common emotions experienced with MEAM’s include happiness, youthfulness, and nostalgia (Janata, Tomic, & Rakowski, 2007).

Nostalgia

History of Nostalgia

Johannes Hofer, a Swiss physician, was the first to coin the word “nostalgia” when observing negative symptoms among Swiss mercenaries involved in foreign trade. Nostalgia was considered a medical or neurologic disease as it displayed negative physiological and behavioral symptoms (i.e. heartbeat irregularity, insomnia, anxiety, etc.). Further, military physicians noticed that nostalgia was primarily diagnosed among the Swiss and believed it was from damage to the eardrum and brain due to the constant clanging of the cowbell in the Alps. (Wildschut, Sedikides, Arndt, & Routledge, 2006)

Within the 19th century, nostalgia was no longer characterized as a neurologic disorder, but instead was a type of depression. It was not until the 20th century, that nostalgia began to separate itself from the concept of homesickness due to its positive word associations (i.e. warmth, childhood memories, old times). In turn, new definitions were established implying that nostalgia was related to a general longing of one’s past in comparison to specifically longing for home (Wildschut, Sedikides, Arndt, & Routledge, 2006).
**Uncovering Nostalgia**

According to Michels-Ratlliff and Ennis (2016, p. 8), *nostalgia* is defined as a “sentimental longing or wistful affection for the past, typically for a period or place with happy personal associations.” It is characterized as a mixed emotion due to its bittersweet sentiment of positive and negative feelings. Nostalgia derives from the Greek words notos (return or homecoming) and algos (pain or long), longing for the past (Wildschut, Sedikides, Routledge, Arndt, & Cordaro, 2010). As nostalgia was studied further, it became apparent the many uses of nostalgia and how it can be beneficial in a clinical manner.

Routledge, Arndt, Sedikides, and Wildschut (2008) summarized the four primary reasons for nostalgia: repository for positive emotions, self-positivity, social connectedness, and to provide meaning to life. Later, a fifth reason was discovered that nostalgia can also assist in coping with pain (Zhou, Wildschut, Sedikides, Chen, & Vingerhoets, 2012). Though nostalgia was originally characterized with negative physiological and behavioral symptoms, it turns out individuals were using nostalgia to cope and counteract these negative feelings.

Nostalgia’s positive and negative emotions (i.e. happiness and sadness) may be attributed to the change in mood states. Initially, individuals report higher negative mood states prior to nostalgia and then move to a more positive mood state following. Individuals who report higher negative mood states and loneliness also report stronger feelings of nostalgia (Sedikides, Wildschut, Arndt, & Routledge, 2008; Wildschut, Sedikides, Arndt, & Routledge, 2006; Wildschut, Sedikides, Routledge, Arndt, & Cordaro, 2010).

Nostalgia serves as a repository for positive emotions (Holak, & Havlena, 1998). Holak and Havlena (1998) analyzed 164 written narratives looking at the specific emotion of nostalgia. Eight judges then rated the narratives on emotions concluding more positive emotions were expressed including feelings of joy and warmth. Abeyta, Routledge, Roylance, Wildschut, and
Sedikides (2015) corroborated this concept by also analyzing the content of nostalgia. Again, though positive and negative emotions were reported, more positive emotions were attributed to feelings of nostalgia than negative. Finally, Cady, Harris, and Knappenberger (2008) observed negative mood states decrease after experiencing feelings of nostalgia. The Positive and Negative Affect Schedule (PANAS) was administered both before and after the elicitation of nostalgia. PANAS negative mood scores were significantly lower after experiencing nostalgia.

Nostalgia serves as a resource for the self and is linked to autobiographical memories of the self, consisting of positive associations. Therefore, even when individuals are given negative feedback on performance, they are able to access more positive self-attributes when engaged in nostalgia, creating higher self-esteem (Vess, Arndt, Routledge, Sedikides, & Wildschut, 2012.) Stephan et al., (2015) further attributed high self-esteem induced by nostalgia to the increase of both inspiration and motivation. These self-affirming attributes are then an important coping mechanism for maintaining a positive view of the self, especially when threats to self-esteem occur.

Nostalgia strengthens social connectedness. Being that nostalgia is a social emotion, it can provide references to increase social relationships. Sedikides et al. (2016) states nostalgia increases the sense of belonging and acceptance, fostering an increase in social connectedness. Twenty participants received lyrics to a song that would personally elicit nostalgia. To establish a control, another twenty individuals were given matching lyrics to read. After reading, participants were requested to report on nostalgia and social connectedness. Those who read lyrics personal to them reported higher levels of experienced nostalgia, self-continuity, and social connectedness compared to the control group. Zhou, Sedikides, Wildschut, and Gao (2008) also reported increases in perceived social support for those in the nostalgia condition compared to control group. The nostalgia condition was instructed to bring a nostalgic experience to mind.
while the control group was to bring an ordinary experience to mind. Following the recalled experience, individuals completed measures on perceived social support. Those who recalled nostalgic experiences reported higher perceptions of social support counteracting prior experienced feelings of loneliness.

Nostalgia provides meaning to life. Routledge, Arndt, Sedikides, and Wildschut (2008) explored the use of nostalgia in coping with fears of death. Participants were either assigned to a nostalgia group or a control group and were instructed to either recall a nostalgic or ordinary event. Following, participants were given an assessment measure on mortality salience. Those within the nostalgia condition reported less accessibility to thoughts of death in comparison to the control group. This may be because nostalgia provides a positive, self-relevant memories attributed to meaningful life events of the self.

Finally, nostalgia assists with coping with pain. Zhou, Wildschut, Sedikides, Chen, and Vingerhoets (2012) observed feelings of warmth experienced when nostalgia was recalled. Within the first study, participants reported perceptions of warmer temperatures when experiencing nostalgia. Further, participants were to complete a cold pressure task. Participants were to either bring to mind nostalgic autobiographical memories or ordinary autobiographical memories. Those in the nostalgia group were able to immerse their hand for a longer period, manipulating the perception of pain experienced.

*Music-Evoked Nostalgia*

As discussed previously, nostalgia is an emotion that is linked to memories of the self, creating meaning to one’s life. This is because nostalgia is associated with autobiographical memories usually consisting of the self as the protagonist (Wildschut, Sedikides, Arndt, & Routledge, 2006). Knowing that autobiographical memories can be evoked through musical
experiences, Janata, Tomic, and Rakowski (2007) observed music could also elicit feelings of nostalgia. These nostalgic experiences are stated to occur on a mixture of both person–level (individual differences between the listeners) and context–level (person’s relationship to the song) constructs (Barrett et al., 2010).

Barrett et al. (2010) and Michels-Ratliff and Ennis (2016) explored these person–level and context–level constructs in relation to music-evoked nostalgia. In both studies, participants were asked to listen to a variety of chosen songs that were thought to elicit feelings of nostalgia. Prior to listening to the music selections, participants assessed their current mood state with the Positive and Negative Affect Schedule (PANAS) and their level of proneness for nostalgia with the Southampton Nostalgia Scale (SNS). After listening, participants were asked to indicate their relationship to songs through self-report questions of familiarity, pleasure, autobiographically salience, and arousal. Studies indicated that nostalgia was stronger when the song elicited higher autobiographical salience, arousal, familiarity, and mixed emotions. However, neither study explored the use of physiological measurements when experiencing nostalgia in comparison to self-reports of arousal. Belfi (2015) reported differences between perceived emotions and emotions experienced. Therefore, the use of self-reports may not provide the entire picture of what the individuals is experiencing emotionally during the listening experience.

**Electrodermal Activity**

Electrodermal activity (EDA) is defined as the “automatic changes in the electrical properties of the skin,” (Braithwaite, 2013, p.3). The history of electrodermal activity (EDA) dates to the late 1800’s. A French researcher Fére discovered small currents traveling between two points of contact were able to measure skin resistance in response to the presence of an external stimuli. Further, a Russian researcher by the name of Tarchonoff was able to measure
the same electrical changes without the presence of an external current. This was then termed as an Exosomatic method, which is now the preferred method within EDA data collection (Dawson, Schell, & Filion, 2007).

EDA is used to track physiological changes that correlate with different emotional and cognitive states (Braithwaite, 2013). It works through an electrical potential that is established between two points of skin contact. The skin is important as it is responsible for maintaining water and body temperature through the vasoconstriction and dilation of sweat glands. As the sweat gland becomes more constricted, it fills up creating a more conductive pathway. EDA then uses this pathway to measure skin conductance through electrical activity (Dawson, Schell, & Filion, 2007). The output of the electrical potential results in two components including Skin Conductance Level (SCL) and Skin Conductance Response (SCR). SCL measures the tonic level of the electrical conductivity of the skin and SCR measures the phasic change in the electrical conductivity of skin (Braithwaite, 2013).

