A MENTAL MODEL OF MUSIC FAMILIARITY AND MUSIC PREFERENCE FOR MUSIC THERAPY PRACTICE

By

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Ruozao Han
LL.B. (Social Work), Renmin University of China, 2011

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Chairperson: Dr. Deanna Hanson-Abromeit

_____

Dr. Cynthia Colwell

_____

Dr. Bill Matney

Date Defended: August 29, 2018

The Thesis Committee for Ruozao Han
Certifies that this is the approved version of the following thesis:

A Mental Model of Music Familiarity and Music Preference
For Music Therapy Practice

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Chairperson: Dr. Deanna Hanson-Abromeit

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Abstract

The purpose of this study was to review the researcher's initial mental model of music familiarity and preference in music therapy and propose a revised mental model for the use of preferred and familiar music based on psychological and neurological constructs of music preference and familiarity. In order to collect exiting theories of related topics, the researcher identified several key words and then conducted searches in database and reference lists. Based on the psychological and neurological constructs of familiarity and preference, the researcher operationally defined familiar music and preferred music in music therapy, explained the relationship between familiar and preferred music, and presented a revised mental model. Suggestions for music therapy education and research were made based on these findings.

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Chapter One: Introduction

Client familiar and preferred music has been widely used by music therapists in various settings in order to achieve therapeutic goals. Clinicians may use familiar music to the client, due to its ability to elicit memories associated the past (e.g. Clair, 1996; Crystal, Grober, & Mauser, 1989), as well as its ability to create a familiar environment, potentially reducing agitation in certain populations (e.g. Gerdner, 2000). Client preferred music is used in music therapy to achieve therapeutic goals, including promoting relaxation, improving mood, reducing pain, and encouraging participation (e.g. Hilliard, 2004; Madson & Silverman, 2010; Renshaw, 2015). Clinicians usually determine clients' music preference as a part of music therapy assessments (American Music Therapy Association, 2015). When examining music preferences of older adults specifically, individuals have shown higher preference for music that was popular during their young adult years (Gibbons, 1977), suggesting music preference may depend upon familiarity. Using familiar and/or preferred music has a standard for music therapists when choosing music for clinical practice and research with diverse populations and ages. However, the terms "familiar music" and "preferred music" seem to be used interchangeably, and are often not clearly defined.

Research has shown the effectiveness of using client preferred music. For example, patients with cancer listened to music they chose during radiation therapy and reported lower anxiety and treatment-related distress (Clark et al., 2006). Clients listening to preferred music after solid organ transplant showed significant improvements in relaxation and anxiety based on clients' self-report on Likert-type scales and researchers' observations of clients' behavioral changes (Madson & Silverman, 2010). Compared to other cognitive and emotional distractions, the use of client preferred music significantly increased tolerance of pain (Mitchell, MacDonald,

& Brodie, 2006). In another research, decreased level of anxiety was found among older adults with Alzheimer's disease during and after listening to their preferred music (Sung, Chang, & Lee, 2010).

Research examining the use of familiar and unfamiliar music presents mixed outcomes. In a study on the motivational effects of familiar and unfamiliar music, participants were asked to bring four pieces of familiar music (that they were exposed to on more than 30 occasions) and four pieces of unfamiliar music (that they were exposed to on no more than five occasions) for a walking test. When measuring the motivational properties of musical selections, participants self-reported familiar music as more motivating during a treadmill endurance experience than unfamiliar music. However, a post hoc statistical test result showed there were no significant differences between the two music listening conditions on duration of exercise (Crust, 2004). In an fMRI study, participants with Alzheimer's disease demonstrated greater activations in areas of the brain when listening to familiar music, but deactivations when listening to unfamiliar music. Healthy participants in the control group demonstrated contrary outcomes, showing greater brain activation when listening to unfamiliar music. These results suggest that patients with Alzheimer's disease pay more attention to their familiar music, while individuals without the disease pay more attention to novel music (Yang et al., 2015).

It could be that cumulative results of single studies have created a belief that preferred and/or familiar music is necessary for positive or beneficial outcomes, therefore leading music therapists to make treatment decisions based on clients' preferences and familiarity of music. However, lack of statistical significance (Crust, 2004) and differences in participants without memory deficits (Yang et al., 2015) suggest there is reason to question at such music choice decisions. Moreover, music therapy approaches, such as the Bonny Method of Guided Imagery

and Music and Nordoff-Robbins Music Therapy, traditionally use pre-selected classical music (Muller, 2014) or improvisation (Aigen et al., 2018) respectively. The Bonny Method of Guided Imagery and Music utilizes different themes of music programs to assist individuals to explore all aspects of their inner selves, in order to help them resolve significant life such as disturbing memories and relationship issues (Association for Music and Imagery, 2008). Nordoff-Robbins Music Therapy was originated based on the concept of the *music child,* which asserts that each child processses unique music skills to respond to music and resonate with emotions. Thus, active music making could evoke the inner "music child" and provide an alternative way for children with disabilities to communicate by musical response (Aigen, 2014). Traditionally, improvisational music is largely used in Nordoff-Robbins Music Therapy because of its nature to immediately reflect a client's presentation and responses (Aigen et al., 2008). However, Nordoff-Robbins clinicians also use pre-composed music specifically written for the approach and other pre-existing songs to serve a broader population and a range of therapeutic goals (e.g. Guerrero, Turry, Geller & Raghavan, 2014).

In a recent review addressing this topic, only one study indicated the degree of preference as being more important than the degree of familiarity with only a few articles attempting to provide explanations why preferred music was more therapeutically effective (Silverman, Letwin, & Nuehring, 2016). Therefore, if clients' familiar music is always their preferred, the music therapist may need to know how familiarity leads to preference, how to differentiate between preferred music and familiar music, and how to make clinical decisions about the use of preferred and familiar music in the therapeutic context.

Researcher's Stance and Purpose Statement

As a music therapy student and an entry-level music therapist, the researcher finds she and her peers often use client familiar/preferred music in clinical practice in different ways to meet clients' different needs. However, the researcher rarely notices people discussing the difference between familiar and preferred music. During clinical training, a clinical supervisor once told the researcher to use "client preferred music" instead of "client familiar/preferred music" to eliminate repeated wording since client familiar music and preferred music are usually the same. While the researcher often finds that clients prefer familiar music, it is possible that clients could build preference on music with which they are not familiar. Thus, the researcher began to wonder if client familiar music and preferred music is the same and if client familiar music and preferred music function differently in music therapy.

Clinet preferred, familiar, unfamiliar, or not-preferred music can be therapeutically effective, but the researcher did not find existing systematic theories to explain why this is so. While music therapists may assume preference and familiarity are a basis for music interventions, some research suggests familiarity may also lead to boredom (e.g. Bornstein, 1989; Huron, 2013). Such contradictory findings create questions regarding familiarity and preference in music, and the utility of preferred and/or familiar music in music therapy. Does music preference depend on familiarity? If yes, is the relationship between preference and familiarity linear? When is preferred and/or familiar music most appropriate in the context of music therapy? The goal of this project was to address these questions by exploring a deeper understanding of the constructs of music familiarity and preference and examine the relationship and differences between those constructs. Specifically, the purpose of this study was to review the researcher's initial mental model of the therapeutic used of familiar and preferred music in

music therapy and subsequently propose a revised mental model for the use of preferred and familiar music based on psychological and neurological constructs of music preference and familiarity.

Chapter Two: Literature Review

Music therapists frequently use the terms preferred music and familiar music in training, practice, and research; yet few clearly differentiate the terms familiar and preferred while some authors even use these terms interchangeably (e.g. Ferrer, 2007; Iwaki, Tanaka, & Hori, 2004). As previously mentioned, client may prefer music that they are familiar with, and using client preferred familiar music become a stand in music therapy. However, preferred yet unfamiliar music may be used in a therapeutic context to promote engagement in therapeutic activities, but the individual response to the music must be taken into account in relationship to the intended outcomes. Familiar music may also be used in a therapeutic context, but it does not necessarily mean the individual prefers that music (Clair, 2016).

Music selections should serve therapeutic goals and not be limited to client familiar and/or preferred music. In many situations, music therapists need to make an immediate assessment and provide related music interventions. Music therapists may need to improvise or compose music in a particular style to meet the client's musical preference. Therefore, music therapists should have a good understanding of music familiarity and preference to best determine whether client's familiar or preferred music necessarily meet the therapeutic goal. In order to clearly understand the value of familiarity and preference of music in a therapeutic context, these terms must be operationally defined and the psychological and neurological constructs of each must be explored.

Familiar Music

Defining music familiarity is difficult. There are various factors that influence the human perception of familiarity, including the complexity and predictability of a music piece, and the listener's expectation based on previous music training (Huron, 2016; North & Hargreaves, as

cited in Vuoskoski, 2017). The Oxford American College Dictionary (n.d.) defines familiarity as, "close acquaintance with or knowledge of something." This definition clearly states that familiarity is related to learning and associations with past experience.

Expectation (The Oxford American College Dictionary, n.d.) is defined as "a belief that something will happen because it is likely." Although Meyer (1956) adopted principles from the Gestalt Laws, he believed that expectations are "products of habit responses," which developed from the connections between the ways music is organized and cognitive processes, and that the fulfillment and denial of the listener's expectations are also important sources of emotion in music. In other words, expectations are learned and based on the memory of previous experiences and knowledge, and expectations induce emotions. For example, when listening to a dissonant chord, five-year-old children did not perceive it as "wrong," while nine-year-old children laughed at it (Sloboda, as cited in Juslin & Västfjäll, 2008). In other research, a group of adults and a group of children were asked to listen to four excerpts of melody: (a) an excerpt using the original melody, (b) an excerpt that employed one out-of-key, altered note, (c) an excerpt that employed an out-of-harmony note, and (d) an excerpt that altered one note which is both in the key and in harmony in the last time. Results showed that adults did better at identifying out-of-key and out-of-harmony tasks than children, which implied that music expectations are influenced by training (Trainor & Trehub, 1994).

Familiarity and expectation are formed through repeated exposure (Huron, 2006); this idea can be applied to music. However, the feeling of familiarity varies from person to person based on the complexity of music. Researchers argued the need to identify objective complexity and subjective complexity of music (North & Hargreaves, 2008). Objective complexity is determined by elements of music themselves, such as predictability; whereas subjective

complexity refers to the complexity perceived by the listener, and the subjective complexity changes as the number of exposures changes. For example, a listener's perceived complexity of a piece of music during first time listening is higher than the perceived complexity after the music is repeated five times.

