

EFFECT OF TUNE REPETITION ON JUDGMENTS OF PREFERENCE IN NONTONAL
MUSIC

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EFFECT OF TUNE REPETITION ON JUDGMENTS OF PREFERENCE IN NONTONAL
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Thesis Abstract

Mustafa Taha Bilge, “Effect of Tune Repetition on the Judgments of Preference in Nontonal Music”

Previous studies have demonstrated a mere exposure effect (MEE) with unfamiliar tonal music. In this study, my goal was to investigate whether a MEE could be obtained with nontonal tunes. The fluency misattribution (Bornstein, 1989) and the affective precedence (Zajonc, 1980, 1984) accounts of MEE predict different outcomes for nontonal tunes in the MEE paradigm. Specifically, the affective precedence hypothesis predicts no relationship between increased fluency in processing these tunes and the extent of MEE and suggests that MEE should be observed for all tune types. On the contrary, the fluency misattribution hypothesis argues that MEE should be related to the extent of the increased fluency in processing the tunes. As a measure of the fluency I employed familiarity ratings. In Experiment 1, nonmusicians gave familiarity ratings to 4 times repeated presentations of unfamiliar (tonal), semi-random (nontonal), or fully random (nontonal) tunes during the exposure phase. A subsequent forced-choice liking task measured their preference for old vs. new tunes. The second experiment was identical except that the way tunes were repeated during exposure was varied. The results showed a MEE for fully random and unfamiliar tunes in Experiment 1, and for semi-random and unfamiliar melodies in Experiment 2. Further, familiarity ratings for all tune types showed increases with more exposures, however, the extent of this effect differed for tune types between Experiment 1 and Experiment 2. These results clearly contradict the predictions of the fluency misattribution hypothesis, however, are also problematic for the affective precedence hypothesis at some points.

Tez Özeti

Mustafa Taha Bilge, “Melodileri Tekrar Etmenin Tonal Olmayan Müzikteki Beğeni Kararları Üzerine Etkisi”

Daha önceki çalışmalar, tanıdık olmayan tonal müzikte salt maruz kalma etkisi (SMKE) ortaya koymuştu. Bu çalışmadaki amacım tonal olmayan melodilerde SMKE'nin geçerli liliğini ortaya koymaktı. SMKE'yi açıklayan iki yaklaşım olan akıcılık yanlış aktarımı (Bornstein, 1989) ve duyuşsal öncelik (Zajonc, 1980, 1984) hipotezleri, tonal olmayan müzik için farklı içerimler yapmaktadır. Duyuşsal öncelik hipotezini, tekrarlarla birlikte melodilerin işlenilmesindeki artan akıcılığın, SMKE'yle ilişkisi olmayacağını ve tüm melodi türleri için SMKE'nin geçerli olacağını savunur. Bunun aksine, akıcılık yanlış aktarımı hipotezi, SMKE'nin akıcılık artışlarıyla ilişkili olması gerektiğini iddia eder. Bu çalışmada, akıcılık ölçütü olarak tanıdıklık derecelendirmesini kullanılmıştır. 1. Deney'de, müzisyen olmayan katılımcılar, tanıdık olmayan (tonal), yarı-rastgele (tonal olmayan) veya tamamen rastgele (tonal olmayan) melodilerin 4 tekrarının her birinin ardından tanıdıklık derecelendirmeleri yapmıştır. Ardından, ikili seçmeli prosedürüyle, katılımcıların eski veya yeni melodilerden hangisini tercih ettikleri ölçülmüştür. İkinci deney, melodilerin ilk aşamada farklı şekillerde tekrar edilmesi dışında ilk deneyle aynıdır. İlk deneyde tamamen rastgele ve tanıdık olmayan melodiler için, ikinci deneyde ise yarı-rastgele ve tanıdık olmayan melodiler için SMKE bulunmuştur. Ayrıca, her iki deneyde de bütün melodi türleri için maruz kalma sayısıyla beraber tanıdıklık derecelerinde artışlar bulunmuştur, fakat, melodi türleri için bu artışlar 1. ve 2. Deney'de farklıdır. Bu sonuçlar akıcılık yanlış aktarımı hipotezine açıkça aykırıdır, fakat duyuşsal öncelik hipotezi de bu sonuçları açıklamakta bazı problemlerle karşı karşıyadır.

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CHAPTER 1

INTRODUCTION

The Mere Exposure Effect and Its Underpinnings

Repeated presentations of a stimulus lead participants to like it better. This is called the mere exposure effect and is demonstrated with a variety of stimuli including tunes (e.g. Halpern & O'Connor, 2000; Peretz, Gaudreau, & Bonnel, 2003; Szpunar, Schellenberg, & Pliner, 2004; Tan, Spackman, & Peaslee, 2006), polygons (e.g. Kunst-Wilson & Zajonc, 1980; Seamon et al., 1995) and words (e.g. Zajonc, 1968). The mechanism through which the mere exposure effect occurs is largely unknown. Of various accounts, the fluency misattribution model (Bornstein, 1989) and Zajonc's (1980, 1984) affective precedence hypothesis have been influential in generating mere exposure research.

The fluency misattribution model represents a cognitivist approach and explains the link between repetition and liking by referring to perceptual fluency. According to the fluency misattribution model, repeated exposures lead to an increase in perceptual fluency which refers to the ease of processing (Oppenheimer, 2008; Whittlesea & Williams, 2001). According to this hypothesis, after repeated exposures people misattribute that ease of processing to an increase in their liking of the stimulus when asked how much they liked the stimulus.

The affective precedence hypothesis, in sharp contrast, posits that misattribution of increased fluency to liking is not involved in the generation of liking through repetitions. Rather, according to this perspective, it is suggested that the affective system, which is theorized to be separate from the cognitive system (Zajonc, 1980, 1984), is influenced by repeated exposures.

Therefore, the affective precedence hypothesis assumes that preference judgments in the mere exposure paradigm are based on the affective system.

The predictions of those two accounts differ with regard to the manipulations used in the mere exposure paradigm. For instance, the affective precedence hypothesis predicts that regardless of their structural features, repetition of every stimulus will produce a mere exposure effect. This prediction stems from the idea that the affective system will not deal with the structural features of a stimulus while forming a preference judgment. On the contrary, the fluency misattribution model suggests that the structure of a stimulus will be influential in the mere exposure paradigm since those features determine the perceptual fluency by which the stimulus is processed. Thus, according to the fluency misattribution hypothesis, if repeated exposures to a stimulus do not increase the perceptual fluency with which the stimulus is processed due to its lack of structure, a mere exposure effect will not be observed.

Manipulating the structure of a stimulus is an efficient means to investigate what the mere exposure effect is based on. First of all, this manipulation leads to an efficient test of two prominent accounts of the mere exposure effect. Secondly, such a manipulation will help to determine how the link between exposure and liking is constituted, if there is any such link. One potential link discussed in the fluency misattribution model is increased fluency that results from the formation of a perceptual representation of a stimulus in memory. Therefore, memory measures such as familiarity ratings may keep track of the extent of increase in perceptual fluency and demonstrate whether exposure and affect in the mere exposure paradigm are linked via a perceptual fluency mechanism. To find out whether the changes in perceptual fluency with repeated exposures for stimuli of varying degrees of structure is related to changes in affect to these stimuli will shed light on the mechanism of the mere exposure effect.