To establish these two points of contact, electrodes are placed on the skin with double sided-adhesives. The adhesives assist in two ways. The first is to hold the electrode in place during data collection and the second is to help define the area of contact. In addition, electrode paste is placed on the skin to resemble sweat. This assists in gaining a clear read between the skin and the electrode. Across studies, there continues to be variability within the placement of electrodes on the hands. Some studies indicate placement on opposite sides of the palm, while others use either the medial or distal areas of the phalanges. It is important to note that while studies differ, not all sites collect arousal comparably. For instance, data collection at medial and distal points are attributed with higher SCL and SCR readings. Further, there has been no evidence to support the preference of dominant or non-dominant hand. Typically, studies will
collect data with the non-dominant hand so that participants can perform necessary tasks with the other. (Dawson, Schell, & Filion, 2007)

**Music, Emotion, and EDA**

As previously discussed, music can evoke strong emotional responses (Blood & Zatorre, 2001; Jäncke, 2008). These emotional responses to music have been measured using physiological measurements (Bosch, Salimpoor, & Zatorre, 2013; Rickard, 2004; van der Zwaag, Janssen, & Westerink, 2013). van der Zwaag, Janssen, and Westerink (2013) had participants record their physiological reactions through EDA while listening to music categorized as either calming or exciting. Participants were then asked to rate if their mood went up or down with each song. EDA was congruent to self-reports of mood. Rickard (2004) had participants listen to relaxing music, arousing music, an emotional movie clip, and an emotionally powerful music piece. Emotional music produced significantly higher physiological responses compared to all other conditions. Because of EDA’s ability to measure arousal levels while listening to music and nostalgia is reported as emotionally arousing, self-reports of arousal and physiological measurements through EDA should correlate while listening to music-evoked nostalgia.

**Summary**

In summation, music-evoked nostalgia is a complex phenomenon that has not been thoroughly explored. There are multiple constructs that assist in music-evoked nostalgia both at a person – level and context – level (Barrett et al., 2010). Within the person – level construct, the literature states that one must be prone to nostalgia (Barrett et al., 2010). One’s mood state is also a determinant of the likelihood that nostalgia is experienced. Typically, individuals within a negative mood state report higher levels of nostalgia (Zhou, Sedikides, & Wildschut, 2008). In addition, nostalgia is specifically associated with autobiographical memories (Janata, Tomic, &
Rakowski, 2007); therefore, the song must be familiar and enjoyable to the listener. The primary literature also states that strong emotions are correlated with high emotional arousal (Barrett et al., 2010). However, Trost, Ethofer, Zentner and Vuilleumier (2011) state that nostalgia is not considered a high-arousing emotion due to the different areas of the brain that are active in comparison to other emotions. Therefore, the purpose of this study will be to continue to explore both person – level and context – level constructs established by Barrett et al. (2010) and their relation to music-evoked nostalgia. This study will also determine the strength of the relationship between self-reported arousal levels and EDA as well as if they were good predictors of nostalgia.
CHAPTER III

METHOD

Sample Frame

Sample Size Calculations

Individuals for this study were recruited from a sample of students at Western Michigan University. The sample size of the study was determined by using the G*Power program (version 3.1) with an effect size of 0.25, an alpha level of 0.05, a beta level of 0.8, and conditions set at 2. A priori calculations determined that 32 participants were needed to be fully powered. Inclusion criteria required all participants were between 18 – 28 years of age (Barrett et al., 2010). The age range was specifically chosen to resemble the studies used as a model for this thesis project (Barrett et al., 2010; Michels-Ratcliff & Ennis, 2016) as information was used to compare findings across studies. Western Michigan University students were specifically selected as a sample of convenience. Individuals who self-reported hearing loss were excluded due to the need for an individual to successfully listen to the presented stimuli (music) to complete study procedures.

Recruitment

Participants were recruited through advertisements posted in Western Michigan University’s buildings and general public posting boards located on the main campus (See Appendix A). Recruitment was also achieved through email. Faculty from the departments across campus were contacted to request their assistance in contacting their students with the recruitment email (See Appendix B). Potential participants were then provided with information regarding participation in the study prior to scheduling a meeting for the informed consent
process (See Appendix C and Appendix D).

Participants

A total of 30 participants completed the study. Participants in this study had an age range of 18-28 years ($M = 22.07$, $SD = 2.74$) with 18 females (60%) and 12 males (40%). The racial/ethnic background reported by participants included: 73.3% White, 13.3% Asian/Pacific Islander, 3.3% Black/African American, 3.3% Hispanic/Latino, 3.3% Syrian American, and 3.3% Middle Eastern / Chaldean. Fifty percent indicated that they identified themselves as a musician, meaning they had taken more than one year of musical training or had any training within the last three years. Fifty percent identified themselves as non-musicians.

Design

This study was conducted through a mixed multilevel model with repeated measures. Both person – level and context – level constructs were collected from each participant creating a multilevel model (Barret et al., 2010). Figure 2 displays a visual of the two-level model with each song trial (Level 1) nested within participants (Level 2).

*Figure 2. Visualization of Two-Level Model Design*
Multiple regression was used to determine how well the predictor variables (i.e., current mood condition, nostalgia proneness, familiarity, enjoyment, arousal, and autobiographical salience) predict the outcome variable, nostalgia. This design was chosen to resemble the previous studies using the core design and procedures as guidelines (Barrett et al., 2010; Michels-Ratliff & Ennis, 2016).

**Apparatus**

Equipment and materials used to administer this thesis project included a 27-inch 2012 iMac computer, two 13-inch 2012 iMac laptops, Koss headphones Model # T55959, headphone extension cord, Positive and Negative Affect Schedule (Watson, Clark, & Tellegen, 1988), Southampton Nostalgia Scale (University of Southampton, 2017), Pandora © subscription, SurveyMonkey subscription, SPSS Statistics (Version 20; Armonk, 2011), EDA administered through BioNomadix MP150 (model #507), AcqKnowledge Version 4.3, and EDA equipment (wireless transponder (model #BN-PPGED), adhesive disks, isotonic recording gel, medical tape, and alcohol cleaning pads).

After consent was given, the participant identified five songs that elicit feelings of nostalgia. Nostalgia was defined as “a wistful or sentimental longing for the past, and typically involves a particular time or place with some personal association,” (Michels-Ratliff & Ennis, 2016, p.8). The student investigator then placed these five songs into a personal Pandora playlist that generated new songs similar to those that the participant initially indicated. Therefore, a subscription to Pandora was necessary to create personal playlists and have advertisement free listening. A complete list of songs participants chose can be found in Appendix L.

All music selections were played through the sound source of an iMac laptop and with the Koss headphones. The headphone extension cord was used so that the participant could
independently sit in a separate room apart from the researchers who were collecting the data. The second iMac laptop was used for the participant to answer questions regarding nostalgia following each listening selection. To answer these questions, the student investigator used SurveyMonkey to administer all assessment measures. This assisted in collecting accurate data that was transferred directly into SPSS.

The Positive and Negative Affect Schedule (PANAS) and Southampton Nostalgia Scale (SNS) were administered prior to listening to the songs tailored to the participant (Barrett et al., 2010; Michels-Ratliff & Ennis, 2016). The purpose of this was two-fold: 1) assess if the individual’s mood was related to their listening and their nostalgia proneness, but 2) to allow the student researcher to evaluate if the participant had the potential to be in a state of nostalgia (Barrett et al., 2010).

EDA signaling was collected using the BioNomadix MP150 (model #507) data acquisition and analysis system. This system contains a wireless transponder and a Velcro strap that was attached to the wrist of the participant. The BioNomadix also contains 8mm disposable electrodes (model EL-658) that were placed on the participant’s distal pads of the third and fourth digit of the non-dominant hand with the use of electrode conductivity gel, disposable adhesive discs (model ADD 208), and medical tape. Following the completion of data collection for each participant, all items the participant used (iMac laptop, headphones, and electrodes) were wiped down with alcohol cleaning pads for sanitation purposes. All EDA data was collected on the 27-inch 2012 iMac computer through the program AcqKnowledge which was also used for EDA analysis. Below is a model representation of the data collection layout (See Figure 3).
Procedure

After consent had been given (See Appendix K), individuals were asked to provide demographic information (See Appendix E) regarding gender, age, ethnicity, previous music experience, and identified three primary genres of music that they listened to while growing up. In addition, individuals were asked to indicate five songs that provoked nostalgia by indicating the song title and artist. A list of the top ten songs from the 100 Billboard list was generated over a span of 15 years from the participant’s late childhood to early adult years (7-25 years old) (Barrett et al., 2010) (See Appendix I). This list was used for the participant to reference as potential song options. The participant, however, was not be restricted to this list of songs nor a particular time span but prompted to indicate music selections that specifically provoked
nostalgia for them individually. This method of song selection was selected to model a similar study exploring intentional physiologic responses (Blood & Zatorre, 2001).

During the first session, participants also created their own 5-digit code composed of letters and numbers to identify their personal selected playlist at a later time. Once the individual had identified his/her five songs that they were confident would provoke nostalgia, the songs were then inputted into his/her own Pandora playlist and used during the second session (Michels-Ratliff & Ennis, 2016; Pandora Media, 2017; Tingle, Kim, & Turnbull, 2010). At the conclusion of the first session, the student researcher inputted the selected songs into the participant’s own Pandora playlist marked by the 5-digit code created by the participant.

Participants then came back at a later time agreed to by the participant and student researcher to complete the second session. The participant was instructed to sit in front of a computer, while the student researcher read the description for data collection (See Appendix J). The description informed the individual that he/she would listen to a total of four songs and answer a variety of questions at the conclusion of each song. Once the script was read, the BRAIN Lab Manager applied the electrodes, beginning by instructing the participant to place his/her non-dominant hand in supine position.

The electrodes were placed on the distal pads of the third and fourth digits of the non-dominant hand (Bosch, Salimpoor, & Zatorre, 2013). The participant was then asked to leave his/her hand on the table in supine position and avoid moving it for the duration of the session, to avoid the creation of signal noise. A towel was placed over the participant’s hand to increase comfort and to ensure the participant’s hand stayed warm throughout the duration of the listening experience. Keeping the participant’s hand warm provided better EDA readings according to Biopac System, Inc. (2018). The participant was instructed to use his/her dominant hand to answer questions using a mouse at the conclusion of listening to each song. The participant was
then instructed to place headphones on his/her head and find a comfortable position. When ready, the participant completed the Positive and Negative Affect Schedule (PANAS) (See Appendix G) (Watson, Clark, & Tellegen, 1988) and the Southampton Nostalgia Scale (SNS) (See Appendix F) (University of Southampton, 2017).