Huron (2006) identified three types of familiarity in musical experiences, veridical, schematic, and dynamic, and provided examples of each type. *Veridical familiarity* refers to the expectations that arise during the process of repetitive listening. For instance, throughout the course of a movie, each character is commonly associated with a particular music theme; this piece of music repeats when the character is on the scene. As the movie continues, the audience develops an association of the music with the character. *Schematic familiarity* refers to the expectations that arise from the listeners' previous knowledge, in other words, a particular schema. For example, musicians that are trained in the classical Western music system tend to expect music in major or minor keys, with diatonic scales, which end on the tonic chord, played by Western orchestral instruments. These musical elements are commonly used schema that listeners are familiar with through music education and exposure in everyday life. *Dynamic familiarity* is the expectation evoked by the immediate musical experience, leading listeners to expect similar passages as the music continues. For example, in popular and folk songs, the chorus is usually repeated with the same melody and lyrics; when eliminating lyrics, other musical elements across different verses typically stay the same (pp. 241-262).

Preferred Music

As discussed in the previous section, familiarity is the product of learning and memory, whereas expectation is described as a product of habit responses that develop from the connections between particular organizations and cognitive process (Meyer, 1956). Thus,

expectations are learned and based on the memory of previous experiences and knowledge. Although sometimes, individuals prefer familiar objects, a novel object may also be preferred. Thus, preference and familiarity are two different but related concepts. While familiarity is related to awareness of knowledge of the subject, preference does not require learning, as the term is defined as, "a greater liking for one alternative over another or others (The Oxford American College Dictionary, n.d.)."

Psychological Theories on Familiarity and Preference

There are several psychological theories potentially explain the relationship between familiarity and preference. Zajonc (1968) conducted series of experiments and found that individuals prefer what they were previously exposed to without cognitive process. Other researchers developed this finding and suggest individuals prefer easy-to-process objects (Bornstein & D'Agostino 1994). However, different opinions on whether preference requires cognitive process exist. Musicologists (Huron, 2006; Meyer, 1956) hold the idea that the fulfillment and denial of musical expectations evoke emotions, and since expectations require certain musical knowledge and past experience, preference requires cognitive process. In addition, LeBlanc (1982) suggest music preference can be influenced by other factors such as listener's mood during listening and locations where music is performed, and different factors interact with each other and together influence the one's music preference at the moment.

Mere Exposure Effect. The mere exposure effect (MEE) is a theory that explains the phenomenon of individuals developing a preference for objects merely based on what they are familiar with (Zajonc, 1968). Several laboratory experiments were conducted in the 1960s that demonstrated this phenomenon (for a review, see Zajonc, 1968). These experiments were with both human and animal subjects using both musical (e.g., songs, sounds, etc.) and non-musical

objects (e.g., nonsense words, foreign language characters, photographs, etc.). Results showed that subjects rated or demonstrated more positive attitude toward the stimuli to which they had previous exposure. According to this theory, familiar stimuli do not require complex cognitive processes, which minimizes physiological arousal level, thus, people feel relaxed when exposed to them.

Zajonc (1980) later proposed a hypothesis that MEE can happen without conscious cognition and affective responses, such as liking and preference, and do not require complex cognitive processing. In experiments testing this hypothesis, Zajonc presented repeated stimuli when subjects were not consciously aware of them; however, results still showed that subjects preferred the exposed stimuli. Interestingly, it was also demonstrated in the experiment that when comparing the affective responses of stimuli that are presented longer (that subjects are consciously aware of) and stimuli that are presented briefly (that subjects are not consciously aware of), it showed that subjects demonstrated faster responses when reacting to briefly presented stimuli (Bornstein & D'Agostino, 1992, as cited in Bornstein & D'Agostino, 1994).

Zajonc (2001) provided another explanation on the mechanism of MEE using classical conditioning theory. In classical conditioning, the unconditioned stimulus creates the unconditioned response. During conditioning, the conditioned stimulus, paired with the unconditioned stimulus, create the new conditioned response (Gottlieb & Begej, 2014). Since the MEE does not require cognitive response, but only sensory accessibility to the exposure, the absence of aversive response is the unconditioned stimulus (Zajonc, 2001). The preference response, or the lack of an unsafe feeling, is the unconditioned response. In other words, familiarity grows due to the repeated exposure (conditioned stimulus). Individuals' preferences may grow as a result (conditioned response). For example, when listening to an unfamiliar song,

the song is first the unconditioned stimulus, and a potential lack of discomfort while listening is the unconditioned response. Therefore, the lack of discomfort also serves as the negative reinforcement and reinforces that listening to the music is safe. Thus, the conditioned response is the increased preference after repetitive exposure to the music, and the conditioned stimulus is the repetitive exposure.

Rather than the mere-exposure effect, perhaps the observed phenomenon is based on prediction rather than simple repetition. Prediction effect asserts that prediction is a factor in preference (Huron, 2000). Under this theory, preference occurs through cognitive processes rather than an unconscious response. Accurate prediction during the presentation of the stimulus is rewarded, and the reward leads to preference (Huron, 2006). For example, in the presentation of three stimuli, stimulus A is the most frequently repeated but randomly presented; stimuli B and C are less repetitive than A, but C is always presented after the presentation of B. The hypothesis is that people will prefer the predictable C, although it is less exposed than A. However, there is no other laboratory evidence in either musical or non-musical fields supporting the argument of prediction effect (Huron, 2006).

Processing Fluency. As MEE research continued, researchers found that it is not repeated exposure, but rather the ease of perceiving the stimuli that contributes to preference. In other words, repeated exposure of the stimuli enhances fluency (ease of perceiving), which creates a positive response toward the stimuli (e.g., Bornstein D'Agostino, 1994; Jacoby & Dallas, 1981; Reber, Winkielman & Schwarz, 1998). Bornstein and D'Agostino (1994) proposed "the Perceptual Fluency/Attributional Theory" as an alternative to MEE, arguing that individuals prefer stimuli that are easy to perceive, and familiarity facilitates this process. The two researchers asserted that positive hedonic experiences arose as individuals were exposed to

familiar stimuli, and this positive experience in return made listeners prefer the stimuli. In their research, however, Bornstein and D'Agostino found the positive response was not as strong when subjects were consciously aware of the stimuli. Researchers later argued that the individuals not only preferred items that were easy to perceive, but also ideas that were easy to process; thus, the terminology expanded to "processing fluency." For example, when presented with the same food with different labels, one of which is easy to pronounce and the other hard, individuals prefer the food with the easy-to-pronounce label, even though the food is the same (Song, 2009). Another example follows; given a picture followed by a word, individuals tend to prefer the word that is related to the picture rather than the word that is not related to the picture (Huron, 2013). This preference occurs because the related word facilitates the mental processing of the picture, and this ease of processing raises a positive experience regarding the word. Evidence also suggests that easy processing of objects leads to activation over the region of the zygomaticus major muscle, which is the muscle in charge of the smiling facial affect (Winkielman & Cacioppo, 2001). The fluency of processing can be enhanced by repetitive presentation of the stimulus; thus, an individual processes a familiar stimulus faster than a novel stimulus. Fluent processing can boost the feeling of familiarity (Brown & Marsh, 2009). So, ease of perception may falsely lead individuals to consider the object as familiar (Whittlesea, 1993).

Habituation. Repetitive exposure can contribute to the MEE and ease of processing; yet, repetition can also lead to a decrease in responsiveness. This negative effect can be explained by habituation, which is a desensitization that reduces the magnitude of responses (Huron, 2006). Habituation is a mental process where highly predictable stimuli are ignored by the brain (Huron 2013). The process of habituation depends on different factors (Harris, 1943). First, it depends on the frequency of the stimulus. Habituation occurs sooner when the frequency is higher. Second,

habituation depends on the predictability of the stimulus. Habituation occurs more easily if the stimulus is more predictable. Third, if individuals have habituated to the stimulus before, when the stimulus is re-introduced, the new habituation occurs sooner than the first time. Therefore, habituation contradicts the Mere Exposure Effect.

Other studies also find evidence that contradicts MEE. In a meta-analysis of 208 experiments, Bornstein (1989) found the effect of exposure increases as stimuli repeat, and usually reaches its peak when stimuli are repeated 10-20 times. If the stimuli are presented too long, the preference declines. Also, when an unfamiliar object and an object one has seen a few times are presented at the same time, an individual tends to prefer the latter. Swap (1977) suggested that exposure strengthened the disliking of stimuli that were initially disliked by participants.

Psychological Complexity and Preference – A Hedgehog Theory of Behavior. Walker (1973) borrowed ideas from Berlyne, Dember, and Earl, and introduced the mechanism of psychological complexity and preference and proposed the hedgehog theory of behavior. The theory argues that individuals prefer things that are neither too simple nor too complex. Walker used the phrase "optimal level of complexity," which is a point in the psychological complexity dimension. For example, when listening to music, an individual tends to prefer a piece of music whose complexity is close to the optimum, and shows less preference for music that is more or less complex than that optimal point. Thus, the relationship of music complexity and preference form an inverted-U shaped curve: the hedonic experience rises as complexity grows, then reaches the peak at the optimal level of complexity, and from that point, the positive experience gradually decreases as it becomes too complex. Walker (1973) also mentioned that complexity

decreases as familiarity forms, suggesting that the optimal level of complexity also can change over time.

ITPRA Theory. Huron (2006) developed his own theory of expectation, ITPRA, based on the human survival theory. ITPRA stands for imagination, tension, prediction, reaction and appraisal (2006). Huron built ITPRA on the assumptions that these five components are processes of expectation, and that they collectively contribute to emotional and intellectual responses and their outcomes. Huron argues that neurotransmitters in the brain are released to reinforce successful predictions about the outcome (discussed in more detail in the next section). Statistical learning is learning through repeated exposure. In statistical learning, individuals tend to expect "the most frequent past event (Huron, 2006, p. 360)." Huron strongly argued that the mechanism of statistical learning is the foundation of musical expectations (pp. 73-90). As previously reviewed, Huron (2016) indicated three types of familiarity expectations: veridical, schematic, and dynamic. However, based on the ITPRA theory, even if a piece of music is not predictable, but has a pleasurable musical outcome, the listener would still have a positive emotional affect, and this affect is more pleasurable than that of purely predictable music. On the contrary, if the listener predicts a pleasurable musical outcome, but the true outcome is unpleasant, the emotional affect will be less pleasurable than if the listener had successfully predicted the unpleasant outcome.