Mere exposure research on the link between stimulus structure and affect generated mixed results. Butler, Berry, and Helman (2004) failed to find an increase in liking ratings after repeated exposures for meaningful words in contrast to non-words. Kuhn and Dienes (2005) created a set of tunes which used an artificial musical grammar. They exposed participants to tunes that either conformed or not conformed to that artificial grammar. Affect ratings showed that grammatical tunes were liked more than ungrammatical (i.e., non-structured) ones. Seamon et al. (1995) used visual stimuli which comprised possible and impossible figures. A mere exposure effect was observed for both kinds of stimuli, possible figures showing a higher effect though. In an artificial grammar study, Newell and Bright (2003) exposed participants to a set of words that were either grammatical or ungrammatical in the exposure phase. Liking responses on a Likert scale did not demonstrate a mere exposure effect for either stimulus type. However, a forced choice task on preference showed a mere exposure effect for grammatical stimuli but not for ungrammatical stimuli. To summarize, present research has not been successful yet in fully answering the question as to whether this effect is sensitive to structural features of stimuli and if so, what role, if any, cognition plays in the proclaimed link between exposure and affect.

I employed musical stimuli which varied in tonality and rhythmic regularity to address this question. I also collected familiarity ratings per exposure as a measure of cognitive processing and tried to investigate how perceptual fluency was related to increase in affect in the mere exposure paradigm. Before presenting my hypothesis, however, I will provide a description of how musical rules are processed in the human mind and discuss the two accounts of the mere exposure effect in relation to this frame.

Processing of Musical Stimuli

The mere exposure effect is also demonstrated in the musical domain (e.g. Halpern & O'Connor, 2000; Peretz et al., 2003; Szpunar et al., 2004; Tan et al., 2006). Nevertheless, the question remains whether exposures per se are sufficient for a mere exposure effect in music, or whether the structure of the stimuli mediates this effect. Structure (i.e. rules) in tonal music allows notes to form meaningful wholes through which affect can be communicated, and structure of musical stimuli are often hypothesized to be related to the expression of affect in music (cf. Juslin, 2003). Keeping in mind that meaningless stimuli (e.g. Chinese ideograms presented to American participants; see Zajonc, 1968; for a review on stimulus meaningfulness, see Bornstein, 1989) can invoke an enhancement in affect, it is also possible that structure, which provides meaning in music (Juslin, 2003), is unnecessary for the mere exposure effect. Utilizing random tunes in a mere exposure paradigm will allow evaluating this possibility. Moreover, if a mere exposure effect could be demonstrated with nontonal and random tunes, it would suggest that previous experience with any kind of musical stimuli is not mandatory and repeated exposures are sufficient for increases in affect.

The role of repetition is critical for musical expression in musical themes (Hutchins & Palmer, 2008) in that repetition is necessary for musical ideas to be elaborated and enriched. If repetitions lead to better liking, the intriguing question regarding the basis of affective reactions in music is answered at last. That is, mere repetition of musical themes within a musical composition might be sufficient to invoke a feeling of liking. However, if this is the case, musical structure can no longer be claimed to play a role in the mere exposure effect. The two accounts of the mere exposure effect evaluated in this thesis attribute different roles to musical structure in the mere exposure effect. For the fluency misattribution model, the prerequisite for

enhancement in liking is whether repeated exposures to a stimulus facilitate perceptual fluency, which is a cognitive operation on perceptual traces (Oppenheimer, 2008; Whittlesea & Williams, 2001). The affective precedence hypothesis, however, argues that the mere exposure effect will not be contingent upon whether or not stimuli are subject to cognitive processing but instead wholly rely on the affective system (Zajonc, 1980, 1984, 2001). Accordingly, the affective precedence hypothesis predicts that repeated presentations of tunes of any kind, be it tonal or nontonal, will be sufficient to increase liking and there will not be any relation between cognitive measures and preference judgments for the presented stimuli.

The question of whether nontonal stimuli are able to form mental representations is vital for the purposes of this thesis. Hitherto, research on how nontonal stimuli are cognitively processed was concerned with recognition memory and rule learning. Mikumo (1996) illustrated, for instance, that tune structure (i.e. the tonality factor) influences recognition performance. In Mikumo's study, musically untrained participants showed chance-level recognition for nontonal tunes that were compared to lures which were also nontonal but modified versions of the original tune. Unlike musically untrained participants, musically trained ones were able to correctly recognize nontonal tunes above chance level, although their overall recognition performance for nontonal tunes was worse than that for tonal tunes. All in all, this study suggests that nontonal tunes cannot establish adequate representations for recognition, at least for nonmusicians. To the extent that the same mental representations are used for recognition and attributional processes (i.e. the misattribution of fluency to liking in this case), the fluency misattribution account predicts no mere exposure effect for nontonal tunes.

A study by Dienes and Longuet-Higgins (2004) partly answers the question of whether or not nontonal music leaves "traces" that enable implicit learning of their structure. In this study,

the authors created a set of tunes which relied on the rules of serialist nontonal music. In serialist nontonal music, composers select a pitch class, which is a group of notes split by octaves (e.g. C is a pitch class which includes all of the 12 pitches in an octave including the specific pitch of C), and create tunes by using every pitch only once in a pitch class and employing transformations of this tune as a means of forming musical themes (Dienes & Longuet-Higgins, 2004). In the study phase, participants were exposed to serialist nontonal stimuli and a specific transformation of this tune. In the test phase, Dienes and Longuet-Higgins informed their participants that the tunes in the study phase were created using a rule and required them to classify the tunes presented in the test phase according to this rule. Their results indicated that non-musicians performed at chance level in the classification task in contrast to participants who were experienced in serialist music although those participants reported that they were purely guessing while making their classifications. This study reveals that representations formed after listening to nontonal serialist music are not adequate for the purposes of rule learning. If, as in the case for recognition memory, the same representations are employed for rule learning and attributions, the fluency misattribution account predicts no mere exposure effect for nontonal tunes. Affective precedence hypothesis, on the other hand, assumes no role for cognitive representations for the mere exposure effect.