The purpose of these scales was not only to assess if the individual’s mood influenced their listening, but also to allow the student researcher to evaluate if the participant had the potential to be in a state of nostalgia (Barrett et al., 2010). The PANAS is a measurement used to capture the underlying mood affect, both positive and negative. Prior to the development of the PANAS, scales measured positive affect and negative affect via separate scales and were unreliable (Watson, Clark, & Tellegen, 1988). It was originally thought that positive and negative affect correlated each other; however, they were found to be unique measures indicating different mood states. For instance, high positive affect indicates that the individual is engaged and has high energy, while low positive affect indicates sadness and lethargy. Separately, a high score in negative affect indicates distress, fear, and disgust, while a low score in negative affect indicates calmness and serenity (Watson, Clark, & Tellegen, 1988). Watson, Clark, and Tellegen (1988) created a scale indicating reliability and internal consistency to measure individual’s current mood state.

In addition, the Southampton Nostalgia Scale was initially used in the Routledge, Arndt, Sedikides, and Wildschut (2008) study observing the use of nostalgia as a coping mechanism with death. The Southampton Nostalgia Scale correlated with the already established and reliable Batcho Nostalgia Inventory, indicating that higher scores reflect greater nostalgia proneness (Routledge, Arndt, Sedikides, & Wildschut, 2008). The original scale contained five questions, however, an updated version containing seven questions was used in Barrett et al., (2010). This
version was used for the present study. Both scales were obtained from their original sources and do not require specific credentials in order to administer.

The participant then listened to a total of four selected songs that were previously tailored for the participant. Following each listening portion, the participant answered a variety of questions concerning the level of familiarity, enjoyment, nostalgia, arousal, and autobiographical association (See Appendix H). It is important to note that the terms autobiographical salience and association are used interchangeable in this study. Although this phrase is not typically defined, autobiographical association was broadly defined to participants as memories of the self in association to the song they listened to.

The time spent answering questions served as a new baseline. No more than one participant participated in data collection at a time. This ensured that only music tailored to the participant was heard. After each participant had completed the listening portion, the student researcher provided participants with an Amazon gift card for their participation in the study. Below is a figure of the procedure for data collection (See Figure 4).

Figure 4. Data Collection Procedure

Analysis of Data

The purpose of this study was to further explore both person – level and context – level constructs established by Barrett et. al (2010) and their relation to music-evoked nostalgia. In addition, this study also measured emotional arousal through the use of EDA and self-report measures. The research questions include how person – level and context – level constructs
influence levels of music-evoked nostalgia and how EDA correlates with individuals’ self-assessments of emotional arousal. The following analyses were approved by Dr. Joshua Naranjo, Director of the Statistical Consulting Center.

**Multiple Regression**

This study used a mixed or multilevel model with repeated measures. Multiple regression was used to determine how well the predictor variables (i.e., current mood state, nostalgia proneness, familiarity, enjoyment, arousal, and autobiographical salience) predict the outcome variable, nostalgia.

Multiple regressions assisted in determining the overall fit (variance explained) across each predictor variable and their general level of contribution to the outcome variable. Therefore, the coefficient of determination (r²) states what percentage current mood condition, nostalgia proneness, familiarity, enjoyment, arousal, and autobiographical salience explains nostalgia.

The analysis was conducted using SPSS Statistics (Version 20; Armonk, 2011). In order to interpret each coefficient, three assumptions needed to be made for the regression model to be determined as valid. These three assumptions are linearity, homoscedasticity, and normality of the residuals. First, linearity needs to be assumed stating that there is a relationship between each predictor variable and the outcome variable. Second, homoscedasticity should be assumed stating that all data points on average are the same distance away from the regression line. Third, normality of residuals needed to be assumed by determining that the residuals represent a normal bell-shaped curve. If the regression matches all these assumptions, then one can continue to regress the predictor variables on the outcome variable to determine the confidence in the relationship between variables. If the regression does not match these assumptions, then external validity cannot be assumed.
After all assumptions were assumed, the student-investigator interpreted each predictor coefficient to determine if each coefficient was significant. Finally, the coefficient of determination was used to determine the percentage that the predictor variables explain nostalgia.

*Analysis of Electrodermal Activity*

EDA varies from person to person and moment to moment by the millisecond. Therefore, in order to compare participants’ data, two different methods were used. The first was to obtain the inter-individual differences in physiological activity by calculating each individual’s EDA range. This is done by calculating the mean from the SCL during the baseline tasks and subtracting it from the SCL collected during the activity task. The second was a range correction that was completed to observe the inter-individual differences in variance. This was done by using the range that was computed for each individual participant and then expressing the participant’s momentary value in terms of this range. Therefore, the participant’s value at a given moment can be expressed as a percentage using this formula \((SCL - SCL_{min}) / SCL_{max} - SCL_{min}\) (Bosch, Salimpoor, & Zatorre, 2013).

To compute these values within the listening segments, focus areas were created for each portion of data collection. Portions titled “baseline” consisted of when individuals were answering questions. Areas titled “song” indicated when participants were listening to music selections. Figure 5 provides a visual representation of how focus areas were created. The range was then determined using all focus areas created to establish SCLmax and SCLmin. Following, the equation reported above was used to calculate each participants SCLmean for each song in terms of a proportion of range.
Footnote: This figure displays the focus groups created across data collection. Vertical lines paired with flags mark each focus area for baseline and song listening segments for EDA analysis.

*Figure 5. Example of Focus Areas for EDA*

These values were then analyzed using a Pearson correlation to explore the relationship between mean SCL and self-reported arousal levels experienced while listening to each song. The purpose of this was to determine the strength of the relationship between self-reported arousal levels and EDA as well as if they were good predictors of nostalgia.

Though initially explored, SCR was not calculated or reported after consultation with Biopac technical support. Due to limitations within the analysis software. SCR algorithms are currently not able to distinguish when two SCRs are overlapping (one SCR starting prior to the other one ending) and instead count it as one instead of two. However, every SCR will, in fact, influence the SCL, therefore, for the purposes of this study, only mean SCL was analyzed.
Figure 6 is a visual representation of the software counting seconds 480.00 - 490.00 as one SCR when there are additional inflection points after the initial rise.

Footnote: This figure displays the limitations within SCR analysis. Current SCR algorithms compute seconds 480.00 - 490.00 as one SCR when visually four additional inflection points are seen. Therefore, mean SCL was analyzed as each inflection point will influence SCL.

**Figure 6. EDA Limitations**

*Frequencies Types of Music-evoked Autobiographical Memories*

Autobiographical association frequencies were also examined for the types of autobiographical memories elicited based on associations with people, time, and place. (Barrett et al., 2010; Michels-Ratliff & Ennis, 2016). Frequency tables were used to explain the percentage of songs associated with people by selecting all that apply: friend(s), romantic partner(s), parent(s), sibling(s), no one, or other. A frequency table was also used to present the percentage of songs individuals associated with a specific time or place (school, work, vacation, specific event, specific city/location, none, or other). Finally, a frequency table was used to present the percentage of songs associated across various periods of life (early childhood,
elementary, middle school, high school, early 20’s, and late 20’s). For further analysis, these percentages were compared to the previous studies this study resembles.
CHAPTER IV
RESULTS

To determine the percentage of how well the predictor variables explain nostalgia, nostalgia was regressed on the following eight variables: PANAS positive score, PANAS negative score, SNS composite score, level of familiarity, level of enjoyment, level of self-arousal, level of autobiographical salience, and mean skin level conductance (SCL). In addition, correlations between all variables were analyzed further to determine which relationships were significant. All significance testing used an alpha level set at p<0.05. Statistical tests were advised and approved through a consultation with the Director of Statistical Consulting Center at Western Michigan University. Data analyses were reported according to Discovering Statistics Using SPSS (Field, 2009), which follows the American Psychological Association formatting. A total of 30 participants completed the study to create a total of 120 different listening segments to analyze. Due to EDA technical error, EDA interruptions (e.g. coughing), and missing data, only a total of 101 trials were analyzed and reported for regression in the results.
Multilevel Regression

Prior to exploring the relationship between the predictor variables and nostalgia, three assumptions were analyzed including linearity, homoscedasticity, and normality of residuals. Linearity was assumed stating there is a relationship between each predictor variable and the outcome variable. Second, homoscedasticity was assumed stating that all data points on average are the same distance away from the regression line.

![Scatterplot](image)

Dependent Variable: Nostalgic

Footnote: This graph displays a scatterplot to observe the homoscedasticity of all data points. Homoscedasticity is assumed as all data points on average as the same distance away from the regression line.

*Figure 7. Regression Standardized Predicted Value*
Third, the normality of residuals needs to be determined. The histogram resembles a normal bell-shaped curve; therefore, we can assume normality for the residuals.

![Histogram](image)

**Footnote:** This graph represents the normality of the residuals indicating that the error terms are normally distributed as shown by the bell-shaped curve.

*Figure 8. Normality for the Residuals*

Nostalgia was regressed on both person – level constructs (PANAS positive score, PANAS negative score, and SNS composite score) and context – level constructs (level of familiarity, level of enjoyment, level of self-arousal, level of autobiographical salience, and mean skin level conductance (SCL)). Regression coefficients are presented in Table 1.
Further, the coefficient of determination or $R^2 = .774$, using the adjusted R squared for multiple regression. This states that PANAS Positive, PANAS Negative, SNS Composite Score, level of familiarity, level of enjoyment, level of excitement, autobiographical salience, and the standardized SCL EDA explains 77.4% of the individual’s level of nostalgia.