The Interactive Theory of Music Preference. LeBlanc (1982) proposed an interactive theory of music preference. He proposed variables that influence an individual's music preference, and that operate on different hierarchical levels; there exist one or more variables in each level (see Figure 1). These variables and levels interact with each other, and provide a key to understanding how music preference is developed. The initial screening of music preference is

on level 8, which includes musical characteristics (physical property of stimulus, complexity of stimulus, referential meaning of stimulus, familiarity, performance quality, and media) and developmental characteristics (peers, family, authority figures, and incidental conditioning). The next three levels –7, 6, and 5 – are enabling conditions, which are the current physiological state of the individual who is exposed to the stimuli. These three variables immediately influence the listener's music preference at the moment, and it can change time to time based on the changes in the listener's physiological condition. Level 4 variables consist of personal characteristics of the listener, such as sex, gender, etc. Level 3 is "processing by listener's brain," which include the listener's expectations based on music training. At this level, the listener will make preference decisions, either keeping and exploring the stimulus (level 2, and going back to level 8), or rejecting/accepting the stimulus (proceeding to level 1). Developmental characteristics (from level 8) appear to have a perceived influence on preference with a significant difference note particularly on the influence of religious background (identified as "church" in figure 1), although it is the weakest influential variable. Among enabling conditions (level 5-7), mood is most influential and among personal characteristics personality is highly influential on music preference (Phelps, 2014).

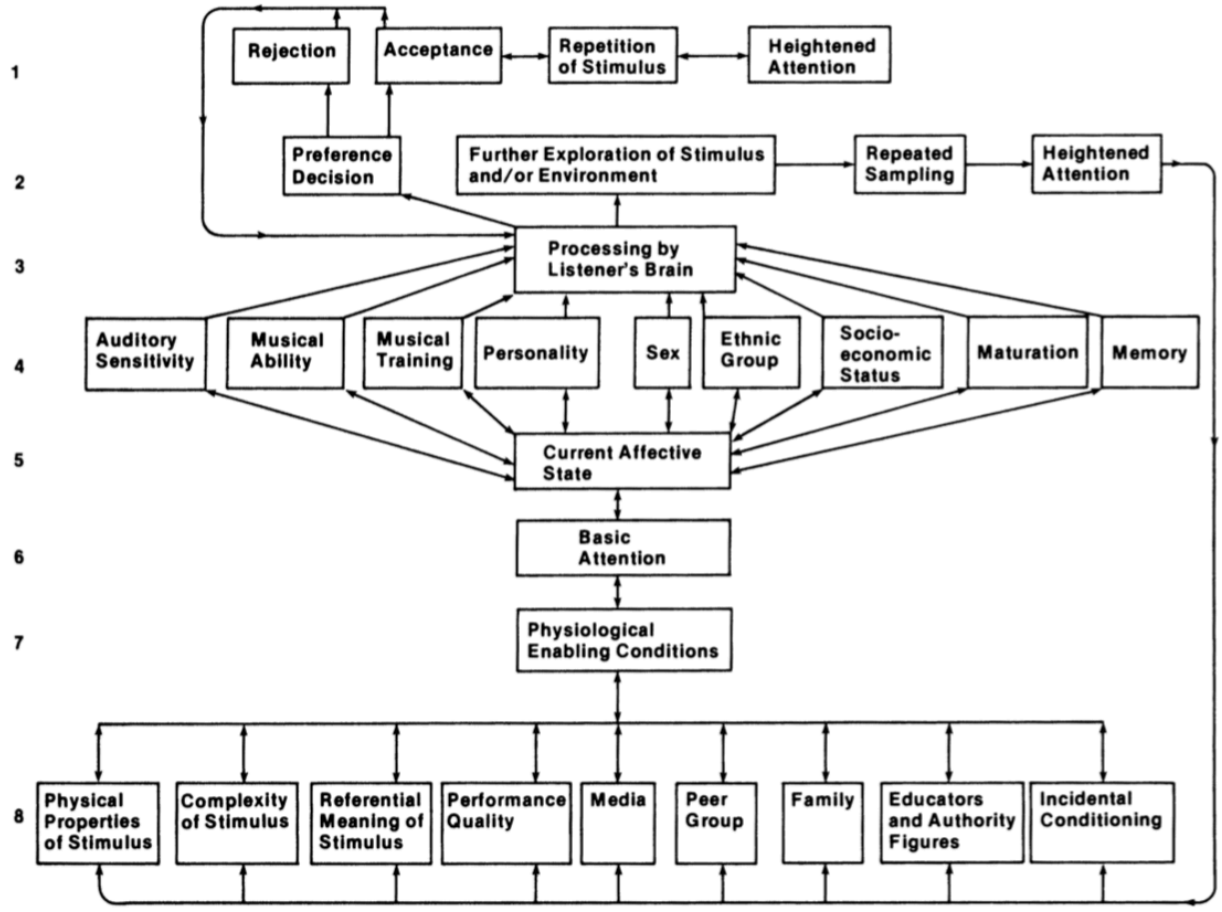

Figure 1. Sources of variation in music preference. Reprinted from "Effects of Style, Tempo, and Performing Medium on Children's Music Preference," by A. LeBlanc, 1981, *Journal of Research in Music Education*, *29*(2), p. 144. Copyright 2008 by SAGE Publications. Reprinted with permission.

Neurologic Theories on Familiarity and Preference

Familiarity is closely related to memory, specifically declarative memory. Declarative memory is a type of long-term memory that is associated with recognition of past events, people, and ideas (Bauer, 2013). Major brain areas associated with memory include (a) the hippocampus, which consolidates short-term memory to long-term memory (Frankland & Bontempi, 2005);

(b) the amygdala, which facilitates consolidation of emotional memory (Josselyn, 2010); (c) the prefrontal cortex, which is associated with encoding and retrieving memories (Craik et al., 1999); and (d) the cerebellum, which is responsible for motor learning (Green & Woodruff-Pak, 2000).

Neuroscience research has provided evidence to support Zajonc's argument that MEE does not require cognitive processing (Zajonc, 1980). One experiment (Elliot & Dolan, 1998) had nine participants exposed to images while being asked if the images were either preferred or familiar. Results suggest that preference and memory judgments are processed in different areas in the brain. When presenting memory judgment, the left frontopolar cortex and parietal areas were activated; when presenting preference judgments, medial prefrontal cortex and regions of occipital cortex were activated. When preference was modulated by object familiarity, right lateral frontal cortex was activated. When new items were presented, the hippocampal gyrus was significantly activated. Results also demonstrated the dissociation between explicit memory (associate with hippocampus left frontopolar cortex) and implicit memory (right lateral frontal cortex). Other researchers (Zola–Morgan et al., 1997). conducted experiments on monkeys with lesions, results of which suggest that affect and cognition are independent and separate neural processes These results demonstrated that lesions to the amygdala only impair affective functioning, not cognitive functioning; lesions in the hippocampus only impair cognitive functions and do not impair affective functions. Therefore, this study supports Zajonc's arguments that affective responses do not require cognitive processing, and that an individual is able to make preference decisions without complex cognitive process.

The limbic system is a set of structures in the brain that plays an important role in emotion behaviors (Koelsch, 2013). Major structures of the limbic system include the amygdala, the hippocampus, the cingulate cortex, the fornix, the septum, and the mammillary bodies (Geula

& Mesulam, 2012). The amygdala is the emotion center, and it has been evidenced as responsive to affective stimuli. When the amygdala is stimulated, intense emotions such as fear and aggression will occur (Koelsch, 2013). While being a part of the limbic system, the hippocampus also plays an important role in memory consolidation. Memory consolidation is the converting of short-term memory into long-term memory. After the brain receives new information, new memory is formed in the hippocampus, and the newly-formed memory becomes independent from the hippocampus and is transformed into remote memory (Frankland & Bontempi, 2005).

Several studies have reported amygdala activation while listening to music. In an fMRI study (Koelsch, Fritz, & Schlaug, 2008), the amygdala showed significant increased activity when subjects listened to unpleasant music. Activity decreased when listening to pleasant music. Authors defined pleasant and unpleasant in this study as consonance and dissonance respectively. Another fMRI study also used both consonant and dissonant music, with amygdala activity increasing with no significant difference in either condition. However, different regions of the amygdala demonstrated different types of activities (Ball et al., 2007). In a study that includes visual stimuli and related musical stimuli, the amygdala is not activated when only visual stimuli are presented, but it is activated when visual stimuli are paired with musical stimuli (Baumgartner et al., 2006).

Although the hippocampal formation is best studied in its processing of memories, it is also found to be related to emotional processes while listening to music. In a study by Baumgartner and colleagues (2006), the hippocampal formation, parahippocampal gyrus, and temporal poles are activated when visual and musical stimuli are paired. Eldar and colleagues (2007) also found that the amygdala and hippocampal formation demonstrated increased activity

when subjects listened to music while watching film clips (neutral commercials), and this activity was greater than when watching film clips alone or music alone.

Darwin introduced feelings of pleasurable nature, such as affection, joy, and sympathy, as "tender feelings (1872, as cited in Koelsch, 2013)." Koelsch (2013) expanded Darwin's concept of "tender feelings" to "tender emotions," and used the term "tender positive emotions" to refer to positive feelings such as joy and happiness (p. 229). Koelsch and colleagues (2007) found that individuals who had difficulty processing "tender positive feelings" when listening to music demonstrated different brain activities in anterior hippocampal formation than those had no difficulty processing "tender positive feelings." Warner Schmidt and Duman (2006) noted that reduced hippocampal activities and structural abnormality in the hippocampus were found in individuals diagnosed with depression; and neurons within the hippocampus died when individuals were under extreme stress and despair. Therefore, the hippocampus can be reviewed as an important brain structure for generating positive affect.