Mere Exposure Research in Music

Mere exposure research with musical tunes mostly refers to the mere exposure effect as an implicit memory phenomenon (e.g. Halpern & O'Connor, 2000; Peretz, Gaudreau, & Bonnel, 1998). For instance, Halpern and O'Connor (2000) examined whether participants who suffered Alzheimer's disease (AD) and healthy participants who were either young or old would demonstrate similar performance in a recognition task (as a measure of explicit memory

performance) and a pleasantness task (i.e. the mere exposure effect, as a measure of implicit memory performance). Their results showed that recognition memory performance of the AD group was similar to that of the age and education-controlled group and lower than that of young and old healthy participants. However, the AD group did not demonstrate a mere exposure effect in contrast to the remaining groups, including matched-controls. The results seem to disagree with the implicit memory studies which consistently find that AD harms explicit memory but leaves implicit memory relatively intact (Fleischman et al., 2005). The authors were unable to offer an explanation of the results since their account treated the mere exposure effect as an implicit memory phenomenon. Those results are surprising also for the fluency misattribution model because the AD and the matched-control groups showed similar performance in the recognition task which suggests that the representations of the tunes were of similar strength for participants in the AD and matched-controls. Whereas matched controls attributed the increased fluency based on the previous exposures to liking, the AD group did not employ such a misattribution. From the viewpoint of the fluency misattribution hypothesis, the only explanation for these results is that the representations used in recognition are not related to the representations used in the misattribution processes leading to the mere exposure effect. However, the fluency misattribution hypothesis consistently argues for an inverse relationship between explicit memory and the strength of the mere exposure effect claiming that subliminal presentations of stimuli lead to stronger mere exposure effects than supraliminal presentations (cf. Bornstein, 1989; but see Whittlesea & Price, 2001). On the other hand, Halpern & O'Connor's results are less problematic for the affective precedence hypothesis since it does not assume a mediating role for cognitive processing (i.e. explicit memory in this specific case) in the mere exposure effect (but see Zajonc, 2001). All in all, it seems obligatory to use a more

sensitive measure of cognitive processing than recognition for a more fruitful evaluation of the mere exposure effect.

Another line in mere exposure research with musical stimuli deals with whether tune structure determines the strength of the mere exposure effect. Smith and Cuddy (1986) employed five classes of structurally different stimuli varying from 7-note chromatic sequences (i.e. the most complex and nontonal) to 7-note sequences which heavily relied on Western harmonic and melodic rules (i.e. the simplest and the most tonal). Their participants consisted of highly trained, intermediately trained and untrained students. In the exposure phase, tunes were presented 10 times and pleasantness ratings on a 7-point Likert scale were collected after each exposure. The results of this study showed that repeated exposures increased participants' liking ratings for all four tune types except the simplest type. Musical training also demonstrated a main effect such that highly trained musicians gave the highest liking ratings whereas untrained participants gave the lowest ones. However, no significant interaction between musical structure and repetition was found which means that tune structure did not show different levels of liking effect with number of repetitions. As explained earlier, previous research on nontonal stimuli demonstrated that nontonal stimuli were not encoded aptly for a recognition memory task (Mikumo, 1996) or for a rule classification task (Dienes & Longuet-Higgins, 2004); thus, nontonal stimuli might also not form adequate representations to be used in the process of misattribution. If such is the case, the mere exposure effect for nontonal stimuli in this study remains problematic for the fluency misattribution hypothesis. However, no measure for cognitive processing of tunes were applied in this study, thus, no further comments can be made on the predictions of the fluency misattribution hypothesis with this data.

Szpunar et al. (2004) also included tune structure as a factor in the mere exposure paradigm. The authors employed either random, nontonal tunes (Experiment 1 and 3) or tonal, orchestral tunes (Experiment 2) and presented them repeatedly under either a focused listening condition, or an incidental listening condition in which the participants listened to the tunes via one channel from an earphone as they heard a story through the other channel with the instruction not to pay attention to the tunes. Participants gave liking ratings after each exposure, and subsequently, recognition confidence ratings to the same tunes after each exposure in a separate phase. For nontonal tunes, a linear increase in liking ratings was observed under incidental listening but not under focused listening. Recognition confidence ratings, on the other hand, showed a very sharp linear increase under the focused listening condition but not under the incidental listening condition (under which neither a linear, nor a cubic, or quadratic trend was observed). In Experiment 2, which used tonal tunes, a linear increase in liking ratings with repeated exposures was observed under the focused listening condition and a quadratic trend was observed under the incidental listening condition. The increase in recognition confidence and liking ratings with repeated exposure under incidental listening was similar to each other in both Experiment 2 and 3. The authors argued that this finding was not compatible with the fluency misattribution hypothesis that predicts stronger mere exposure effects without explicit memory (Bornstein, 1989). Putting aside that recognition confidence ratings may not be ideal measures for explicit memory, the differences between the results of Experiment 1 and Experiment 2 and 3 deserves attention. First, the stimuli used in Experiment 1 were monophonic and nontonal, random tunes that consisted of 5 to 9 notes whereas the stimuli used in Experiment 2 were excerpts from polyphonic orchestral scores, thus, different trends in liking and recognition confidence between those tune types might not be merely based on structure of the stimuli. Second, the number of repetitions differed between Experiment 1 (4, 16, or 64 times) and 2 and 3

(2, 8, or 32 times). Despite those caveats, the results of Szpunar et al. are important in that they demonstrate a dissociation between the effect of repeated exposures on liking ratings (an affective judgment) and recognition confidence ratings (a cognitive judgment). Earlier research on nontonal stimuli (e.g. Dibben, 1994; Dienes & Longuet-Higgins, 2004; Krumhansl, Sandell, & Sergeant, 1987; Mikumo, 1996) so far suggested that unlike with tonal stimuli cognitive processing does not seem to occur with nontonal ones. However, Szpunar et al.'s measure of cognitive processing (recognition confidence) suggests otherwise, probably because they used a more sensitive measure than those used so far in nontonal music research. The sensitivity of cognitive measures is critical in mere exposure research with nontonal stimuli because it enables researchers to put to test the predictions of the fluency misattribution hypothesis.

The Present Study

I have outlined above that the structure of musical stimuli influences how those stimuli are cognitively processed (e.g. Dienes & Longuet-Higgins, 2004; Mikumo, 1996). Therefore, it becomes an essential question in the mere exposure paradigm whether a mere exposure effect can be obtained with nontonal and rhythmically irregular stimuli. If both tonal and metrically regular tunes and nontonal and rhythmically irregular tunes show similar mere exposure effects, I may say that the mere exposure effect is, to some extent, independent of cognitive processing. To test this possibility, I used three groups of tunes which consisted of a) rhythmically regular, tonal unfamiliar tunes, b) rhythmically regular but nontonal tunes that were randomly composed using notes within 1.5 octave only (semi-random tunes), and c) rhythmically irregular nontonal tunes that were randomly composed using notes within all 5 octaves (random tunes). Tune type was designed as a between-subjects variable.

As a measure of cognitive processing, I preferred familiarity scores. Familiarity, which is conceptualized as a feeling that is based on the experience of fluency while processing a stimulus (Jacoby & Dallas, 1981), seems to be a good fit for the aims of this thesis (in this case, the measurement of cognitive processing in the exposure phase). In addition, measuring familiarity may be a more sensitive indicator of overall cognitive processing than most of the cognitive processing measures used in nontonal musical research such as recognition (Mikumo, 1996), recognition confidence (Szpunar et al., 2004), or tune classification (Dienes & Longuet-Higgins, 2004), and so on. Familiarity scores were collected after each tune exposure, therefore, it was possible to see the relationship between number of repetitions and the cognitive processing of stimuli.

For each tune type, I compared the trends in familiarity ratings to preference judgments. I tested the predictions of the affective precedence and the fluency misattribution via those comparisons. Specifically, the affective precedence hypothesis predicts that a mere exposure effect will be observed for all tune types and will not be related to cognitive processing related mechanisms. On the contrary, the fluency misattribution hypothesis predicts that the mere exposure effect is contingent on cognitive processes.