As predicted, negative mood state and autobiographical salience were the strongest predictors of nostalgia. Negative mood state was the strongest factor in predicting feelings of nostalgia ($\beta = .755, t (101) = 1.999, p < .05$). Autobiographical salience was second strongest factor in predicting feelings of nostalgia ($\beta = .519, t (101) = 7.373, p < .001$) while controlling for all other variables. This was then followed by self-reported enjoyment of the song ($\beta = .225, t (101) = 2.350, p < .05$). Finally, familiarity of the song predicted feelings of nostalgia ($\beta = .099, t (101) = 1.980, p < .05$). Pearson correlations were used to observe the relationships between context – level variables (familiarity, enjoyment, excited, autobiographical salience, nostalgia) while not controlling for all other dependent variables.
Context – Level Constructs and Nostalgia

Familiarity significantly correlated with enjoyment ($r = .52, p < .001$), level of excitement ($r = .46, p < .001$), nostalgia ($r = .50, p < .001$), and autobiographical salience ($r = .56, p < .001$). Enjoyment significantly correlated with level of excitement ($r = .81, p < .001$), nostalgia ($r = .70, p < .001$), and autobiographical salience ($r = .71, p < .001$). Level of excitement significantly correlated with nostalgia ($r = .65, p < .001$) and autobiographical salience ($r = .67, p < .001$). Finally, the level of nostalgia significantly correlated with autobiographical salience ($r = .85, p < .001$).

Table 2

Correlations between Context – Level Constructs

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<th>Familiarity</th>
<th>Enjoyment</th>
<th>Excited</th>
<th>Nostalgia</th>
<th>Autobiographical</th>
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<tr>
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<td>Sig. (2-tailed)</td>
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<td>.000</td>
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<td>.000</td>
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<tr>
<td><strong>Enjoyment</strong></td>
<td>Pearson Correlation</td>
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<td>.698</td>
</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
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<td>.000</td>
<td>.000</td>
<td>.000</td>
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<tr>
<td><strong>Excited</strong></td>
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<td>.807</td>
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</tr>
<tr>
<td><strong>Nostalgia</strong></td>
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<td>.698</td>
<td>.647</td>
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</tr>
<tr>
<td></td>
<td>Sig. (2-tailed)</td>
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<td>.000</td>
<td>.000</td>
<td>.000</td>
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<tr>
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<td>Sig. (2-tailed)</td>
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EDA and Self-reported Arousal

In addition, a Pearson correlation was used to compare self-reports of arousal and mean SCL EDA. There was not a significant relationship between participants’ self-reports of arousal while listening to a selected song and the calculated mean SCL EDA, $r = -.02, p$ (two-tailed) < .1.
Pandora’s Ability to Evoke Nostalgia

Pre-selected songs that provoked feelings of nostalgia were placed in a personal playlist on Pandora. Participants then self-rated their level of nostalgia on a continuous rating scale for songs listened to that were generated from their playlist. Scale numbers were hidden to the participant and numbers ranged from 0-100 on the level of nostalgia experienced. Seventy-five percent of listened songs were self-rated above 50 in evoking nostalgia (50-100 on a 100-point scale). This corroborates the use of Pandora-selected songs in evoking feelings of nostalgia (Michels-Ratliff & Ennis, 2016). The table below reports mean and standard deviations on self-reported information for song familiarity, enjoyments, excitement, nostalgia, and autobiographical salience with Pandora-selected songs (See Table 3).

Table 3

Descriptive Statistics for Context – Level Constructs

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>N</th>
</tr>
</thead>
<tbody>
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<td>Familiarity</td>
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<td>120</td>
</tr>
<tr>
<td>Enjoyment</td>
<td>75.17</td>
<td>27.241</td>
<td>120</td>
</tr>
<tr>
<td>Excited</td>
<td>61.30</td>
<td>26.646</td>
<td>119</td>
</tr>
<tr>
<td>Nostalgia</td>
<td>66.38</td>
<td>29.082</td>
<td>120</td>
</tr>
<tr>
<td>Autobiographical</td>
<td>61.15</td>
<td>32.029</td>
<td>119</td>
</tr>
</tbody>
</table>
Types of Music-Evoked Autobiographical Memories

Together participants listened to a total of 120 songs and selected all that were applicable with associations they had, if any. For associations with people, Friend(s) 46.7%, Romantic Partner(s) 30%, Parent(s) 18.3%, Sibling(s) 14.2%, Other 10%, and No Association 18.3% were reported. Figure 9 shows a visual representation of the data.

Frequencies of Memories with People Associations

Footnote: This graph represents the percentage of music-evoked autobiographical memories association with people.

Figure 9. Frequencies of Memories with People Associations
For associations specifically involving a place, *School* 22.5%, *Work* 5%, *Vacation* 7%, *Specific Event* 27.5%, *Specific City* 15.8%, *Other Place* 25%, and *No Association to Place* 30.8% were reported. Figure 10 provides a visual representation for the percentage of songs associated to a place.

**Footnote:** This graph represents the percentage of music-evoked autobiographical memories that are associated with a particular place.

*Figure 10. Frequencies of Memories with Place Associations*
In addition, this study explored what period in time participants associated specific songs with. Participants could only select one time period per song. For associations for each time period, *Early Childhood* 5%, *Elementary* 6.7%, *Middle School* 15.8%, *High School* 34.2%, *Early 20’s / Undergraduate* 27.5%, *Late 20’s* 1.7%, and *No Association to Time* 9.2% were reported. Figure 11 provides a visual representation of the frequencies individuals ages 18-28 associate songs with.

**Frequencies of Memories with Time Associations**

![Bar chart showing frequencies of memories associated with time periods](chart)

Footnote: This graph represents the time periods associated with music-evoked autobiographical memories for individuals between the ages of 18-28.

*Figure 11. Frequencies of Memories with Time Associations*
Genres Listened to While Growing Up

Prior to identifying songs that elicit nostalgia, participants were asked to select three primary styles of music they listened to most while growing up. The three most listened to genres included Rock 76.7%, Pop 50%, and Alternative 46.7%. Figure 1 displays a visual representation of the primary genres participants listened to while growing up.

![Genres Listened to While Growing Up](image)

Footnote: This figure represents the demographic information gathered prior to data collection on the three primary genres of music listened to while growing up.

*Figure 12. Genres Listened to While Growing Up*
CHAPTER V
DISCUSSION

Results of Dependent Variables on Nostalgia

The analysis for this study consisted of a multilevel model to determine how well the predictor variables (i.e., current mood state, nostalgia proneness, familiarity, enjoyment, arousal, and autobiographical salience) predict the outcome variable, nostalgia. Thirty participants listened to four Pandora-selected songs. A total of 101 songs were analyzed using multiple regression.

This study supports the hypothesis that both person – level constructs (negative affect) and context – level constructs (familiarity, enjoyment, and autobiographical salience) influence levels of music-evoked nostalgia. These results are similar to the modeled studies (Barret et al., 2010; Michels-Ratliff & Ennis, 2016) suggesting there are interactions between these constructs that influence one’s level of nostalgia experience while listening to a song. When regressing all dependent variables on nostalgia, four of the variables were significant in predicting nostalgia. This included the person – level construct of negative mood and three context – level constructs (familiarity, enjoyment, and autobiographical salience).

A negative mood-state highly predicted self-reported ratings of nostalgia while listening to a personal playlist. This suggests that individuals who report higher negative mood states are more likely to experience feelings of nostalgia (Barrett et al., 2010; Sedikides, Wildschut, Arndt, & Routledge, 2008; Zhou, Sedikides, Wildschut, & Gao, 2008). Interestingly, this negative mood state can be counteracted by the experience of nostalgia, in turn, creating a more positive mood (Zhou, Sedikides, Wildschut, & Gao, 2008). Though a negative mood state was a predictor of nostalgia, a positive mood state score was not. In addition, these data do not suggest that nostalgia proneness measured by the Southampton Nostalgia Scale did not predict feelings of
nostalgia. This disconnect may be attributed to the Pandora selected songs used which will be discussed later.

Regarding context – level constructs, autobiographical salience highly predicted feelings of nostalgia. This coincides with the literature that nostalgia involves narratives of the self, usually as the lead role in the story (Barrett et al., 2010; Michels-Ratliff & Ennis, 2016; Sedikides, Wildschut, Arndt, & Routledge, 2008). This use of music-evoked nostalgia is said to be highly important to one’s ability to regulate emotions, which is important in mental health (Blais-Rochette & Miranda, 2006).

Additionally, familiarity and enjoyment of the piece were significant to predicting nostalgia however at a small effect size. This may because 80% of the songs played by Pandora were self-rated above 50 in familiarity (50-100 on a 100-point scale). Level of enjoyment on average was rated slightly higher with 85% of songs self-rated above 50 (50-100 on a 100-point scale). Because so many songs were rated as familiar and enjoyable, the two dependent variables may not have been good predictors of nostalgia. This also shows that just because a song is familiar and/or enjoyable, does not mean it will elicit feelings of nostalgia. Juslin and Laukka (2004) report that emotions felt are while listening to music only 55% of the time. In addition, it may be suggested that individuals have established meaning to particular songs instead of time period or genre of songs (Barrett et al., 2010).

The two context – level constructs that did not predict feelings of nostalgia included a self-report of arousal and the mean SCL within EDA. This suggests that levels of arousal may not predict levels of nostalgia.