The reward circuit is also an import brain structure associated with music preference, Brown, Martinez, and Parsons (2004) found that the nucleus accumbens (NAc) in the ventral striatum is activated when listening to unfamiliar yet pleasant pieces. Menon and Levitin (2005) found that passively listening to music modulates activities in the mesolimbic dopaminergic structures, including the ventral tegmental area and NAc, which are involved in reward processing. When individuals experience pleasure associated with natural motivated behaviors, signals are sent to the ventral tegmental area (VTA). Then, the VTA releases dopamine into the NAc and other regions including the amygdala, striatum, and frontal cortex (Björklund & Dunnett, 2007). Koelsch (2013) suggests positive musical emotions come in two varieties, "fun" and "joy (tender emotions)" (pp. 227–31). Although these two emotions often occur together,

each of them is associated with a different subsystem of the brain's limbic system. "Fun" is mainly associated with the reward system, mostly with VTA and NAc of the basal ganglia. "Joy" is associated with the hippocampus, which relates to attachment-related affect. The VTA-NAc reward circuit controls individuals' natural rewards, and also informs the memory center to pay attention to the rewarding experience, so it can be repeated in the future.

Summary

Several psychological theories suggest relationship between familiarity and preference, as well as between expectation and preference. Zajonc (1968) argued that mere repetition of stimuli can result in preference, and it does not require cognitive process. The processing fluency theory suggests that the ease of processing make individuals prefer the stimulus, since it does not require much cognitive effort, and that fluency is usually the result of past experience (Jacoby & Dallas, 1981). In contrast to Zajonc, theorists including Huron (2006) and Walker (1973) suggest that although familiarity can create preference, it requires cognitive processing. Huron (2006) suggests that music training is the foundation of expectation in music, and that successful or unsuccessful expectations influence the listener's affective response. Based on Walker's work (1973), there appears to be an inverted-U shaped curve between music complexity and preference. When the music reaches the listener's optimal level of complexity, the music is most preferred. According to North and Hargreaves (2008), subjective complexity of music depends upon the listener's knowledge of music.

Neurological findings provide scientific evidence on the relationship and difference between familiarity and preference. Based on the current information about the human brain, the hippocampus is an important structure associated with memory, which converts short-term memory to long-term memory (Frankland & Bontempi, 2005). Since familiarity is based on past

experience and thus memory, familiarity is likely associated with hippocampus activation. The amygdala is the center of emotion (Koelsch, 2013), and it is associated with affective responses such as liking. However, due to the complexity of the brain and limitations in the current development of neuroscience, researchers are finding brain structures have overlapping functions, and since there are structures not yet researched, it makes it difficult to provide clear and thorough information on the neural mechanisms of familiarity and preference.

Music therapists have used client familiar and preferred music when choosing music in clinical practice; however, the terms "preferred music" and "familiar music" seem to be used interchangeably and not clearly defined. Both psychological and neurological researchers find connections between familiarity and preference; yet, familiarity does not always guarantee preference. In addition, both preferred/familiar music and unfamiliar/not-preferred music can be therapeutically effective, but there are no existing systematic theories to explain why this is true. Moreover, there is limited information in the literature to suggest critical analysis of preferred and familiar music in the therapeutic context.

A mental model is an individual's process of thinking about how something operates in the real world, and is a framework to help explain the relationship among things (Senge, 1992). A mental model can shape one's behavior in decision making and help problem solving; however, it can also limit an individual's creativity when the model is not longer adequate to solve the problem yet is still deeply internalized by the individual (Chermack, 2003; Senge, 1992). Therefore, the purpose of this study was to review the researcher's initial mental model of music familiarity and preference in music therapy and propose a revised mental model for the use of preferred and familiar music based on psychological and neurological constructs of music

preference and familiarity. The revised mental model of the researcher of preferred and familiar music will be informed by the following research questions:

1) What is the researcher's initial mental model of the researcher of preferred and familiar music in music therapy?
2) Based on the psychological and neurological constructs of familiarity, what is an operational definition of familiar music for therapy?
3) Based on the psychological and neurological constructs of preference, what is the operational definition of preferred music for therapy?
4) Based on these operational definitions, what is the relationship between preferred and familiar music in a therapeutic context and how does that relationship change the mental model of the researcher?
5) In what ways should the music therapist consider familiar and preferred music for therapeutic outcomes?
    a) When is preferred and/or familiar music appropriate in music therapy?
    b) When is preferred and/or familiar music contradictory in music therapy?

Chapter Three: Methods

The purpose of this study was to review the researcher's initial mental model of music familiarity and preference in music therapy and propose a revised mental model for the use of preferred and familiar music based on psychological and neurological constructs of music preference and familiarity. A comprehensive review of the literature was used to construct operational definitions of familiar music and preferred music, to shape the revised mental model, and to inform clinical decisions about familiar and/or preferred music selections in music therapy.

Search Strategies

Studies for this topic were identified using keywords for two search strategies: keyword database searches and a search of reference lists. This study was developed from a class project that sought to identify the relationship between music familiarity and preference. During that project, the researcher was introduced to the book *Sweet Anticipation* (Huron, 2016). She used this book as a starting point for the current study, as well as a place with which she identified a few keywords to be used in the database search. After briefly reading *Sweet Anticipation*, the initial keywords included: familiarity, expectation, preference, and mere exposure effect. After the initial database search using these keywords, additional keywords were identified from words repeatedly used in the background and literature review. The literatures was focused on topics of music selections in music therapy settings, psychological theories on music and emotion, and neurological and biological evidence on music listening. The researcher conducted a subsequent database search after this second set of keywords was identified. All keywords are indicated in Table 1.

Table 1

Keywords Used in Database Searches

General keywords	Music therapy	Psychology	Neurology
Prefer	Music therapy	Psychology	Neurology
Preferred	Client preferred music	Learning	Amygdala
Preference	Music selection	Emotion	Hippocampus
Liking		Mere exposure effect	Reward system
Like		Processing fluency	
Familiar		Perceptual fluency	
Familiarity		Hedgehog theory	
Expectation		Habituation	

The researcher searched the literature using some keywords as independent single-word by themselves; quotations marks were used around the multi-word phrases to link them together as a unified keyword. These unified keywords included: “mere exposure effect,” “processing fluency,” “perceptual fluency,” and “hedgehog theory.” Some keywords were combined during database searches using the Boolean operator “AND,” in order to include relevant literature and exclude the literature unrelated to the research questions. Examples of keyword combinations include “music therapy” AND prefer, “music therapy” AND familiar, “music therapy” AND “client preferred music,” “music therapy” AND “music selection,” familiarity AND liking, familiarity AND expectation, liking AND expectation, music AND emotion, music AND amygdala, music AND hippocampus, music AND “reward system.”

The database keyword searches were conducted using the following databases: PsychINFO, PUBMED, Music Periodicals Database, ProQuest Dissertations and Theses Global, and ScienceDirect. Each single keyword, unified keywords, and keyword combinations using AND were searched in all five databases. The full list of keywords combinations are indicated in Table 2.

Table 2

Keywords Combinations Used in Database Searches

Music AND preference	Preference AND emotion
Music AND familiarity	Music AND emotion
Music AND expectation	"Music therapy" AND "music selection"
"Music therapy" AND preference	Music AND psychology
"Music therapy" AND familiarity	Music AND neurology
Familiarity AND learning	Music AND amygdala
Familiar AND expectation	Music AND hippocampus
Expectation AND preference	Music AND "reward system"
Familiarity AND liking	Music AND neurology

The researcher conducted an additional keyword search of titles using studies found in the reference lists of the articles, books, and websites identified during the initial database search. Keywords in Table 1 were used in this process.

Literature included in this study met two criteria; publications that did not meet these criteria were excluded from this study. Inclusion criteria was:

- Scholarly journal articles, dissertations and theses, and books.
- Published in English.

Data Analysis

During the initial keyword search, the researcher reviewed titles and abstracts. Relevant articles that included keywords were downloaded and entered into an article synthesis spreadsheet (Appendix). The synthesis spreadsheet functioned as a method to keep track of the key information and connections among literature. The researcher included the full references in APA style of the literature reviewed in Chapter 2 in the spreadsheet. The researcher analyzed data based on the information presented in the synthesis spreadsheet from reviewed literature to answer the research questions. The researcher marked repeating keywords in red in the spreadsheet, in order to clearly show connections across literature.

Based on the procedure to develop operational definitions (Sager, 1976), the researcher first identified the definitions of "familiarity" and "preference" from the Oxford American College Dictionary Online. Then, the researcher identified the characteristics of familiar music and preferred music as extracted from music therapy literature. Next, the researcher determined situations in which familiar music and preferred music have been utilized in facilitating conditions. In the case of this research, the facilitating condition is general music therapy settings. Lastly, the researcher created operational definitions based on the information identified in these first three steps. This final step is processed by writing out the definitions in sentence form including the two terms ("familiar music" and "preferred music"), the characteristics of each term, and the facilitating conditions the two terms are used (music therapy settings).

The definitions of familiarity and preference were used to inform the researcher's intial mental model of familiar and preferred music in music therapy, and they also support the

potential emergence of a revised mental model of familiar and preferred music in music therapy grounded in the current evidence-based research. In order to determine if a revised mental model of familiar and preferred music was warranted, the researcher followed the steps: (a) described her initial mental model of familiar and preferred music in music therapy; (b) provided an understanding of the relationship between familiar and preferred music based on psychological and neurological constructs; (c) provided emerging responses to the questions targeting the appropriateness and contraindication of preferred music and familiar music in music therapy; and (d) present the revised mental model.

Chapter Four: Results

Researcher's Initial Mental Model of Music Familiarity and Preference

Research has suggested that people tend to prefer music that was popular from their young adulthood years (Gibbons, 1977) and music therapists appear to often take this assumed tendency into account when making music choices. Although there is no claimed mental model of music familiarity and preference in music therapy, Gibbons' finding suggests familiar music is usually preferred and has informed how music therapists select music especially when clients are not able to verbalize their choice of a particular song. Some music therapists tend use the terms "familiar music" and "preferred music" interchangeably and assume these two terms are the same.

Based on knowledge and experience before this study, the researcher's understanding of familiar music and preferred music was that, familiar music is *a piece of music a client previously listened to*, and preferred music is *a piece of music a client likes more than other pieces of music.* Although different in definitions, the clients' preferred music is usually the music they are familiar with, and "familiar and preferred music" is widely used in music therapy settings. This mental model is illustrated in Figure 2. However, musical experience grows throughout an individual's lifetime, and standard which believes client prefer familiar music is a general statement without investigating the complexity of human experience. Results from reviewing the literature indicate that clients' familiar music and preferred music are different based on psychological and neurological constructs.