I ran two experiments which differed in how tunes were repeated throughout the exposure phase. In Experiment 1, the four repetitions of every tune were distributed in a dispersed fashion. In Experiment 2, I employed an exposure list which included dispersed repetitions, repetitions at the beginning and at the end of the list. The main purpose of this manipulation was to see whether repetition in the beginning of the list as opposed to the end of the list would create differential mere exposure effects.

Hypotheses

1- If the fluency misattribution hypothesis is valid in the mere exposure paradigm with musical stimuli, increasing familiarity ratings with repeated exposure should lead to an increase in liking preference. The fluency misattribution hypothesis further predicts that the type of tune in which the highest increases in familiarity are observed will display the largest mere exposure effect, whereas the type of tune in which the lowest increases in familiarity are observed will display the smallest mere exposure effect, if any.

2- If the affective precedence hypothesis is valid, there will be no relationship between the increases in familiarity ratings with repeated exposure and preference ratings. A mere exposure effect will be observed for all tune types, regardless of whether the tunes are nontonal or rhythmically irregular.

3- Based on the data from previous research with nontonal music (e.g. Dienes & Longuet-Higgins, 2004; Mikumo, 1996) the steepest increases in familiarity ratings with repeated exposures will be for unfamiliar, tonal tunes. Random tunes will demonstrate the lowest increases in familiarity ratings.

4- If the affective precedence hypothesis is valid, for any type of tune there will be no differences between preference ratings shown for different types of repetition (i.e. at the beginning, at the end, and dispersedly) because according to this hypothesis, cognition does not mediate affective responses.

5- If the fluency misattribution hypothesis is valid, type of repetition will have an effect on preference ratings for all tune types. The direction of effect will be related to the increases in

familiarity ratings, e. g., if repeated exposures in the beginning of the list creates the highest increases in familiarity ratings, it will likewise create the largest mere exposure effect.

CHAPTER 2

EXPERIMENT 1

Method

Participants

Fifty-eight nonmusicians who were undergraduate students participated in return for extra credits in psychology courses. None of them had more than 1 yr of musical experience. Yet, to be eligible they all had to pass a pitch test that required them to distinguish a minor interval from a major interval to ensure a basic level of sensitivity to pitch change.

Materials

A total of 36 tunes were used for each tune type. Eighteen of those tunes were repeated four times in the exposure phase while the other 18 tunes were only presented in the test phase. Unfamiliar tunes were taken from the study of Mungan, Peynircioglu, and Halpern (2010). Those tunes were mainly excerpts from classical pieces, or themes from movie scores. Semi-random and random nontonal tunes were generated using a tune generator software (Temperley, 2010) (available on <http://www.link.cs.cmu.edu/tune-generator/>), which allows users to determine certain parameters of the tunes. By manipulating degree of tonality, interval range, and degree of rhythmic regularity, I generated two types of tunes, semi-random and random tunes, both of which were nontonal. Semi-random tunes used random notes that had a range restriction of one and a half octaves to sound somewhat like unfamiliar tunes albeit lacking tonality, whereas random tunes were allowed an interval range of up to 5 octaves. The rhythmic irregularity also varied between semi-random and random tunes; I designed semi-random tunes to be rhythmically regular and to include no accented notes while random tunes had a distorted metric

structure as some notes were accented more than others. The random tune generator allowed me to determine the tonality factor by assigning a value between zero and one for the tonality parameter. This value was zero for both semi-random and random tunes. As a result, semi-random tunes sounded somewhat like unfamiliar tunes though lacking tonality, whereas random tunes sounded very unusual due to their extreme octave range and rhythmic irregularity. All tunes, including unfamiliar tonal tunes, were monophonic (i.e., only one note was played at a time) and had an average length of 11.5 s.

Unfamiliar tunes were recorded using a MIDI keyboard on a piano patch whereas semi-random and random tunes were exported by the generator software as MIDI files and then converted to WAV files.

A total of 6 CDs were prepared, 3 CDs for the exposure phase and 3 for the test phase. All CDs contained either unfamiliar (tonal), semi-random (atonal) or random (atonal) tunes. Each exposure phase CD contained 18 tunes that were repeated four times throughout the list in a pseudorandom fashion such that there were at least 5 tunes in between two repetitions. Each preference test CD, on the other hand, consisted of 18 tune pairs. One tune in each pair was from the exposure list (old) whereas the other was a novel tune of the same tune type (new). New and old tunes were counterbalanced across subjects such that each tune appeared equally often as a new and old tune across lists. The track list is presented in Table 1.

Table 1. The Track List Used in the Exposure Phase in Experiment 1.

<i>Track Number</i>	<i>Tune</i>	<i>Track Number</i>	<i>Tune</i>	<i>Track Number</i>	<i>Tune</i>
1	5	25	12	49	17
2	8	26	14	50	15

3	6	27	2	51	11
4	1	28	5	52	6
5	11	29	18	53	1
6	18	30	16	54	4
7	12	31	17	55	8
8	14	32	9	56	5
9	4	33	11	57	3
10	13	34	15	58	16
11	2	35	1	59	10
12	10	36	13	60	13
13	9	37	9	61	2
14	7	38	10	62	7
15	17	39	2	63	9
16	3	40	6	64	12
17	11	41	1	65	16
18	15	42	15	66	8
19	4	43	8	67	17
20	6	44	7	68	4
21	10	45	18	69	18
22	3	46	16	70	5
23	13	47	14	71	14
24	7	48	12	72	3

Note: All tunes repeat throughout the list.

Participants gave familiarity ratings on a 10-point Likert scale while listening to the tunes in the exposure list. In the test phase, participants made their preference judgments by indicating which one tune in each pair they preferred.

Design

The study had a 3 (type of tune: unfamiliar, semi-random, random) x 4 (repetition number: First, Second, Third, and Fourth) mixed factor design for the analysis of participants' familiarity ratings. Type of tune served as the between-participants variable with 21 participants in the unfamiliar tune condition, another 21 in the semi-random condition, and 16 in the random tune condition. Regarding preference rating analyses, type of tune served as the main independent variable and preference rating for old tunes in comparison to .50 chance level served as the main dependent variable.

Procedure

I did not inform participants about the fact that the experiment consisted of two phases. Participants were invited to a room, in which to sit at a comfortable distance from the stereo player. Prior to the experiment, participants signed an informed consent form, after which they received a 3-note transposition test which required them to differentiate two variants of a tune (C E D) one of which was exactly the same as the base tune (F A G) whereas the other had a slight interval change (F Ab G). After the transposition test, participants who had passed the test were given a questionnaire concerning musical listening habits and experiences to make sure that all of the participants had a maximum musical experience of one year. Participants who did not pass the transposition test were thanked for their participation and dismissed.

After the questionnaire, participants received the exposure phase booklets. They were told that they would listen to a total of 72 tunes each of which they would have to rate in terms of how familiar the tunes sounded to them using a 10-point Likert scale. Participants were not informed that each tune was repeated four times across the list.