Correlations within Context – Level Constructs

Further, Pearson correlations were used to observe the relationships between the context – level constructs while not controlling for all other dependent variables. All relationships were
found to be significant at \( p < .001 \). The strongest relationship was between nostalgia and autobiographical salience (Barrett et al., 2010; Wildschut, Arndt, & Routledge, 2008) followed by enjoyment and arousal.

Autobiographical salience also produced strong relationships between enjoyment, arousal, and familiarity. Further analysis could regress enjoyment, arousal, and familiarity on autobiographical salience to determine potential predictor variables.

Though levels of self-reported arousal did not predict levels of nostalgia, there is still a strong relationship between these two variables. There is also a correlation between level of arousal and familiarity (Bosch, Salimpoor, & Zatorre, 2013).

**EDA and Self-reported Arousal**

There was no correlation between self-reports of arousal and mean SCL. There was a strong correlation between level of self-reported arousal and nostalgia; however, there was not a significant correlation between mean SCL and nostalgia. Though, while controlling for all other variables, both self-reported levels of arousal and EDA did not predict levels of nostalgia. This suggests that self-reports of arousal and EDA are not good predictors of nostalgia.

The choice of using mean SCL was determined with consultation from BioPac Technical Support. Suggestions were given that mean SCL was the best representation to measure the changes in emotional arousal. Originally, SCR was also going to be analyzed however, a discussion emerged that the analysis program does not have the ability to measure SCR as accurately at this time due to technological shortcomings. Because of this, EDA may not be the most appropriate measure for changes in emotional arousal in relation to nostalgia.

Because there was not a relationship between self-reported arousal and EDA, this study does not support the hypothesis that individuals’ self-assessments of arousal correlated with
mean SCL EDA. Further, self-reports of arousal and mean SCL did not predict levels of nostalgia. This may suggest that arousal levels are not a predictor of nostalgia or that there are limitations to this study.

Characteristics of Music-Evoked Autobiographical Memories

Sixty-eight percent of songs were self-rated above 50 on autobiographical salience (50-100 on a 100-point scale). In addition to answering questions in relation to the song listened to, the participants also reported to whom their associations were regarding the memories recalled. These included questions of who, where, and when. Participants typically associated the songs with friends, partners, and family. This corresponds with the literature that music-evoked autobiographical memories are tied to these three groups (Janata, Tomic, & Rakowski, 2007; Michels-Ratliff & Ennis, 2013).

Primarily, participants did not associate songs listened to with a particular place. When reported, participants communicated songs were associated with school or a specific event. Finally, participants primarily associated songs with high school, their early 20’s, and middle school. Though late 20’s was a choice, many participants had not reached their late 20’s and therefore could not report it as an associated time. However, these reports suggest that the songs listened to were primarily from the participant’s adolescent and early 20’s periods of life. This coincides with the literature stating that individuals are most nostalgic about songs from their youth (Krumhansl & Zupnick, 2013; Schulkind, Hennis, & Rubin, 1999).

Summary of Results

The results suggest that both person and context – level constructs influence levels of nostalgia experienced. The two strongest predictors of nostalgia include negative mood state and
autobiographical salience. Primarily, participants associated songs with friends, significant others, family, specific events, and school. Participants also reported that most songs were from periods of high school and early 20’s. Song familiarity and enjoyment also predicted levels of nostalgia though it was not as strong of a predictor. As music therapy clinicians, learning these constructs of nostalgia may assist in the clinical use for counteracting loneliness (Zhou, Sedikides, Wildschut, & Gao, 2008), enhancing social connectedness (Wildschut, Seikides, Routledge, & Ardt, 2010), and increasing self-esteem (Vess, Arndt, Routledge, Sedikides, & Wildschut, 2010). For this study, the reported mean SCL EDA and the self-reported measure of arousal were not good predictors of experienced nostalgia though this may be due to the limitations of this study.

Limitations

A limitation of this study is that it is underpowered. Thirty participants were able to complete the study, however, because this is a multilevel design, more participants and more listening selections would have been needed to be sufficiently powered. Therefore, the results of this study can only be applied to the demographics reported above.

During data collection, participants sat in a separate room from the student researcher with motion activated lights. Prior to listening to the music selections, participants were informed to remain still to ensure accurate EDA data collection. Due to this, the light would occasionally turn on and off during some testing periods, influencing the individual’s level of arousal. In addition, if the student coughed or sneezed during data collection this would also influence the participant’s level of arousal, in turn, increasing their EDA. The student researcher accounted for this during analysis by throwing out song trials in which EDA may have been affected, but this may have still influenced the reported results.
As discussed previously, mood states are said to influence nostalgia proneness (Sedikides, Wildschut, Arndt, & Routledge, 2008). For a period of time during the months of data collection, the weather had presented rainy and/or gloomy, which may have impacted participant mood states. To control for this, the shades in the data collection room were closed for all participants. However, this is not to say that the weather may have influenced responses.

Though Pandora gave more preferred songs comparatively to the both the Michels-Ratliff and Ennis (2016) and Barrett et al., (2010) study, Pandora does rely on the internet which also caused some flaws during data collection. Occasionally, the internet was inconsistent creating periods of silence after a song had started playing or cause a delayed start. This of course, influenced the individuals EDA levels and the accuracy of the EDA collected. Again, the researchers made note of when this occurred and threw out data trials in which accuracy was not guaranteed. In addition, though participants created a list of five songs that elicited nostalgia, the student researcher observed that Pandora would play a certain number of songs from a particular genre. Therefore, if an individual had stated a variety of genres compared to listing songs from one genre, then the participant may have only heard a select few that may or may not have provoked nostalgia. It may be recommended for future studies that a different source be used in which the researcher has the ability to download the songs prior to data collection and/or that a criterion is put in place that individuals with similar genres listed in the first session can further participant in the second session.

The use of mean SCL also requires standardization because of the variability between participants (Lykken & Venables, 1971). Though baselines were taken at the beginning of each listening period, individuals were not at a complete rest. Lykken and Venables (1971) observed SCL range between heightened arousal (i.e. popping of a balloon) and relaxation for 30 minutes and found that the highest point of arousal was twice as high compared to an individual being at
rest. Because a true baseline was not obtained, the mean SCL’s reported as a proportion of the participant’s range may not be the best representation of the level of arousal experienced. Further EDA analysis outside of this project’s requirements may be needed to observe the relationship between arousal and nostalgia. As discussed previously, SCRs were not calculated or reported as originally planned for this study due to the technical limitations of the analysis program.

Finally, though the researchers attempted to flag each portion of the study (listening vs. answering questions) while collecting EDA, the accuracy was not perfect. Future studies would be wise to set up a trigger system for accurate records of when the participant was listening to music and when he/she was answering questions.

Suggestions for Future Research

Future research should include a qualitative portion of the study. Many participants after listening to their selected songs from their personal playlist were thrilled to share their experiences. Some shared that they remember watching MTV music videos or recall particular trips or moments with family or friends. One participant followed up with an email to share a memory of her significant other.

The reason I chose "Music of the Night," from Phantom of the Opera was when my boyfriend and I studied abroad in Brazil during our undergraduate program, he sang this song for a master’s class. When he got to the last line, ‘You alone can make my song take flight,’ he looked straight at me and only me. Our professor then announced to the entire room of 70ish people that I was his girlfriend, and I swear everyone in the room turned to me and started talking to me in Portuguese, which I did not understand! It was both the most romantic and embarrassing thing anyone has ever done for me. I teared up at one point [during the song] because after dating 6 years, doing distance for the past 8 months has definitely been tough! But it was fun to think about that moment.

Future research should use a phenomenological approach to study the feelings associated with these memories or take a narrative approach on how individuals share their experiences and its relation to increasing social connectedness (Creswell & Poth, 2018). Past studies have analyzed
written memories and counted the frequencies of words (Janata, Tomic, & Rakowski, 2007). However, to analyze the content and meaning behind these memories qualitatively may further inform the literature of nostalgia and its clinical use.

Within a quantitative methodological design, further exploration should continue to observe nostalgia and arousal through EDA. If using mean SCL, a true baseline of when the participant is at rest should be collected for a duration of time prior to beginning the listening portion of data collection. This may provide a more accurate range when standardizing scores.

The use of a quasi-experimental, multi-level design may be helpful in choosing songs that both purposefully elicit nostalgia and also provide novel material to compare. Therefore, participants could listen to an identified nostalgic song, a novel song, and a Pandora selected song and compare the responses.

A comparison study should observe music-evoked nostalgia among older adults. Currently, most of the literature established represents undergraduate students. It would be interesting to explore the use of music-evoked nostalgia within older adults to assist in the knowledge development of music therapy interventions for music reminiscence.

Finally, arousal has been linked to feelings of nostalgia (Barrett et al., 2010) however, studies have primarily used self-reported measures to observe the relationship. As discussed previously, self-reported material may be confounded with perceived emotions versus emotional reactions (Belfi, 2015). Therefore, continued exploration between perceived emotions and emotional reactions regarding music-evoked nostalgia should be studied.
APPENDIX A
RECRUITMENT FLYER

VOLUNTEERS NEEDED
For music and nostalgia research study
Flexible Scheduling is available

Overview:
Participants will listen to a variety of music selections and answer questions in order to analyze how music relates to nostalgia.

Requirements:
- Must be between the ages of 18 – 28

Compensation:
Compensation will be provided in the form of a $10 Amazon Card.