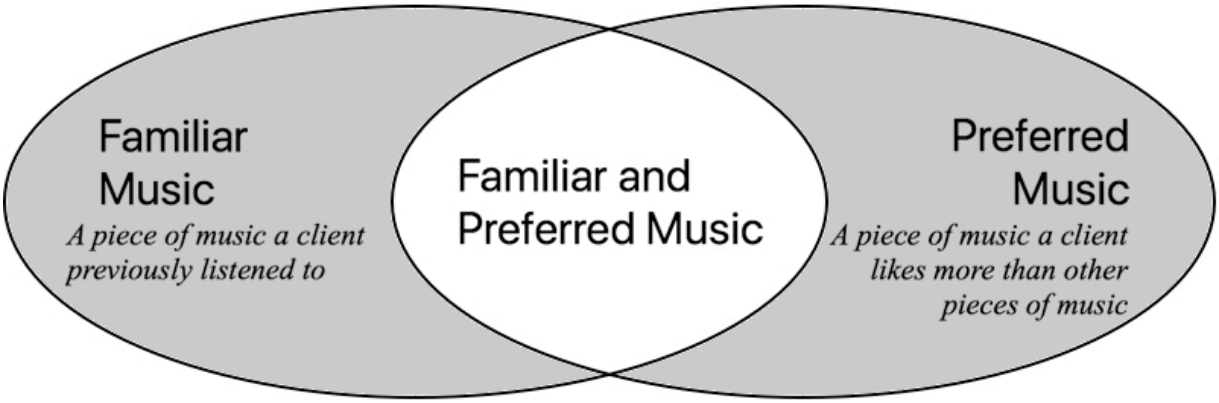

Figure 2. Researcher's initial mental model of music familiarity and preference.

Operational Definition of Familiar Music for Therapy

The operational definition of familiar music for therapy is constructed from the psychological and neurological research findings for familiarity as previously reviewed. Familiarity is a primary component of recognition memory, which is closely associated with past experience (Clark, 2013). As an individual becomes familiar with music selections, expectations of what happens next in the music are elicited, with the fulfillment and denial of expectations are important for emotion in music (Meyer, 1956). There are three types of expectation that form familiarity through repeated exposure as previously reviewed (Huron, 2006). *Veridical expectation* is associated with episodic memory; *schematic expectation* is associated with long-term memory; *dynamic expectation* is associated with short-term memory (Huron, 2006).

The current evidence in neuroscience shows that several brain structures are important in forming memory, including the hippocampus, the amygdala, the prefrontal cortex, and the cerebellum (Craik et al., 1999; Frankland & Bontempi, 2005; Green & Woodruff-Pak, 2000;

Josselyn, 2010). Among all structures associated with memory, the hippocampus is considered the most important as it consolidates short-term memory into long-term memory (Frankland & Bontempi, 2005). The three different types of expectation related to familiarity can therefore be understood from a neurological perspective. Dynamic expectation is utilizing short-term memory implicating hippocampus activation during immediate music listening experiences. These experiences may influence schematic expectations, or long-term declarative memory for recognition of past events. Schematic expectations activate the amygdala, which is involved in the consolidation of emotional memory. Veridical expectation of music forms episodic memory that may activate hippocampus short to long-term memory consolidation, amygdala activation for emotional memory association, and the prefrontal cortex related to encoding and retrieving memories with multiple exposures. Neurological research on the mechanism of mere exposure effect also confirm other brain areas, including left frontopolar cortex and parietal areas, were activated during memory (familiarity) judgement (Elliot & Dolan, 1998). Experience, or repeated exposure, strengthens expectation and memories for music experiences thus building familiarity. Therefore, this researcher proposes an operational definition of familiar music for therapy as: *a piece of music a client previously listened to, or a piece of music or a music style that a client recognizes based on musical knowledge or prior experience*. In this definition, "familiar music" is not only limited to particular pieces of music that a client has been exposed to, but extends to other comparable music that may not have been specifically listened to, but have expected properties based on client's music education and musical experience.

Operational Definition of Preferred Music for Therapy

The operational definition of preferred music for therapy is constructed from the psychological and neurological research findings for preference as previously reviewed. There

are several theories that provide explanations of music preference. The mere exposure effect (MEE) proposes preference does not involve cognitive processes, but is purely formed by repeating a stimulus (Bornstein & D'Agostino, 1994; Zajonc, 1968). Processing fluency further developed the MEE. Processing fluency argues that, because the individual is repetitively exposed to the stimulus, the processing of the stimulus becomes easier, and this ease of processing creates a hedonic experience, which makes the individual prefer the stimulus (Bornstein & D'Agostino, 1994). Repetition of the stimulus promotes ease of processing, but too many repetitions can lead to habituation, where the individual gets used enough to the stimulus that cognitive responses halt. In this case, the theory of psychological complexity and preference argues that each individual has an "optimal level of complexity." When the complexity of the stimulus matches the individual's "optimal level of complexity," the individual has the highest level of preference for that stimulus (Walker, 1973). In contrast, Zajonc (1968) promoted the idea that preference emerges from the fulfillment of expectation, which is associated with past experience and requires cognitive processing (Huron, 2016). As another alternative, the Interactive Theory of Music Preference argues that preference is formed not only by familiarity, but also due to interactions with other factors such as the characteristics of music, personality of the individual, and other social and environmental influencers.

Similar to familiar music, the amygdala is considered the emotion center and responds to affective stimuli (Koelsch, 2013). Neurological research shows increased amygdala activity when listening to preferred music. Although considered as memory center, hippocampus is also implicated as an important brain structure in emotional response (Koelsch et al., 2007; Warner-Schmidt &Duman, 2006). The neurological reward circuit is also associated with music preference, as evidenced by the activated nucleus accumbens when listening to pleasant music

(Menon & Levitin, 2005). Familiarity and preference activate similar neurological systems and are theoretically grounded in exposure and expectation. The difference between the two can be explained as follows; whereas familiarity is based in experience, preference also involves an affective response. Therefore, the operational definition of preferred music is: *a piece or style of music that a client likes more than other pieces or styles of music.*

Relationship and Difference between Music Familiarity and Preference

Music therapists often ask clients for what music clients know or what music they prefer during the initial assessment. When clients are not able to respond or when there is limited time and resources to make assessments before providing service, music therapists may choose music from the client's young adulthood or based on their age and/or developmental stage. In the researcher's initial mental modal on music familiarity and preference, client familiar music and preference were considered one and the same. Based on the findings of this study, a few theories support this statement in the following ways: (a) individuals prefer music that they were previously exposed to, because it does not require much cognitive processing (Zajonc, 1968; Bornstein & D'Agostino, 1994); and (b) individuals prefer a familiar music piece or a style when it is predictable (Huron, 2006), and when the individual has the "optimal" cognitive ability to understand the music (Walker, 1973). However, familiar music is not always preferred. When a piece of music is repeated too many times, individuals lose interest (Bornstein, 1989). Besides, familiarity is not the only factor that influences preference; the interaction of the music, the listener, and the environment together form the preference at the moment (LeBlanc, 1982). Based on a review of the related psychological theories and neurological evidence and the operational definitions, the researcher's mental model of familiar music and preferred music has been revised. The revised mental model is illustrated in Figure 3.

As illustrated in Figure 3, familiar music and preferred music are given more importance in the revised mental model, and each term is given with revised operational definition. With added boxes indicating psychological and neurological constructs that informed the revised model, the researcher was able to identify evidence in psychology and neuroscience that contribute to the original idea that familiar music and preferred are used interchangeably. The top left box indicates brain structures associated with familiarity, and the top right box indicates brain structures associated with preference; structures that function in both familiarity and preference (e.g. hippocampus and amygdala) are boxed in two additional boxed connected with a line. The bottom left box indicates psychological factors related to familiarity, the bottom right box identifies theories related to preference, and the bottom center box indicates theory explaining why sometimes individuals prefer music they are familiar with.