Following the exposure phase, participants were told that they would now take part in another study that was unrelated to the first one. They were told that the researcher wanted to establish a database about likeability of tunes. The participants were not told that half of the tunes in this phase had been presented to them in the exposure phase. Participants were given a booklet that listed 18 trials with each one consisting of an “a” and a “b” option. They were told that in each trial they would hear two tunes, one in option “a” and one in option “b”. After listening to each pair, their task would be to indicate which of the two tunes in the pair they preferred by circling the given option on their booklets. Unbeknownst to the participant, in each trial, one of the tunes (“a” or “b”) was a new tune whereas the other was a tune presented during the first phase.

At the end of the experiment strategy questions were directed to the participants: a) Did you feel anything peculiar about the studies? b) On which basis did you give familiarity ratings in the first study? c) On which basis did you make preference judgments in the second study? d) Were you bored during the study, was there anything that might have disrupted your attention? Eight of the participants identified the purpose of the study and were hence replaced by new participants.

Results & Discussion

Familiarity Ratings

Familiarity ratings were turned into z scores before put to analysis by using each participant’s own mean and standard deviation values per tune (over four repetitions). Mean familiarity z scores and standard deviations by experimental condition are presented in Table 2.

Table 2. Familiarity Ratings as a Function of Tune Type in Experiment 1.

<i>Tune Type</i>	<i>1st Exposure</i>		<i>2nd Exposure</i>		<i>3rd Exposure</i>		<i>4th Exposure</i>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Unfamiliar	-.58	.31	-.08	.18	.19	.19	.47	.29
Semi-random	-.73	.39	-.16	.38	.32	.36	.72	.63
Random	-.31	.61	-.18	.24	.11	.28	.39	.42
Overall	-.54		-.14		.21		.53	

A 3 (type of tune: unfamiliar, semi-random, random) x 4 (repetition number: first, second, third, fourth repetition) analysis of variance (ANOVA) showed that repeated presentation increased participants' familiarity ratings, $F(3, 165) = 70.60, p < .001, \eta^2_p = .56$. As apparent in Figure 1, trend analyses demonstrated that familiarity ratings increased in a linear fashion for all three types of tunes, $F(1, 20) = 68.58, p < .001, \eta^2_p = .77$ for the unfamiliar group; $F(1, 20) = 62.46, p < .001, \eta^2_p = .76$ for the semi-random group; and $F(1, 15) = 8.96, p < .01, \eta^2_p = .37$, for the random group.

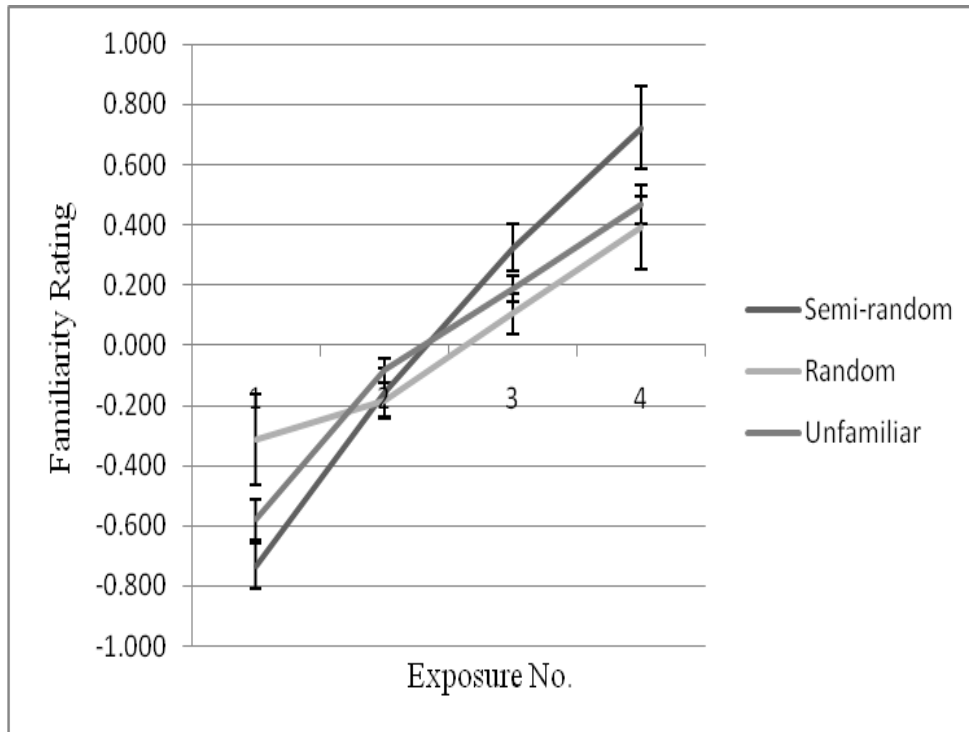


Figure 1. Familiarity Ratings as a Function of Tune Type in Experiment 1. Error bars represent the standard error of the mean.

Type of tune, on the other hand, did not have an effect on participants' familiarity ratings, $F(2, 55) = .82, p > .448, \eta^2_p = .03$. Yet, an interaction between the two variables showed that repeated exposure increased familiarity ratings differently depending on type of tune, $F(6, 165) = 3.23, p < .01, \eta^2_p = .11$

A one-way ANOVA showed that type of tune had a significant effect on the familiarity increase slopes, $F(2, 55) = 4.08, p < .01, \eta^2_p = .13$. Post hoc comparisons showed that random tunes ($M_r = .24; SD_r = .32$) showed a significantly or marginally significantly lower increase in familiarity over four repetitions than semi-random ($M_{sr} = .49; SD_{sr} = .06$) and unfamiliar ($M_u = .34; SD_u = .06$) tunes, $p < .01$ and $< .05$, respectively. Other comparisons did not demonstrate significant differences.

Preference Ratings

Mean preference ratings for old over new tunes are presented in Table 3. One sample t-tests revealed that previously presented unfamiliar ($M_u = .65$; $SD_u = .13$) and random ($M_r = .65$; $SD_r = .13$) tunes were preferred significantly above .50 chance level ($t(20) = 5.25$ and $t(15) = 4.69$, respectively, $ps < .001$). No such preference was observed for semi-random tunes ($M_{sr} = .45$, $.15$, $t(20) = -1.41$, $p > .10$).

Table 3. Preference Ratings for Each Tune Type in Experiment 1.

<i>Tune Type</i>	<i>M</i>	<i>SD</i>
Unfamiliar	.65	.13
Semi-Random	.45	.15
Random	.65	.13

The results indicate that repetition of tunes led to increases in familiarity ratings for all tune types. Semi-random tunes demonstrated the steepest increase in familiarity ratings, followed by unfamiliar and random tunes, respectively. These results contradict previous research on nontonal music (e.g. Dienes & Longuet-Higgins, 2004; Mikumo, 1996) in that semi-random tunes (i.e. nontonal tunes) demonstrated a steeper increase in familiarity ratings than unfamiliar tunes (i.e. tonal tunes). The increases in familiarity ratings were not related to the preference ratings for old tunes; the preference ratings for unfamiliar and random tunes were not statistically significant from each other and above chance level, however, a mere exposure effect was not

observed for semi-random tunes. These results mostly support the affective precedence hypothesis (Zajonc, 1980, 1984) in that there is no relationship between increases in familiarity ratings and preference. Yet, the absence of the mere exposure effect for semi-random tunes is problematic for the affective precedence hypothesis since it argues repetition of any tune type should lead to the mere exposure effect. The present results clearly contradict the predictions of the fluency misattribution hypothesis (Bornstein, 1989) that the familiarity rating increases should be related to the preference ratings.