For more information contact:
Alycia Sterenberg, MT-BC
alycia.j.sterenberg@wmich.edu

NOSTALGIA & MUSIC STUDY
(269-387-8841)
alycia.j.sterenberg@wmich.edu
NOSTALGIA & MUSIC STUDY
(269-387-8841)
alycia.j.sterenberg@wmich.edu
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alycia.j.sterenberg@wmich.edu

APPENDIX B

INITIAL RECRUITMENT EMAIL

Initial Recruitment Script

Participants are needed for a research study on music-evoked nostalgia. This study is open to WMU students who are between the ages of 18-28. Individuals who have self-reported hearing loss due to the individual’s ability to successfully listen to the presented stimuli (music) may not be able to participate. Compensation will be provided in the form of a $10 Amazon card.

If you are interested in participating in this study, please contact Alycia Sterenberg at alycia.j.sterenberg@wmich.edu or (269-387-8841).

Thank you,
Alycia

Alycia Sterenberg, MT-BC
Graduate Student of Music Therapy
Western Michigan University
Kalamazoo, MI 49008-5434
APPENDIX C

SCRIPT

Script to Respond to Initial Inquiry (E-mail / Phone)

Thank you for your interest in participating in this research study. This study will analyze different constructs and their relation to music-evoked nostalgia. The entirety of the study will last a total of approximately 60 minutes. This time will be across two sessions including the first meeting scheduled below.

If you are interested, please fill out the google form below. Once I have received the necessary information, I will provide you with specific information on when and where to meet to review the informed consent. You will be provided with four options during the informed consent meeting:
(1) You will be given the opportunity to request clarification and ask any questions you may have related to the study.
(2) You can agree to participate in the study and begin participating immediately following the informed consent process.
(3) You can take the informed consent home with you in order to determine whether or not you would like to participate. This will also you to make a decision in your own time.
(4) You may choose to decline in participating in the study with no consequence of any sort.

Availability Form:  
https://goo.gl/forms/66cw2EhOR7y2gVdV2

Please feel free to contact me if you have any questions.

Thank you,
Alycia Sterenberg

Alycia Sterenberg, MT-BC  
Graduate Student of Music Therapy  
Western Michigan University  
Kalamazoo, MI 49008-5434
APPENDIX D

AVAILABILITY FORM FOR INFORMED CONSENT PROCESS

Google Form Link: https://goo.gl/forms/66cw2EhOR7v2gVdV2

Your email is only recorded for correspondence purposes. Once you choose to enroll in the study, all of your information will be de-identified and anonymous. Please provide times in which you are available by selecting the corresponding times. You will not need to provide any additional information, only indicate the available times.

<table>
<thead>
<tr>
<th>Time</th>
<th>Mondays</th>
<th>Tuesdays</th>
<th>Wednesdays</th>
<th>Thursdays</th>
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<td>7:00pm</td>
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APPENDIX E

INITIAL DATA DEMOGRAPHICS COLLECTION

With which sex do you associate? (Please selected one of the following)
- Male
- Female
- Other
- Prefer not to respond

Age:

Please specify your ethnicity.
- White
- Hispanic / Latino
- Black or African American
- Native American or American Indian
- Asian / Pacific Islander
- Other
- Prefer not to respond

Do you consider yourself a musician (meaning have you taken more than one year of musical training, or had any training within the last three years)?
- Yes
- No

We know people often have a diverse music preference. Please select the three primary styles of music you listened to most while growing up:

- Alternative
- Anime
- Blues
- Children’s Music
- Classical
- Country
- Dance / EMD
- Disney
- Easy Listening
- Electronic
- Enka
- French Pop
- German Folk
- German Pop
- Fitness & Workout
- Hip-Hop / Rap
- Indie Pop
- Industrial
- Inspirational – Christian & Gospel
- Instrumental
- J-Pop
- Jazz
- K-Pop
- Latino
- New Age
- Opera
- Pop
- R&B / Soul
- Reggae
- Rock
- Singer / Songwriter
- Soundtrack
- Spoken Word
- Tex – Mex Tejano
- Vocal
- World

Retrieved from: www.musicgenreslist.com
Indicate five songs that personally elicit nostalgia. Nostalgia is defined as a “sentimental longing or wistful affection for the past, typically for a period or place with happy personal associations.” Please indicate the song title and the artist’s name.

<table>
<thead>
<tr>
<th>Song Title</th>
<th>Artist</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
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<td>2.</td>
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<td>3.</td>
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<td>4.</td>
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<tr>
<td>5.</td>
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</tr>
</tbody>
</table>

You may use the Top 100 Billboard List provided as a hard copy to generate ideas.

Please generate a 5-digit code that will be used to identify data information collected. You may use a combination of numbers and letters.

5-digit Code:
APPENDIX F

SOUTHAMPTON NOSTALGIA SCALE

According to the Oxford Dictionary, ‘nostalgia’ is defined as a ‘sentimental longing for the past.’

1. How valuable is nostalgia for you?

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<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much</td>
<td></td>
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</tbody>
</table>

2. How important is it for you to bring to mind nostalgic experiences?

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<tr>
<td>Not at all</td>
<td>Very much</td>
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3. How significant is it for you to feel nostalgic?

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<th>7</th>
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<tbody>
<tr>
<td>Not at all</td>
<td>Very much</td>
<td></td>
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4. How prone are you to feeling nostalgic?

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<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not at all</td>
<td>Very much</td>
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</table>

5. How often do you experience nostalgia?

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<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very rarely</td>
<td>Very frequently</td>
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</tbody>
</table>

6. Generally speaking, how often do you bring to mind nostalgic experiences?

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<th>5</th>
<th>6</th>
<th>7</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very rarely</td>
<td>Very frequently</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

7. Specifically, how often do you bring to mind nostalgic experiences? (Please check one.)

- [ ] At least once a day
- [ ] Three to four times a week
- [ ] Approximately twice a week
- [ ] Approximately once a week
- [ ] Once or twice a month
- [ ] Once every couple of months
- [ ] Once or twice a year

(University of Southampton, 2017)
APPENDIX G

POSITIVE AND NEGATIVE AFFECT SCHEDULE

Worksheet 3.1 The Positive and Negative Affect Schedule (PANAS; Watson et al., 1988)

PANAS Questionnaire
This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below next to each word. Indicate to what extent you feel this way right now, that is, at the present moment OR indicate the extent you have felt this way over the past week (circle the instructions you followed when taking this measure)

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<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
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<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Slightly or Not at All</td>
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<td>A Little</td>
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<td>Moderately</td>
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<td>Quite a Bit</td>
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1. Interested 11. Irritable
2. Distressed 12. Alert
3. Excited 13. Ashamed
5. Strong 15. Nervous
7. Scared 17. Attentive
8. Hostile 18. Jittery
9. Enthusiastic 19. Active

Scoring Instructions:
Positive Affect Score: Add the scores on items 1, 3, 5, 9, 10, 12, 14, 16, 17, and 19. Scores can range from 10 – 50, with higher scores representing higher levels of positive affect. Mean Scores: Momentary = 29.7 (SD = 7.9); Weekly = 33.3 (SD = 7.2)

Negative Affect Score: Add the scores on items 2, 4, 6, 7, 8, 11, 13, 15, 18, and 20. Scores can range from 10 – 50, with lower scores representing lower levels of negative affect. Mean Score: Momentary = 14.8 (SD = 5.4); Weekly = 17.4 (SD = 6.2)


(Watson, Clark, & Tellegen, 1988)
APPENDIX H

CONTEXT – LEVEL MEASURES

Rate your familiarity of the song heard:
0
None......................................................................................................................100
Extremely

Rate your enjoyment of the song heard:
0
None......................................................................................................................100
Extremely

In this present moment, how excited does this song make you feel?
0
None......................................................................................................................100
Extremely

In this present moment, how nostalgic does this song make you feel?
0
None......................................................................................................................100
Extremely

Rate your autobiographical association with the song:
0
None......................................................................................................................100
Extremely

Indicate what you associated with the song. (Janata, 2007; Michels-Ratliff & Ennis, 2016)

(SELECT ALL THAT APPLY) I associate this song with people (past or present):

- Friend(s)
- Romantic Partner(s)
- Parent(s)
- Sibling(s)
- No One
- Other

(SELECT ALL THAT APPLY) I associate this song with a certain time or place:

- School
- Work
- Vacation
- Specific Event
- Specific City / Location
- None
- Other

To the best of your ability, record what period of time you associate this song in your life:

- Early Childhood
- Elementary
- Middle School
- High School
- Early 20’s (undergraduate college)
- Late 20’s
# APPENDIX I