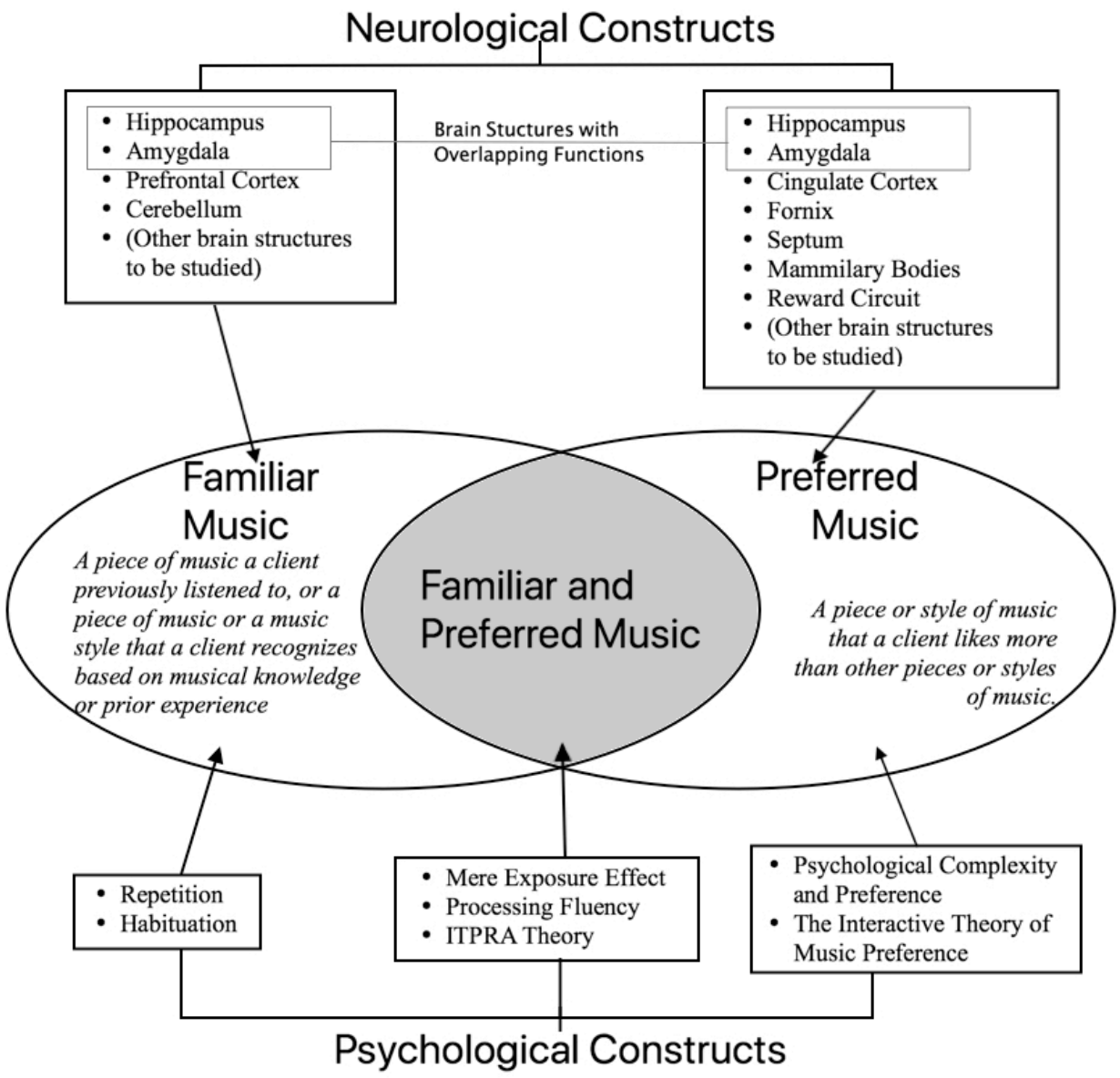

Figure 3. Researcher's revised mental model of music familiarity and preference.

The Use of Familiar and Preferred Music in Music Therapy

The associative sources of emotion in music form the relationships between the non-musical factors and music (Sloboda & Juslin, 2001). Familiar music is associated with past events and people and environment during the event, and familiar music triggers the recall of

those experiences. The idea of associative emotion relates to the classic position of referentialism – the emotion in music refers to extramusical concepts and events outside the music (Meyer, 1956). Since music is largely considered to have associative meaning with personal experience, familiar music has been used in music therapy to promote clients' emotional responses (Ali & Peynircioğlu, 2006; Hilliard, 2004). In addition, familiar music can also be used to build rapport between client and therapist as it creates a sense of safety and enhances orientation to the environment (Baker, 2001; Silverman et al., 2016). Since client familiar music may also be identified as preferred, client "preferred familiar music" functions the same as familiar music. In addition, client preferred music (yet unfamiliar) can also function as a motivation to promote engagement in music therapy interventions (Clair, 2016). In one study, 200 female music education students participated in an experiment. Each participant was assigned one piece of music and asked to rate their stress level both before and after listening, as well as the level of preference and familiarity with the music. Results found that music preference, not familiarity, is the most influential factor in decreasing stress level (Jiang, Rickson, & Jiang, 2016). In another study investigating the effectiveness of music in reducing anxiety, while not statistically significant, results found the participants' preferred genre was slightly more effective than the specific songs in reducing anxiety (Walworth, 2003).

Different from referentialists, absolutists believe that the meaning of music exclusively lies within the music itself (Meyer, 1994). In some music therapy approaches, music therapists utilize unfamiliar music to facilitate certain processes such as stimulating imagery and promoting expressions (e.g. Bonny Method of Guided Imagery and Music, Nordoff-Robbins Music Therapy). For example, in the Bonny Method of Guided Imagery and Music, pre-selected classical music is primarily used (Muller, 2014). The music programs used in each session

consist of several pieces of music, and each music program is focused on evoking different emotions. Examples of themes of music programs used in the Bonny Method Imagery and Music include but are not limited to sadness and loss, compulsions. For another example, Nordoff-Robbins Music Therapy believes each child processes unique music talent and skills to respond to music. Active music-making evokes the inner "music child" and provides an alternative way for children with disabilities to communicate through music (Aigen, 2014).

In summary, both familiar and preferred music has shown effectiveness in many music therapy settings. Familiar music is effective in creating a safe environment (Gerdner, 2000) and elicit past memories (e.g. Clair, 1996), and preferred music is used to encourage participation and improve mood (e.g. Hilliard, 2004; Renshaw, 2015). Research suggest the degree of preference is more important than the degree of familiarity (Silverman, Letwin, & Nuehring, 2016), and a client preferred genre is more effective than preferred specific songs (Walworth, 2003). However, unfamiliar music is also used in music therapy settings regardless of clients' musical preference and has demonstrated effectiveness in promoting relaxation and increasing communication (e.g. Aigen, 2014; Muller, 2014).

Chapter Five: Discussion

The terms “familiar music” and “preferred music” are seemingly used interchangeably in much music therapy literature without clear definitions. In addition, there seems to be a belief for many music therapists that client preferred/familiar music should guide music selection. The researcher of this study found that although “client preferred music” and “familiar music” were used in many music therapy studies, most of the studies did not clearly report the criteria of preferred music and familiar music. For example, the use of the term *Patient Preferred Live Music* (PPLM) is promoted to indicate music that is selected by the patient and delivered live by the music therapist during music therapy interventions (Silverman et al., 2016). However, “familiar live music,” “live music,” and “live patient preferred music” are all used to describe PPLM creating the assumption that familiar and patient preferred may be synonymous. without distinguishing between familiar and preferred. In addition, within the research literature, “patient-preferred” music is often a limited range of music offered by music therapists based on music believed to be commonly familiar (Silverman et al., 2016).

The field of music therapy requires clearer understandings of these terms, how they differ, and how they relate to each other. Otherwise, a clinician can not understand why and when client familiar or preferred music is relevant for music therapy, and therefore how to make appropriate professional decisions about music selection.

Results of this study identified characteristics differentiating music familiarity and preference as distinct but closely related constructs. Music familiarity depends upon memory, while music preference is a feeling of liking one object over another. Music familiarity can induce preference both consciously and subconsciously, but familiarity does not always become preference. On the other hand, music preference could be impacted by familiarity, but also by a

number of musical and psychosocial aspects. For the music therapist, it is important to understand the difference between familiar music and preferred music, and to consider what music is best for the client in the specific context when choosing and offering music choices, rather than using music that music therapists think clients may know.

Although there is no explicit, collective mental model of music familiarity and preference in music therapy, examining one's personal mental model of a phenomenon can provide a platform for further discussion. Similar to case study research, a personal mental model can also create additional knowledge and reflection for discovering more generalizable processes. Therefore, one of the research questions of this project was to identify the researcher's mental model of familiar and preferred music, explore the psychological and neurological constructs of familiarity and preference and operationally define "familiar music" and "preferred music," and apply this knowledge into a revised mental model to inform how the music therapist considers familiar and preferred music for therapeutic outcomes.

Constructing a mental model can be a useful process to help music therapists understand the underlying mechanisms of why a certain piece of music is potentially effective for a client. A mental model of preferred and familiar music can guide music therapists during music selection and to encourage music therapists to reason why to choose a certain song. An individual mental model reflects a person's thinking process; it is flexible and can be revised when the individual thinks the current model no longer answers questions sufficiently. Similarly, opposite views on music therapy protocols have emerged in the profession. On one hand, different music therapy protocols have demonstrated efficiency in decreasing pain perception, anxiety, and nausea (e.g. Silverman et al., 2016; Tan, Yowler, Super & Fratianne, 2010); on the other hand, there are other professionals believe that creating protocols would potentially limit the flexibility of therapeutic

process. However, the researches consider protocols as mental models, which provides clinicians general structures before treatment, and the protocols and be modified and individualized based on the uniqueness of each therapeutic relationship and context. Thus, music therapists can always add new knowledge and research findings from both music therapy profession and other related professions to their mental models to guide their practice.

Clinical Implications and Recommendations

Results from this study identified how familiar and preferred music are different yet closely related concepts, and how defining these concepts is important to identify when familiar or preferred music should be used in the therapeutic context. The revised mental model illustrates music familiarity expectation is based on repetition and prior experience, and extramusical experience and be associated with music; besides, since forming familiarity is associated memory functions and requires cognitive process, familiar music can be used to foster safety and comfort environment, in memory care, and potentially to facilitate rehabilitation. Preferred music, whether specific songs genres, may be more appropriate for reducing stress levels, stimulating imagery, or promoting expression of emotion.

It is important for the music therapist to recognize that familiar music and preferred music are not the only components with which to make clinical decisions regarding music choices. For example, when inducing relaxation, it is important to match the music with client's arousal level, and gradually alter the characteristics of music to affect the client's arousal (Altschuler, 1948). In this case, the meaning of familiar music or the joy potentially elicited when listening to preferred music may create an opposite result to relaxation. Moreover, when working with older adults and individuals with dementia, familiarity would be more appropriate than preference; familiar music contains associative meanings that can elicit memories and

enhance self-consciousness. However, when working with clients whose therapeutic goals are not related to memory functions, or associative meanings of music are not important in the therapeutic process, client preferred music or genres may demonstrate a better outcome. When offering music choices, it is also important to take clients' musical backgrounds and skills into consideration. Since emotions would be elicited by the fulfillment or failure of expectation, individuals with different music training would react differently to the same piece of music. Based on the results, the numbers of repetitions of a specific song can lead to different outcomes. Client may lose interest in the song if it is repeated for too many times. Noticing that repetitions of a non-preferred song can increase the degree of dislike, music therapists should carefully observe clients' behaviors to determine the use of specific songs, especially when clients are not verbally responsive.

Educational Implications and Recommendations for Future Research

Continuing education and broaden knowledge in different professions is important for both music therapy students and professionals. A clear differentiation between familiar and preferred music allows music therapy educators and students to better understand the effectiveness of each type of music in different goals with different populations. This process pushes music therapy as a discipline and a profession to broaden the knowledge in other professions, such as psychology, physiology, and neuroscience. As indicated in existing research, preferred genre plays a more important role than particular songs (Walworth, 2003), it is important for music therapy students to deepen music theory and history knowledge of different music styles, in order to deliver a more authentic musical presentation even though a required song is not familiar to us.

Clearly reporting research details helps other researchers understand why and how a certain piece or type of music is efficient in a certain setting. As stated throughout this study, although there are connections between music familiarity and preference, the two concepts are different. Clearly reporting details of each step of their research procedure (e.g. criteria for preferred or familiar music, how music is selected, etc.) can help the audience understand the relationship among music selections, clinical techniques, and therapeutic outcome. Such clarity will also support replication of research in the field (Robb, Burns & Carpenter, 2011).