CHAPTER 3

EXPERIMENT 2

In Experiment 1, the tunes repeated throughout the exposure list in a dispersed fashion. However, there is a possibility that repetition type (i.e. tunes repeating at the beginning of the list, at the end of the list, or throughout the list) might influence the increases in familiarity ratings. If there is such an influence, the investigation of the effect of repetition type on preference ratings will be an additional test of both the fluency misattribution hypothesis (Bornstein, 1989) and the affective precedence hypothesis (Zajonc, 1980, 1984). More specifically, if repetition type exerts an effect on familiarity ratings, according to the fluency misattribution hypothesis, these effects should be observed also for preference. On the contrary, the affective precedence hypothesis predicts that there will be no effect of repetition type on preference regardless of how repetition type influences familiarity increases. In addition, the introduction of repetition type allows one to examine whether the increases in familiarity ratings in Experiment 1 was genuine; these increases in Experiment 1 might have been related to the bias of participants to increase familiarity ratings toward the end of the list (please note that block lists were used in Experiment 1). Comparisons between first familiarity ratings for tunes in each repetition type will be applied in order to examine this possible confounding factor. If there is no difference between first familiarity ratings for repetition types, one can conclude that the increases in familiarity ratings were due to exposure per se.

Method

Participants

Forty-eight nonmusicians who were undergraduate students participated in return for extra credits in psychology courses. As in Experiment 1, none of them had more than one year of musical experience, and to be eligible, they all had to pass the pitch test described earlier to ensure a basic level of sensitivity to pitch change.

Design

The study had a 3 (type of repetition: dispersed, beginning, end) x 4 (repetition number: First, Second, Third, and Fourth) x 3 (type of tune: unfamiliar, semi-random, random) mixed factor design for the analysis of familiarity ratings. Regarding preference rating analyses, type of tune and type of repetition served as the main independent variables and preference rating for old tunes in comparison to .50 chance level served as the main dependent variable. Type of tune was the only between-participants variable with 15 participants in the unfamiliar tune condition, and 18 participants in the semi-random and random conditions each.

Materials

The materials were the same as the materials used in Experiment I except that the 4-time repetitions were not uniformly dispersed as in Experiment 1 during the exposure phase. Instead, for a third of the 18 tunes, all repetitions were completed within the first half of the list (beginning condition), for a third, all were completed within the second half of the list (end condition), and for the remaining third all repetitions were dispersed throughout the entire list just as in Experiment 1 (dispersed condition). The track list used in the exposure phase is presented in Table 4.

Table 4. The Track List Used in the Exposure Phase in Experiment 2.

<i>Track Number</i>	<i>Tune</i>	<i>Track Number</i>	<i>Tune</i>	<i>Track Number</i>	<i>Tune</i>
1	1	25	11	49	15
2	2	26	8	50	12
3	3	27	5	51	17
4	4	28	1	52	10
5	5	29	7	53	18
6	6	30	3	54	11
7	7	31	6	55	15
8	8	32	2	56	9
9	9	33	4	57	13
10	2	34	14	58	18
11	1	35	10	59	17
12	4	36	5	60	16
13	3	37	13	61	14
14	10	38	12	62	10
15	11	39	15	63	7
16	6	40	9	64	13
17	5	41	17	65	12
18	12	42	18	66	15
19	3	43	16	67	8
20	1	44	13	68	17
21	6	45	8	69	18
22	2	46	14	70	14
23	9	47	7	71	11
24	4	48	16	72	16

Note: Tracks 1-6 repeat in the first half of the list, tracks 7-12 repeat throughout the list, and tracks 13-18 repeat in the second half of the list.

Procedure

The procedure of Experiment 2 was the same as that of Experiment 1.

Results

Familiarity Ratings

As in Experiment 1, all familiarity ratings were turned into z scores for further analysis. Mean standardized familiarity ratings per condition and their standard deviations are given in Table 5.

Table 5. Familiarity Ratings as a Function of Tune Type in Experiment 2.

<i>Tune Type</i>	<i>1st Exposure</i>		<i>2nd Exposure</i>		<i>3rd Exposure</i>		<i>4th Exposure</i>	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Unfamiliar	-.64	.26	-.09	.16	.27	.16	.46	.20
Semi-random	-.44	.31	-.05	.19	.15	.22	.34	.25
Random	-.52	.21	-.13	.24	.17	.14	.48	.35
Overall	-.53		-.09		.20		.43	

A 4 (number of repetitions) x 3 (type of tune) x 3 (type of repetition) mixed ANOVA showed that number of repetition had a main effect on familiarity ratings, $F(3, 135) = 111.59, p < .001, \eta^2_p = .71$. All other effects and interactions were non-significant ($F < 2, p > .10$) which points out that the increases in familiarity ratings demonstrated similar trends for all types of tunes.

To find out whether the increase in familiarity ratings with repeated exposure was significant for each tune type, I ran separate repeated measures ANOVAs. The results demonstrated that the increase was significant for all tune types; unfamiliar tunes, $F(3, 42) = 65.02, p < .001, \eta^2_p = .82$; semi-random tunes, $F(3, 42) = 20.19, p < .001, \eta^2_p = .59$; random tunes, $F(3, 51) = 40.75, p < .001, \eta^2_p = .71$. Moreover, contrast analyses showed that the increase was linear for all tune types; unfamiliar tunes, $F(3, 42) = 92.78, p < .001, \eta^2_p = .87$; semi-random tunes, $F(3, 42) = 28.36, p < .001, \eta^2_p = .67$; random tunes, $F(3, 51) = 65.18, p < .001, \eta^2_p = .79$.