## TOP 10 SONGS 1999 – 2016

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<th>Year</th>
<th>#1</th>
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<td>2012</td>
<td>1. Somebody That I Used to Know</td>
<td>Gotye</td>
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<td>2. Call Me Maybe</td>
<td>Carly Rae Jepsen</td>
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<td></td>
<td>3. We Are Young</td>
<td>Fun feat. Janelle</td>
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<td>4. Payphone</td>
<td>Maroon 5</td>
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<td>5. Lights</td>
<td>Ellie Goulding</td>
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<td>6. Glad You Came</td>
<td>The Wanted</td>
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<td>7. Stronger (What Doesn’t Kill</td>
<td>Kelly Clarkson</td>
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<td>8. We Found Love</td>
<td>Rihanna feat. Calvin Harris</td>
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<td>9. Starships</td>
<td>Nicki Minaj</td>
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<td>10. What Makes You Beautiful</td>
<td>One Direction</td>
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<tr>
<td>2013</td>
<td>1. Thrift Shop</td>
<td>Macklemore &amp; Ryan Lewis</td>
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<td>2. Blurred Lines</td>
<td>Robin Thicke feat. T.I. &amp; Pharrell</td>
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<td>3. Radioactive</td>
<td>Imagine Dragons</td>
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<td>4. Harlem Shake</td>
<td>Baauer</td>
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<td>5. Can’t Hold Us</td>
<td>Macklemore and Ryan Lewis feat. Ray Dalton</td>
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<td>6. Mirrors</td>
<td>Justin Timberlake</td>
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<td>7. Just Give Me a Reason</td>
<td>P!nk feat. Nate Ruess</td>
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<td>8. When I Was Your Man</td>
<td>Bruno Mars</td>
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<td>9. Cruise</td>
<td>Florida Georgia Line feat. Nelly</td>
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<td>10. Roar</td>
<td>Katy Perry</td>
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<td>2014</td>
<td>1. Happy</td>
<td>Pharrell Williams</td>
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<td>2. Dark Horse</td>
<td>Katy Perry feat. Juicy J</td>
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<td>3. All of Me</td>
<td>John Legend</td>
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<td>4. Fancy</td>
<td>Iggy Azalea</td>
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<td>5. Counting Stars</td>
<td>OneRepublic</td>
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<td>6. Talk Dirty</td>
<td>Jason Derulo</td>
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<td>7. Rude</td>
<td>Magic!</td>
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<td>8. All About that Bass</td>
<td>Meghan Trainor</td>
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<td>9. Problem</td>
<td>Ariana Grande</td>
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<td>10. Stay with Me</td>
<td>Sam Smith</td>
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2015
1. Uptown Funk! – Mark Ronson feat. Bruno Mars
2. Thinking Out Loud – Ed Sheeran
4. Fetty Wap – Trap Queen
5. Sugar – Maroon 5
6. Shut Up and Dance – Walk the Moon
7. Blank Space – Taylor Swift
8. Watch Me – Silento
9. Earned It – Weeknd
10. The Hills – Weeknd

2016
1. Love Yourself – Justin Bieber
2. Sorry – Justin Bieber
3. Drake – One Dance
5. Stressed Out – Twenty One Pilots
6. Panda – Desiigner
7. Hello – Adele
9. Can’t Stop the Feeling! – Justin Timberlake
APPENDIX J

DESCRIPTION OF DATA COLLECTION PROCESS

Before we get started, do you need to use the restroom, get a drink of water, or take care of anything. At this time, we are going to start the listening portion of the data collection. You will listen to a total of four songs. This will take a total of 45 minutes.

During this session, we will set up the EDA equipment to measure your body’s responses and request you place the headphones over your ears. Afterwards, you will take two short assessments (PANAS & SNS) to measure your current mood. When this is done, you will listen to four randomly selected songs based off of the preferences you listed in the first session. The music will be administered through the headphones; so please wear them throughout the whole session. Following each listening segment, there will be a period of silence for you to answer some questions about the song. Please follow the instructions presented on your screen. After you are done answering the questions, the next listening segment will begin.

We will now set up the EDA testing material; this will be placed on your non-dominant hand so that you may answer the questions on the computer following. Please remember to keep the hand with the EDA still for physiological accuracy. The BRAIN Lab manager, Meghan, will set up the EDA material for each participant and check to make sure the program is reading you. (Place electrodes)

We will now assist you in placing the headphones over your ears. Once this is in place, we will check to make sure the volume is at a preferred level. Let’s trial a random song; once the volume is at an appropriate level, please indicate this to me by nodding your head. (Check the headphones level)

Now that the EDA is set up accurately and the volume is at a good level, we are almost ready to begin. Just remember to keep your headphones on at all times and keep your hand as
still as possible. At the beginning of each listening portion, it will say “Now will begin the
listening portion of the study… Please click “next” only at the conclusion of the piece.” So, wait
until the song is done prior to clicking the next button.

Do you have any questions before we begin?

I will exit the room and then you may begin.
APPENDIX K

CONSENT FORM

Western Michigan University
Department of Music Therapy

Principal Investigator: Edward Roth, MM, MT-BC
Student Investigator: Alycia Sterenberg, MT-BC

Title of Study: The determinants of affect, emotional arousal, and autobiographical memories on music-evoked nostalgia

You have been invited to participate in a research project titled “The determinants of affect, emotional arousal, and autobiographical memories on music-evoked nostalgia.” This project will serve as Alycia Sterenberg’s thesis for the requirements of the Master of Music Therapy. This consent document will explain the purpose of this research project and will go over the time commitment, the procedures used in the study, and the risks and benefits of participating in this research project. Please read this consent form carefully and completely. If need be, please ask any questions.

What are we trying to find out in this study?

The purpose of this study is to examine physiological reactions, current mood-states, and emotional responses to music and how they relate to nostalgic experiences.

Who can participate in this study?

This study is open to any individual between the ages of 18-28.

Individuals who are not eligible for this study include those younger than the age of 18, older than 28, and individuals who have self-reported a hearing loss that would impede the perception of music samples.

Where will this study take place?

Data collection for this study will take place in the Brain Research and Interdisciplinary Neurosciences (BRAIN) Lab, located in room #2109/2017 in the Health and Human Services building at Western Michigan University.

What is the time commitment for participating in this study?

Participation in this study will require participants to set aside a total of 60 minutes across two sessions. The initial session will take approximately 15 minutes.

This will include:
- Seven minutes to read aloud the informed consent and allow the participant time for questions
- Eight minutes to fill out initial information on their background and preferred music
The following session will take a total of 45 minutes to collect data on the nostalgic music pieces selected.
- Ten minutes will be to apply EDA electrodes
- Five minutes to fill out the Southampton Nostalgia Scale (SNS) and Positive and Negative Affect Schedule (PANAS)
- A total of 30 minutes to listen to music and answer various questions on the songs listened to

What will you be asked to do if you choose to participate in this study?

After consent is given, you will be asked to fill out background information on yourself, indicate your background in music, and state five songs that provoke feelings of nostalgia. Nostalgia is defined as “a wistful or sentimental longing for the past, and typically involves a particular time or place with some personal association.” The student researcher will collect that information and create a personal playlist for you, based on the songs indicated.

At a later time, you will be asked to come back to listen to various songs selected based on your preferences indicated. Initially, you will be asked to complete two assessments on your nostalgia proneness and your current mood. These will include the Southampton Nostalgia Scale (SNS) and the Positive and Negative Affect Schedule (PANAS). You will then be asked to wear headphones and an Electro-dermal (EDA) monitor on your third and fourth finger to monitor physiological arousal, while listening to the music selections. Following each song, you will then be asked a variety of questions about your personal connectedness to the song, if any.

What information is being measured during the study?

The information that is to be measured in the study will include these tests:
- Nostalgia Proneness (Southampton Nostalgia Scale)
- Current Mood State (Positive and Negative Affect Schedule)
- Physiological Reaction (Electro-dermal Activity & Self-Assessment of Emotional Reaction)
- Context – Level Constructs (familiarity, enjoyment, autobiographical association)

These output variables will be associated with the level of nostalgia experienced.

What are the risks of participating in this study and how will these risks be minimized?

There are no foreseen risks to you while participating in this study beyond the loss of time. You may be uncomfortable from sitting still during the listening portion of the study. Comfortable seating, use of towels on which to rest their arms, and the opportunity to stretch will be provided if/as necessary.

What are the benefits of participating in this study?

There are no direct benefits to you for participating in this study. Your participation may contribute to research regarding music-evoked nostalgia.

Are there any costs associated with participating in this study?
There are no monetary costs associated with participating in this study. The only foreseen cost is the amount of time (60 minutes) being asked to participate in the study.

**Is there any compensation for participating in this study?**

There will be compensation of $10 in the form of an Amazon gift card provided at the completion of the study. In addition, you as a student may participate in this study as a part of their course work.

**Who will have access to the information collected during this study?**

The individuals that will have access to the information being collected include the student investigator, the principal investigator, and the BRAIN Lab manager. All data collected will be stored on a password-protected folder and on a password-protected computer, in the locked BRAIN Lab.

All of your data will be de-identified and coded using a five-digit code that you create, in order to maintain personal confidentiality. You will be asked to create and remember your five-digit code across the two sessions. This code will be placed on all data collected from you. However, the code will not be attached to your name.

**What if you want to stop participating in this study?**

You can choose to stop participating in the study at any time for any reason. You will not suffer any prejudice or penalty by your decision to stop your participation. You will experience NO consequences, either academically or personally, if you choose to withdraw from this study.

The investigator can also decide to stop your participation in the study without your consent.

Should you have any questions prior to or during the study, you can contact the student investigator, Alycia Sterenberg at 269-387-8841 or alycia.i.sterenberg@wmich.edu, or the principal investigator, Edward Roth, at 269-387-5415 or edward.roth@wmich.edu. You may also contact the Chair, Human Subjects Institutional Review Board at 269-387-8293 or the Vice President for Research at 269-387-8298 if questions arise during the course of the study.

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is older than one year.
I have read this informed consent document. The risks and benefits have been explained to me. I agree to take part in this study.