Although the researcher of this study provided operational definitions of familiar music and preferred music, and provided several theories and finding targeting this topic, other researchers may process different perspectives on these definitions. Future research can focus on refining the operational definitions of familiar music and preferred music in music therapy, and deepen the understanding of the relationship between the familiar music preferred by integrating additional theories from sociology, behaviorism, and other theories examining emotion and music. Thus, a more holistic model on how musical preference can be formed to guide the use of familiar and preferred music in music therapy and inform music therapy education, practice and research.

Limitations

There are several limitations of this study, and they vary from the ability of the researcher to the lack of evidence of current research. One limitation of this study is that there may be other theories than those reviewed able to provide potential explanations of the mechanisms of preferred music. There are psychological theories can be added to this mental model. For example, Skinner's motivation theory (McLeod, 2018) may explain the effectiveness of preferred music as reinforcement and punishment in behavioral modification. Theories on the

intrinsic emotion in music, which is the affective response directly related to musical expressions might provide an understanding of the preference of novel music since unfamiliar music does not have associative meaning to the listener (Sloboda & Juslin, 2001). In addition to psychological theories, sociological theories can also be considered in future research to better understand individual musical preference as influenced by other people and the environment around them. However, since this study focused on identifying a definition, relationship and differences between music familiarity and preference, these additional theories were not included.

Another limitation of this study lies in the limits of the current development of neuroscience. First, neuroscience research on music preference is not largely conducted, and most studies are focused on the different responses between consonant and dissonant music (Menon & Levitin, 2005). According to the current findings in neuroscience, the limbic system (which includes the amygdala) and the reward center are considered related to emotional responses, while the hippocampus is the memory center. However, due to the complexity of the human brain and the inter-relationship between structures, scientists find overlapping functions of the amygdala and the hippocampus; they both function in emotional response and forming memories. Second, different experimental techniques (e.g. PET, fMRI) lead to different results (Pereira et al., 2011). There is still much to learn about familiarity and preference from a neuroscience perspective. Hopefully, studying music familiarity and music preference from a neuroscience approach will increase understanding and application of these concepts in general and for application to music therapy.

Lastly, there are limitations that lie in the nature of the mental model. Although mental models can be adjusted constantly based on one's everchanging understanding of the topics, several disadvantages were noticed:

1. Mental models are incomplete.
2. People's abilities to "run" their models are severely limited.
3. Mental models are unstable.
4. Mental models do not have firm boundaries.
5. Mental models are "unscientific."
6. Mental models are parsimonious. (Norman, 1983, p. 8)

Since a mental model is built upon an individual's reflection of how things operate in the real world, it contains subjective and imprecise thinking. When applying mental model to real life, it is also possible that the individual miss certain details in the model, which results in different outcomes than expected. In addition, it is usual that an individual would rather "do extra physical operation than mental planning (Norman, p.8)," which results in the insufficient the mental model.

Conclusion

The researcher's mental model of music familiarity and music preference attempted to provide operational definitions of familiar music and preferred music, and provided psychological theories and neurological evidence that explained the relationship between the two concepts. This model may not necessarily guide music therapist when selecting music for clients, but it encourages music therapists to think about the rationale of their music choices. Since mental models serve as guide in decision making, mental models in music therapy context is not only limited to familiar music and preferred music, each music therapist can build their own mental model on specific settings such as music used in group settings with older adults, and music used with individual child with developmental disabilities. In addition, one can always add new knowledge on the related topic to a mental model to guide his/her practice.

Music therapists cannot possibly know every song requested by clients, especially when immediate intervention is required. The findings of this study, supported by other literature (Jiang, Rickson, & Jiang, 2016; Walworth, 2003) suggest the music therapist does not need to use specific songs, but rather be knowledgeable and capable of facilitating a wide range of music repertoire to best meet clients' music preferences. Although music familiarity is a large contributing factor to music preference, other musical, social, and personal psychological and physiological factors also influence one's preference at a given moment (LeBlanc, 1982). Consequently, the quality of the music provided by a music therapist can be an important factor that influences the client's preference.

Finally, according to American Music Therapy Association (n.d.), music therapy is "the clinical and evidence-based use of music interventions to accomplish individualized goals within a therapeutic relationship by a credentialed professional who has completed an approved music therapy program." This definition suggests that a successful therapeutic outcome is impacted by not only music, but also the therapeutic relationship between the client and the therapist. Thus, music therapists should not only focus on broadening music repertoire and performance skills, but also related knowledge of clients' diagnoses and interpersonal skills.

Hopefully, this study will encourage other music therapists to think carefully about the selection of music based on the potential functions of familiar music and preferred music in the therapeutic context, to build their own mental models to guide their practice, and to remember it requires the therapist's keen observation of the client's behavior to adjust the delivery of music and patterns of communication in order to achieve the best outcome.

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Appendix: Literature Synthesis Spreadsheet

Citation	Music		Psychology		Neuroscience	
	Familiarity	Preference	Familiarity	Preference	Familiarity	Preference
Juslin, P. & Västfjäll, D. (2008). Emotional responses to music: The need to consider underlying mechanisms. Beh avioral and Brain Sciences, 31, 559-621. http://dx.doi.org/ 10.1017/s014052 5x08006079	**Bonny Method of GIM** Certain musical characteristics, such as repetition, pre- dictability in melodic, harmonic, and rhythmic elements, and slow tempo, are especially effective in stimulating vivid imagery (McKinney & Tims 1995). "Visual imagery is more strongly influenced or shaped by the unfolding structure of the music than is episodic memory, for which the music mainly serves a retrieval cue." **Episodic Memory**-Clair (Gibbons) finding **Musical Expectancy**-relate to Gestahlt (percetion) and emotion; strongly dependent on learning (Meyer, 1956); cultural learning		**Evaluative Conditioning**-learning, paired repeatedly with other positive or negative stimuli. **Emotional Contagion**-basic emotions only. listener perceives the emotional expression of the music, and then "mimics" this expression internally. Relate to Mirror Neuron **Visual Imagery**-basic and complex emotions. an experience that resembles perceptual experience, but that occurs in the absence of relevant sensory stimuli. Relate to Bonny Method of GIM Berlyne (1971)**"optimum" level of physiological arousal** (Wundt Curve) **Episodic Memory**-people tend to recall more memories from their youth and early adulthood (15 - 25 years of age, "reminiscence bump") Huron, veridical familiarity	**Episodic Memory**- Holbrook and Schindler (1989) found that participants showed the greatest liking for music that was popular during their youth.	**Brain Stem Reflex**-sudden, unexpected sound results in unpleasant feelings (survival functions) "When an auditory signal reaches the primary auditory cortex, the signal has already undergone a number of analyses by such brain structures as the superior olivary complex, the inferior colliculus, and the thalamus (Koelsch & Siebel 2005)." Relate to Walker (1971)"optimum" level of Complexity Mirror neuron - lack of study **Violations of musical expectancy** activate the same brain areas that have been previously implicated in violations of syntax in language (Koelsch et al. 2002a; Maess et al. 2001)	
Huron, D. (2008). Sweet anticipation. Cambridge, MA: MIT.	**Three familiarities/expectations** (p. 241) Veridical-Episodic memory, particular event (p.254) Dynamic-Short term memory, expectation based on new knowledge (p. 242) Schematic-Long term memory, expectation based on past experience		consciouness and exposure effect pp. 132-5		**Survival Functions**	

Appendix: Literature Synthesis Spreadsheet (Continued)

Citation	Music		Psychology		Neuroscience	
	Familiarity	Preference	Familiarity	Preference	Familiarity	Preference
Bornstein, R. (1989). Exposure and affect: Overview and meta-analysis of research, 1968-1987. *Psychological Bulletin, 106* (2), 265-289.				Author review and neta-analyzed experiments that investigage affect change in response to **Mere exposure effect**. Results show that that the exposures are most effective when stimuli are repeated for 10-20 times, and with unfamiliar stimuli presented at the same time. (Wundt curve)		
Menon, V., & Levitin, D. (2005). The rewards of music listening: Response and physiological connectivity of the mesolimbic system. Neuroimage, 28(1), 175-184. http://dx.doi.org/10.1016/j.neuroimage.2005.05.053						passively listening to music modulates activities in the **mesolimbic dopaminergic structures, including the ventral tegmental area and NAc,** which are involved in reward processing

Appendix: Literature Synthesis Spreadsheet (Continued)

Citation	Music		Psychology		Neuroscience	
	Familiarity	Preference	Familiarity	Preference	Familiarity	Preference
Zajonc, R. (2001). Mere exposure: A gateway to the subliminal. *Current Directions In Psychological Science, 10* (6), 224-228. http://dx.doi.org/10.1111/1467-8721.00154			**Mere Exposure Effect:** the author views the effect as **classical conditioning**- the repeated exposure is conditioned stimulus, and the affect is both unconditioned and conditioned response; the unconditioned stimulus is the absence of aversive consiquences.	Repeated exposure can enhance the preference of the stimuli, and can also enhace the preference of additional stimuli that share similar features (relate to wilson article, "subjective old")		
Pereira, C., Teixeira, J., Figueiredo, P., Xavier, J., Castro, S., & Brattico, E. (2011). Music and Emotions in the Brain: Familiarity Matters. Plos ONE, 6(11), e27241. http://dx.doi.org/10.1371/journal.pone.0027241					Brain activation data revealed that broad emotion-related limbic and paralimbic regions as well as the reward circuitry were significantly more active for familiar relative to unfamiliar music. Smaller regions in the cingulate cortex and frontal lobe, including the motor cortex and Broca's area, were found to be more active in response to liked music when compared to disliked one. Hence, familiarity seems to be a crucial factor in making the listeners emotionally engaged with music, as revealed by fMRI data.	