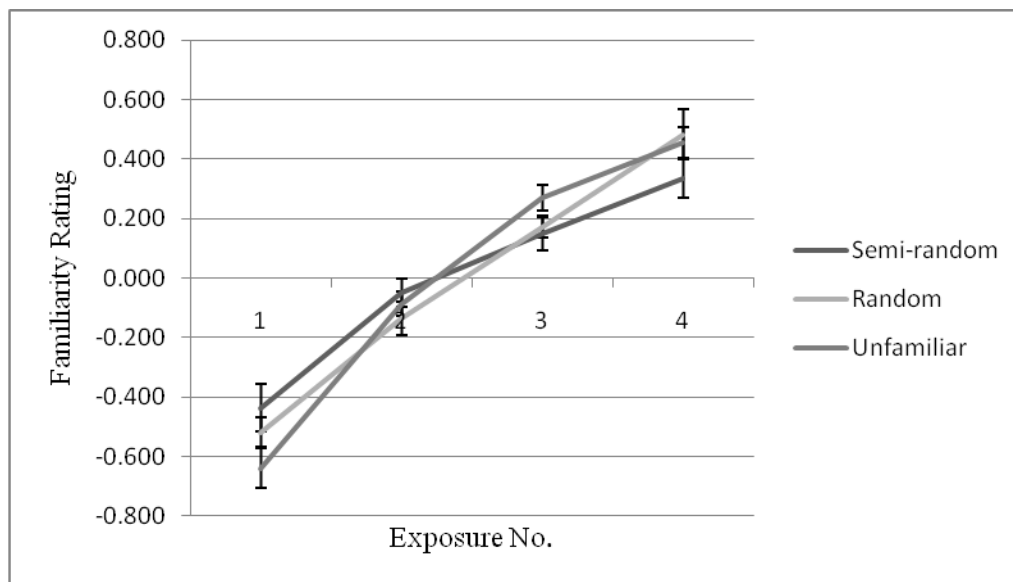


Figure 2. Familiarity Ratings for Each Exposure as a Function of Tune Type in Experiment 2.

Error bars represent the standard error of the mean.

One of my main motivations for using different repetition types in Experiment 2 was to see whether the increases in participants' familiarity ratings over four repetitions was due to the repetitions per se or whether it resulted from a general trend of increasing one's familiarity ratings towards the end of the list (since the fourth repetition in a fully dispersed list as the one in

Experiment 1 are necessarily around the end of the list). Separate repeated measures ANOVAs compared the familiarity ratings given to the first presentation across all three repetition types. Mean familiarity ratings and standard deviations are listed in Table 3. Familiarity ratings for first exposure time between repetition types did not differ for unfamiliar, $F(2, 28) = 2.23, p > .13, \eta^2_p = .14$, and semi-random tunes, $F(2, 28) = 1.68, p > .21, \eta^2_p = .18$. However, random tunes produced different first exposure familiarity ratings for different repetition types, $F(2, 34) = 4.90, p < .05, \eta^2_p = .22$. Pairwise comparisons for random tunes showed that first exposure familiarity ratings for tunes that repeated at the end of the list ($M = -.25, SD = .40$) were significantly different from the familiarity ratings for tunes that repeated at the beginning of the list, ($M = -.69, SD = .50$) and dispersed throughout the list ($M = -.62, SD = .35$); $ps < .05$. Other comparisons did not result in significant differences. Mean first familiarity ratings across repetition types and standard deviations for all tune types are listed in Table 6.

Table 6. First Familiarity Ratings as a Function of Type of Repetition for Each Tune Type in Experiment 2.

<i>Tune Type</i>	<i>Repetition Type</i>						
	Beginning		Dispersed		End		Overall
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Unfamiliar	-.67	.46	-.42	.51	-.82	.54	-.64
Semi-random	-.62	.54	-.24	.62	-.44	.48	-.43

Random	-.69	.50	-.62	.35	-.25	.40	-.52
Overall	-.66		-.43		-.50		

Preference Ratings

I ran several one sample t-tests whether preference for old tunes was different from the chance level (i.e. 50 %) for each tune type. Preference ratings across every repetition type were pooled for those analyses. Old unfamiliar tunes were preferred 69 % ($SD = .20$) of the time over novel tunes and this value was significantly different from the chance level, $t(14) = 3.65, p < .01$. Semi-random tunes also exhibited a mere exposure effect: old unfamiliar tunes ($M = .56, SD = .14$) were preferred over novel tunes, $t(14) = 2.79, p < 0.05$. However, previously presented random tunes were not preferred over random novel tunes ($M = .53, SD = .17$), $t(17) < 1, p > .44$.

To evaluate the effect of repetition type and tune type on preference for previously presented tunes, I ran a 3 (tune type) x 3 (repetition type) mixed type ANOVA. Results showed that tune type exerted a significant effect on preference for old tunes; $F(2, 45) = 3.63, p < .05, \eta^2_p = .14$. Repetition type did not exhibit a significant effect, $F(2, 45) = 2.16, p > .12, \eta^2_p = .05$. The interaction also did not reach significance, $F(4, 90) < 1, p > .56, \eta^2_p = .03$. Mean preference ratings for each tune type across all repetition types and their standard deviations are presented in Table 7.

Table 7. Effect of Repetition and Tune Type on Preference Ratings for Old Tunes in Experiment

2.

<i>Tune Type</i>	<i>Repetition Type</i>						<i>Overall</i>
	<i>Beginning</i>		<i>Dispersed</i>		<i>End</i>		
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	
Unfamiliar	.73	.21	.66	.28	.69	.30	.69
Semi-random	.60	.24	.60	.13	.60	.18	.60
Random	.62	.22	.45	.27	.52	.23	.53
Overall	.65		.57		.60		

I employed a repeated measures ANOVA with type of repetition as the independent and preference ratings as the dependent variable. According to the results, repetition type did not have a significant effect on preference for old tunes for both unfamiliar and semi-random tunes, $F(2, 28) < 1, p > .10, \eta^2_p = .04$, and $F(2, 28) < 1, p > .10, \eta^2_p = 0$, respectively. That is, old tunes were preferred over novel tunes regardless of where they were repeated in the list for unfamiliar and semi-random tunes. However, in random tunes, repetition type exerted a marginally significant effect on preference for old tunes, $F(2, 34) = 2.91, p < .07, \eta^2_p = .15$. Pairwise comparisons showed that tunes that repeated at the beginning of the list ($M = .62, SD = .22$) were preferred over novel tunes more than the tunes that repeated throughout the list ($M = .45,$

$SD = .27$), $p < .05$. Tunes that repeated at the end and throughout the list ($M = .52$, $SD = .23$) were preferred equally. A one-sample t-test comparing the preference rating for random tunes that repeated at the beginning of the list to chance-level showed that these tunes were preferred significantly above chance-level, $t(17) = 2.32$, $p < .05$.

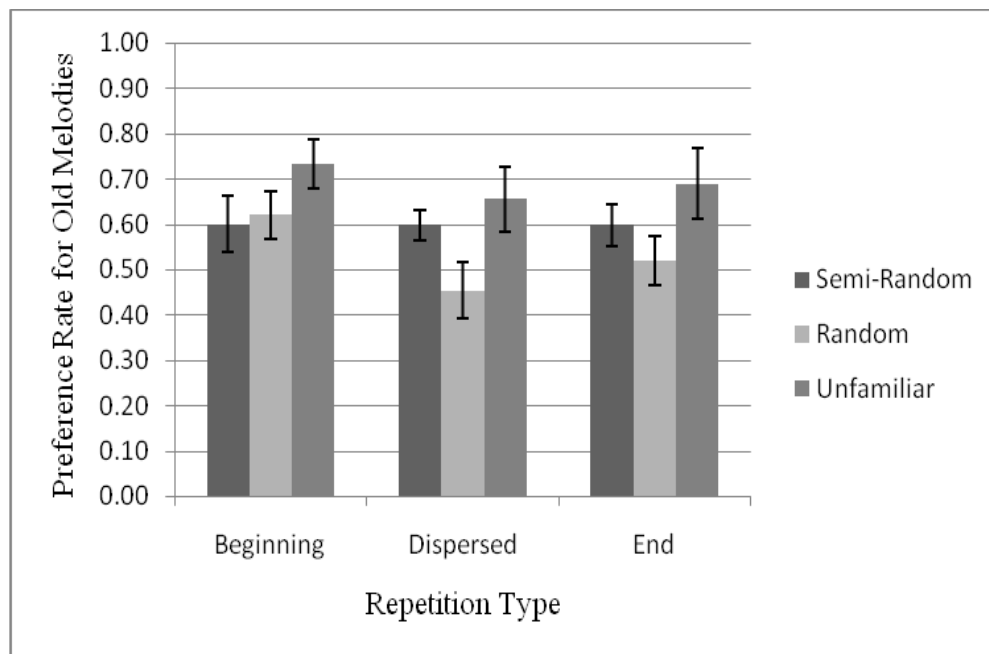


Figure 3. Effect of Type of Repetition and Type of Tune on Preference Ratings for Old Tunes in Experiment 2. Error bars represent the standard error of the mean.