Please Print Your Name

Participant’s signature    Date
## APPENDIX L
### LIST OF FIVE SONGS THAT PERSONALLY ELICIT NOSTALGIA

<table>
<thead>
<tr>
<th>Song 1</th>
<th>Song 2</th>
<th>Song 3</th>
<th>Song 4</th>
<th>Song 5</th>
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</thead>
<tbody>
<tr>
<td>Sadie Hawkins - Relient K</td>
<td>Dance of the Knights - Sergei</td>
<td>The Old Apartment - Barenaked</td>
<td>No Such Thing - John Mayer</td>
<td>Pink Moon - Nick Drake</td>
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<td>Messes of Men - mewithoutYou</td>
<td>Flood - Jars of Clay</td>
<td>He Will Come - Waterdeep</td>
<td>Little Green Men - Project 86</td>
<td>I Can - Skillet</td>
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<tr>
<td>Come as You Are - Nirvana</td>
<td>Gold Digger - Kanye West feat.</td>
<td>Dancing in the Dark - Bruce</td>
<td>Mrs. Robinson - Simon and Garfunkel</td>
<td>Don't Look Back in Anger - Oasis</td>
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<tr>
<td>Maybe I'm Amazed - Paul McCartney</td>
<td>Three Little Birds - Bob Marley &amp; The Wailers</td>
<td>In My Life - The Beatles</td>
<td>Soak Up the Sun - Sheryl Crow</td>
<td>Must Get Out - Maroon 5</td>
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<tr>
<td>Fem in a Black Leather Jacket - Pansy Division</td>
<td>Bubblegum Bitch - Marina and The Diamonds</td>
<td>Damn These Vampires - The Mountain Goats</td>
<td>Hey Digimon - Paul Gordon</td>
<td>Toxic - Britney Spears</td>
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<tr>
<td>Move Along - All American Rejects</td>
<td>Who Are You - The Who</td>
<td>It Don't mean a thing if it ain't got that swing - Duke Ellington</td>
<td>Brave New World - Iron Maiden</td>
<td>Fourth of July - Fallout Boy</td>
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<tr>
<td>Indian Summer - Jai Wolf</td>
<td>Sing Me to Sleep (Marshmallow</td>
<td>Forbidden Voices - Martin Garrix</td>
<td>Love is Alive - Louis the Child</td>
<td>National Anthem - Lana Del Rey</td>
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<td>On My Way - Phil Collins</td>
<td>You Were Meant for Me - Singin in the Rain</td>
<td>When September Ends - Green Day</td>
<td>We Were Just Kids - Radical Something</td>
<td>Up Up and Away - Kid Cudi</td>
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<td>Paper Boats (feat. Ashley Barrett) - Darren Korb</td>
<td>Swing Life Away - Rise Against</td>
<td>Arabian Nights - Bruce Adler</td>
<td>I've Learned to Love Myself - letlive.</td>
<td>Handlebars - Flobots</td>
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<td>Celebration - Kool &amp; The Gang</td>
<td>Jump (For My Love) - The</td>
<td>Thunderstruck - AC/DC</td>
<td>Marry Me - Thomas Rhett</td>
<td>Mean to Me - Brett Eldredge</td>
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<td>I'll Make a Man Out of You -</td>
<td>Free Bird - Lynyrd Skynyrd</td>
<td>My Way - Frank Sinatra</td>
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<td>Mulan</td>
<td>Don't Stop Me Now - Queen</td>
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<td>Song 1</td>
<td>Song 2</td>
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<td>Don't Cry - Guns n' Roses</td>
<td>Summertime Baby - The Holdup</td>
<td>Waltz with Me - Tonic</td>
<td>Masterpiece Theater III - Marianas Trench</td>
<td>The Truth - Tristam</td>
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<td>Peach Pit - Peach Pit</td>
<td>New Scream - Turnover</td>
<td>Lover Come Back - City and Colour</td>
<td>Honeybear - Father John Misty</td>
<td>Beautiful - Bazzi</td>
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<td>Ants Marching - Dave Mathews Band</td>
<td>Bang Bang - David Sanborn</td>
<td>Baba O'Riley - The Who</td>
<td>Red Dirt Road - Brooks and Dunn</td>
<td>Old Time Rock &amp; Roll - Bob Seger</td>
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<td>Perfect - Ed Sheeran</td>
<td>Fat Bottom Girl - Queen</td>
<td>You &amp; I - Lady Gaga</td>
<td>Concrete Angel - Martina McBride</td>
<td>Love Lockdown - Kanye West</td>
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<td>Thunder - Boys Like Girls</td>
<td>Yeah - Usher</td>
<td>Drops of Jupiter - Train</td>
<td>I Want It That Way - Backstreet Boys</td>
<td>Bye Bye Bye - NSYNC</td>
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<td>What Becomes of the Broken Hearted - Jimmy Ruffin</td>
<td>Faithfully - Journey</td>
<td>Yes I'm Changing - Tame Impala</td>
<td>Stay A Little Longer - Brothers Osborne</td>
<td>Galway Girl - Ed Sheeran</td>
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<td>Born to Run - Bruce Springsteen</td>
<td>Lazy River - The Mills Brothers</td>
<td>Love, You Didn't do Right by Me - Rosemary Clooney</td>
<td>Dirt - Florida Georgia Line</td>
<td>Forever and Ever, Amen - Randy Travis</td>
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<tr>
<td>For Good - Wicked musical</td>
<td>Music of the Night - Andrew Lloyd Weber</td>
<td>Please Don't Stop the Music - Rhinanna</td>
<td>Falling Slowly - Once musical</td>
<td>I Gotta Feeling - Black Eyed Peas</td>
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<td>No Scrubs - TLC</td>
<td>Gold Digger - Kanye West feat. Jamie Foxx</td>
<td>Love Like Woe - The Ready Set</td>
<td>Honey I'm Good - Andy Grammar</td>
<td>God Only Knows - The Beach Boys</td>
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<td>Mr. Blue Sky - Electric Light Orchestra</td>
<td>Family Business - Kanye West</td>
<td>Happy - Pharrell Williams</td>
<td>Don't Let Me Down - The Chainsmokers</td>
<td>Me and Your Mama - Childish Gambino</td>
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<td>Do I Wanna Know? - Arctic Monkeys</td>
<td>Mr. Brightside - The Killers</td>
<td>Welcome to the Black Parade - My Chemical Romance</td>
<td>Misery Business - Paramore</td>
<td>Bohemian Rhapsody - Panic! At the Disco</td>
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<td>Viva La Vida - Coldplay</td>
<td>Canon in D - Pachelbel</td>
<td>I'll Make a Man out of You - Mulan</td>
<td>Bohemian Rhapsody - Queen</td>
<td>Seasons of Love - RENT musical</td>
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<td>Walkway Blues - M83</td>
<td>No Roots - Alice Merton</td>
<td>Prophets of Rage - Prophets of Rage</td>
<td>Vivir Mi Vida - Marc Anthony</td>
<td>I Gotta Feeling - Black Eyed Peas</td>
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<td>Song</td>
<td>Artist</td>
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<td>...Baby One More Time</td>
<td>Britney Spears</td>
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<td>Dirty Little Secret</td>
<td>All American Rejects</td>
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<td>Puff the Magic Dragon</td>
<td>Peter, Paul &amp; Mary</td>
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<td>Only One</td>
<td>James Taylor</td>
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<td>God is Our Redeemer</td>
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<td>The Parting Glass</td>
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<td>Drunken Lullabies</td>
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<td>Drift Away</td>
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<td>Down in the Valley</td>
<td>The Head and the Heart</td>
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<td>Hey Ya!</td>
<td>Outkast</td>
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<td>Carlos Santana</td>
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<td>Life in Technicolor</td>
<td>Coldplay</td>
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<td>Nice to Know You</td>
<td>Incubus</td>
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<td>Nicotine</td>
<td>Panic! at the Disco</td>
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<td>Florence and the Machine</td>
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<td>I Can Only Imagine</td>
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<td>Helena</td>
<td>My Chemical Romance</td>
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<td>At the Beginning</td>
<td>Anastasia Movie</td>
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<tr>
<td>Kiss Me</td>
<td>Sixpence None the Richer</td>
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<td>In the End</td>
<td>Linkin Park</td>
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<td>Jumper</td>
<td>Third Eye Blind</td>
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<td>Angel</td>
<td>Shaggy</td>
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<tr>
<td>Umbrella</td>
<td>Rihanna</td>
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<tr>
<td>We Belong Together</td>
<td>Mariah Carey</td>
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<tr>
<td>No Scrubz</td>
<td>TLC</td>
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<tr>
<td>Caught Up</td>
<td>Usher</td>
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</tbody>
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APPENDIX M

HSIRB APPROVAL LETTER

Date: March 5, 2018

To: Edward Roth, Principal Investigator
    Alycia Sterenberg, Student Investigator for Thesis
    Chloe Heintz, Student Investigator for Honors Thesis
    Taylorlyn Mehnert, Student Investigator for Honors Thesis
    Bailey Schulte, Student Investigator for Honors Thesis

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 18-02-38

This letter will serve as confirmation that your research project titled “The Determinants of Affect, Emotional Arousal, and Autobiographical Memories on Music-Evoked Nostalgia” has been approved under the expedited category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may only be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., you must request a post approval change to enroll subjects beyond the number stated in your application under “Number of subjects you want to complete the study.”) Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: March 4, 2019
APPENDIX N

HSIRB POST APPROVAL LETTER

Date: April 11, 2018

To: Edward Roth, Principal Investigator
    Alycia Sterenberg, Student Investigator for Thesis
    Chloe Heintz, Student Investigator for Honors Thesis
    Taylorlyn Mehnert, Student Investigator for Honors Thesis
    Bailey Schulte, Student Investigator for Honors Thesis

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 18-02-38

This letter will serve as confirmation that the change to your research project titled “The Determinants of Affect, Emotional Arousal, and Autobiographical Memories on Music-Evoked Nostalgia” requested in your memo received April 4, 2018 (to add second administration of PANAS at post-test) has been approved by the WMU Institutional Review Board.

The conditions and the duration of this approval are specified in the Policies of Western Michigan University.

Please note that you may only conduct this research exactly in the form it was approved. You must seek specific board approval for any changes in this project. You must also seek reapproval if the project extends beyond the termination date noted below. In addition if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the IRB for consultation.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: March 4, 2019
REFERENCES