Appendix: Literature Synthesis Spreadsheet (Continued)

Citation	Music		Psychology		Neuroscience	
	Familiarity	Preference	Familiarity	Preference	Familiarity	Preference
Zajonc, R. (1968). Attitudinal effects of mere exposure. Journal Of Personality And Social Psychology, 9(2, Pt.2), 1-27. http://dx.doi.org/10.1037/h0025848			People and animals show a marked preference for familiar stimuli. **Mere exposure effect**	familiar stimuli reduce the need to pay attention, and that this reduces an organism's arousal level		
Huron, D. (2013). A psychological approach to musical form: The habituation-fluency theory of repetition. Current Musicology, (96), 7-35.			repetition+prediction->**habituation**: decrease in responsiveness resulting from the repeated presentation of an eliciting stimulus "**stimulus generalization** can be defned as the class of stimuli that an animal treats as similar or equivalent." On the other hand, processing fuency induces positive feelings toward familiar stimuli. "**the exposure effect** **can be absorbed into a broader concept known as** **perceptual fluency.**" (**Mere exposure effect -> peceptual fluency)** "the phrase "perceptual fuency" has tended to be supplanted by the phrase "process-ing fuency." Tat is, we prefer, not just easy perceptions, but also easy thoughts. Processing fuency embraces perceptual, motor, and cognitive behaviors."	"When participants are aware that some stimuli occur more often than others", they prefer new stimuli over familiared ones. (recall the AD article in introduction)		

Appendix: Literature Synthesis Spreadsheet (Continued)

Citation	Music Familiarity	Music Preference	Psychology Familiarity	Psychology Preference	Neuroscience Familiarity	Neuroscience Preference
Björklund, A., & Dunnett, S. (2007). Dopamine neuron systems in the brain: an update. Trends In Neurosciences, 30 (5), 194-202. http://dx.doi.org/10.1016/j.tins.2007.03.006						General information of the reward curcuit: motivated behavior send signals to VTA, and then **VTA releases dopamine to Nac, amygdala, striatum, and frontal cortex**
Koelsch, S., Fritz, T., & Schlaug, G. (2008). Amygdala activity can be modulated by unexpected chord functions during music listening. Neuroreport, 19(18), 1815-1819. http://dx.doi.org/10.1097/wnr.0b013e32831a8722+A18					Irregular sequences (unexpect, unfamiliar) have a different emotional valence than regular sequences, which can be perceived as less pleasant than regular sequences. "fMRI data show increased blood oxygen level-dependent signal changes bilaterally in the **amygdala** in response to music-syntactically irregular (compared with regular) chord functions. The combined data indicate that music-syntactically irregular events elicit brain activity related to emotional processes, and that, in addition to intensely pleasurable music or highly unpleasant music, single chord functions can also modulate amygdala activity."	

Appendix: Literature Synthesis Spreadsheet (Continued)

Citation	Music		Psychology		Neuroscience	
	Familiarity	Preference	Familiarity	Preference	Familiarity	Preference
Whittlesea, B. W. A. (1993). Illusions of familiarity. Journal of Experimental Psychology: Learning, Memory, and Cognition, 19(6), 1235-1253. doi:http://dx.doi.org.www2.lib.ku.edu/10.1037/0278-7393.19.6.1235			The relationship between perceptual fluency and familiarity is complicated by the fact that fluency of performance can result from, and can sensibly be attributed to, sources in either the past or the present showing a word too briefly for conscious perception immediately prior to its presentation for a recognition judgment increased the probability that subjects would claim to have seen the word in a list of words presented much earlier, regardless of whether the word was truly old or new. illusions of familiarity			
Koelsch, S. (2013). Brain and music. Chichester, UK: Wiley-Blackwell.					In music, studies from the laboratory of Koelsch and others have shown that trained musicians demonstrate a high degree of such mirroring, with the sounds of music capable of eliciting motor-cortical activity, and vice versa, motor activity capable of eliciting auditorycortical activity. musical pleasure tends to correlate with activity in the brain's "reward" system, most notably the ventral tegmental area of the midbrain and the nucleus accumbens of the basal ganglia, both predominantly dopaminergic (with some opioids in the mix as well; 226–27)	positive (musical) emotions come in two varieties, "fun" and "joy" (227–31). Each is associated with a distinct subsystem of the brain's limbic system, the former with the nucleus accumbens and ventral tegmental area (associated with "**reward**" as mentioned previously), the latter with the **hippocampus**.

Appendix: Literature Synthesis Spreadsheet (Continued)

Citation	Music		Psychology		Neuroscience	
	Familiarity	Preference	Familiarity	Preference	Familiarity	Preference
Winkielman, P., & Cacioppo, J. T. (2001). Mind at ease puts a smile on the face: Psychophysiological evidence that processing facilitation elicits positive affect.Journal of Personality and Social Psychology, 81(6), 989-1000. doi:http://dx.doi.org.www2.lib.ku.edu/10.1037/0022-3514.81.6.989			easy processing -> activities over the region of zygomaticus major muscle -> smile -> liking (illusions of familiarity) (WOW!)			
Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inferences.American Psychologist, 35(2), 151-175. doi:http://dx.doi.org.www2.lib.ku.edu/10.1037/0003-066X.35.2.15				**Mere exposure effect:** liking does not require conscious cognition.		
Brown, A., & Marsh, E. (2009). Creating illusions of past encounter through brief exposure. Psychological Science, 20(5), 534-538. http://dx.doi.org/10.1111/j.1467-9280.2009.02337.x			**fluency of processing** -> **familiarity (illusions)**. People feel an item is familiar because it is easy to process, even though the item is not previously exposed to them.			
Reber, R., Winkielman, P., & Schwarz, N. (1998). Effects of Perceptual Fluency on Affective Judgments. Psychological Science, 9(1), 45-48. http://dx.doi.org/10.1111/1467-9280.00008			**Perceptual/processing fluency**->liking			

Appendix: Literature Synthesis Spreadsheet (Continued)

Citation	Music Familiarity	Music Preference	Psychology Familiarity	Psychology Preference	Neuroscience Familiarity	Neuroscience Preference
Brown, S., Martinez, M., & Parsons, L. (2004). Passive music listening spontaneously engages limbic and paralimbic systems. Neuroreport, 15(13), 2033-2037. http://dx.doi.org/10.1097/00001756-200409150-00008						**nucleus accumbens** in the **ventral striatum** is activated when listening to **unfamilia**r but pleasant pieces (reward system)
Frankland, P. and Bontempi, B. (2005). The organization of recent and remote memories. Nature Reviews Neuroscience, 6(2), pp.119-130.					**hippocampus**: transform short-term memory to long-term memory	
Aarden, B. (2003). Dynamic melodic expectancy. (Doctoral dissertation, The Ohio State University). Available from ProQuest Dissertations & Theses Global.					experiments testing mere exposure effect: the effect DOES REQUIRE cognitive process (supporting Huron 2006 hypothesis)	
Harris, J. (1943). Habituatory response decrement in the intact organism. Psychological Bulletin, 40(6), 385-422. http://dx.doi.org/10.1037/h0053918				**Habituation:** how is it formed? Frequency, predictability, re-introduction		
Walker. E. (1973). Psychological complexity and preference: A hedgehog theory of behavior. In D. E. Berlyne and K. B. Madsen (Eds.), Pleasure. Reward. Preference (pp. 65-98). New York: Academic Press.			Hedgehog theory of behavior: inverted u-curve	people prefer an item when its complexity is at the "optimal" level - neither too simple nor too hard		

Appendix: Literature Synthesis Spreadsheet (Continued)

Citation	Music		Psychology		Neuroscience	
	Familiarity	Preference	Familiarity	Preference	Familiarity	Preference
LeBlanc, A. (1982). An interactive theory of music preference. Journal of Music Therapy, 19(1), 28-45. http://dx.doi.org/10.1093/jmt/19.1.28		8 levels of variable work interactively to contribute to one's music preference. These varables are musical, invironmental, and objective (personalities, etc.)				
Elliott, R., & Dolan, R. (1998). Neural Response during Preference and Memory Judgments for Subliminally Presented Stimuli: A Functional Neuroimaging Study. Journal Of Neuroscience, 18(12), 4697-4704.					Tested MEE, left **frontopolar cortex** and **parietal areas** were activated during memory judgement (familiarity, learning) Study show dissociation between **explicit memory (associate with hippocampus left frontopolar cortex) and implicit memory (right lateral frontal cortex)**	when presenting preference judgements, medial **prefrontal cortex and regions of occipital cortex** were activated When preference is modulated by object familiarity, **right lateral frontal cortex was activated**
Zola-Morgan, S., Squire, L., Clower, R., & Alvarez-Royo, P. (1991). Independence of memory functions and emotional behavior: Separate contributions of the hippocampal formation and the amygdala. Hippocampus, 1(2), 207-220. http://dx.doi.org/10.1002/hipo.450010208					experiment on monkeys show lesions in the **hippocampus only impair cognitive functions** and do not impair emotional functions.	lesions to the **amygdala** only impair affective functioning, not cognitive processes
Baumgartner, T., Lutz, K., Schmidt, C. F., & Jäncke, L. (2006). The emotional power of music: How music enhances the feeling of affective pictures. Brain Research, 1075(1), 151–164.						**Amygdala, hippocampal formation, parahippocampal gyrus, and the temporal poles** are found activated while visual and musical stimuli are paired

Appendix: Literature Synthesis Spreadsheet (Continued)

Citation	Music Familiarity	Preference	Psychology Familiarity	Preference	Neuroscience Familiarity	Preference
Eldar, E., Ganor, O., Admon, R., Bleich, A., & Hendler, T. (2007). Feeling the real world: Limbic response to music depends on related content. Cerebral Cortex, 17(12), 2828–2840.						**amygdala and hippocampal formation** demonstrate increase activity when subjects listen to music while watching film clips (neutral commercials), and this activity is larger than watching film clips alone or music alone.
Ball, T., Rahm, B., Eickhoff, S. B., Schulze-Bonhage, A., Speck, O., & Mutschler, I. (2007). Response properties of human amygdala subregions: Evidence based on functional MRI combined with probabilistic anatomical maps. PLoS One, 2(3), 1–9.						**amygdala** activities increased with no significant difference in conditions when listening to either consonant music or dissonant music , but different regions in amygdala demonstrated different types of activities
Warner-Schmidt, J., & Duman, R. (2006). Hippocampal neurogenesis: Opposing effects of stress and antidepressant treatment. Hippocampus, 16(3), 239-249. http://dx.doi.org/10.1002/hi po.20156						**hippocampal activities** is reduced in individuals with depression disorder, structural abnormality is find in hippocampus, and neurons of hippocampus die when individuals are under extreme stress.