CHAPTER 4

GENERAL DISCUSSION

To summarize, in Experiment 1, the increases in familiarity ratings were linear for all tune types, and the steepest increase was for semi-random tunes, followed by unfamiliar and random tunes, respectively. However, the preference ratings did not show similar trends with familiarity ratings: Unfamiliar and random tunes demonstrated a mere exposure effect and the preference ratings for these tunes were statistically not different from each other (old preference was 65 % for the two tune types). Semi-random tunes, on the contrary, did not exhibit a mere exposure effect. In Experiment 2, too, all increases in familiarity ratings over four repetitions were also linear for all tune types. Unlike Experiment 1, the steepest increase was observed in this time in unfamiliar tunes and the least steep one in semi-random tunes. In Experiment 2, preference ratings did mimic the trend in familiarity ratings but only for unfamiliar and semi-random tunes: Unfamiliar tones produced the steepest increase in familiarity ratings as well as the strongest mere exposure effect, whereas semi-random tunes produced a shallow familiarity rating increase as well as a weak mere exposure effect. On the other hand, random tunes showed an increase in familiarity ratings but did not show any mere exposure effect. Yet, random tunes which repeated at the beginning of the exposure list were preferred above chance in the test phase. The repetition type factor in Experiment 2 had a statistically significant effect on preference ratings for random tunes but not for semi-random and unfamiliar tunes. Lastly, the first familiarity ratings given to tunes in each repetition type did not differ in unfamiliar and semi-random tunes. Nevertheless, these ratings were the highest for random tunes which played at the end of the list compared to the ratings given to random tunes that repeated in a dispersed fashion or at the beginning of the list.

The results of Experiment 1 and 2 are not compatible with the predictions of the fluency misattribution hypothesis (Bornstein, 1989). There seems to be no consistent relationship between the increases in familiarity scores and preference ratings for any tune type. From the fluency misattribution perspective, the familiarity ratings indicate that the tunes create representations in memory which provide a more fluent processing. However, observing that there is no connection in preference ratings and the steepness of the familiarity increase line points out that stronger representations, and thus a more fluent processing, does not necessarily lead to better liking as evinced in both experiments. In addition, my results imply that type of repetition in Experiment 2 did not have an effect on preference ratings except when using random tunes. If the mere exposure effect is the outcome of a purely cognitive processing (i.e. the misattribution of increased fluency to liking), one would expect type of repetition to affect preference ratings differently since type of repetition may allow for primacy and recency effects to occur. Yet type of repetition was not found to influence the slopes of the familiarity rating increases.

My results are less problematic for the affective precedence (Zajonc, 1980, 1984) hypothesis. The absence of any relationship between the increases in familiarity ratings and preference ratings for any tune type in both experiments supports this hypothesis to some extent. Nevertheless, the affective precedence hypothesis cannot explain why the repetition of semi-random tunes in Experiment 1 and random tunes in Experiment 2 did not result in a significant mere exposure effect. The affective precedence hypothesis argues that since preference judgments are affective processes and affective processes are not subject to be influenced by cognitive processing in the mere exposure paradigm all type of tunes would demonstrate a mere exposure effect. I observed that my measure of cognitive processing (i.e. familiarity ratings) did

not influence preference judgments, however, there should be a reason that prevented participants from preferring old semi-random tunes in Experiment 1 and old random tunes in Experiment 2. Whatever the reason, affective precedence hypothesis is not likely to be able to explain this finding/discrepancy. Moreover, in Experiment 2, I observed that a mere exposure effect emerged for random tunes that had been repeated at the beginning of the list in contrast to the case for tunes that had been repeated at the end or throughout the list. The affective precedence hypothesis predicts that, nevertheless, repetition type should not influence preference ratings since repetition type should surely have an influence on the cognitive but not affective system. Even though the degree of the effect of repetition type was small and it was not observed for unfamiliar and semi-random tunes, it appears that just like the fluency misattribution hypothesis, the affective precedence hypothesis, too, has problems in accounting for the present results.

Nevertheless, the discrepancies between the results of Experiment 1 and 2 should be accounted for in order to make safer inferences. One such discrepancy was that type of tunes showed different familiarity rating increases in the two experiments. The only methodological difference that can lead to this was the type of exposure list employed in the two studies. In the exposure phase of Experiment 1, I used a completely dispersed list, whereas in Experiment 2 I used an exposure list consisting of tunes which repeated only at the beginning of the list, only at the end of the list, or throughout the list. It should also be noted that the familiarity rating increases and preference ratings for tunes that repeated throughout the list in Experiment 2 did not mimic the results of Experiment 1 (in which all of the tunes were repeated throughout the list). This might be a surprise given that type of repetition was the same for these tunes (i.e. tunes repeating throughout the list). However, it seems that other repetition types in Experiment 2,

especially tunes repeated at the beginning of the list, may have influenced the processing of dispersedly repeating tunes. More specifically, in Experiment 2, consecutive repetition of tunes at the beginning may have established a better discriminative power in the listeners, which might have made participants aware of the fact that some tunes were repeated early on. On the contrary, in Experiment 1, since all of the tunes were repeated throughout the list, hence in a less consecutive way, participants might have not developed such a discriminative ability. It should be taken into account that all tune types demonstrated a mere exposure effect in Experiment 2 (however, only random tunes that repeated at the beginning of the list exhibited this effect) which might be based on the elevated discriminative abilities in Experiment 2. This view is in line with the fluency misattribution hypothesis and can be tested with a design which omits tunes repeating at the beginning of the list.

Another possibility is that the processing which leads to the mere exposure effect for musical stimuli is neither purely cognitive nor purely affective. According to the present results, misattribution does not appear to be the main reason for the mere exposure effect. The cognitive operation which can account for these data might be one which is not closely related with familiarity. The alternatives for this cognitive processing are scarce since different tune types employed in the present experiments are very likely to be processed by different cognitive operations because of their varying structure, however, every tune type was able to invoke a mere exposure effect in at least one of the two experiments. There is a possibility that the affective system, which is suggested not to distinguish between stimulus types in the mere exposure paradigm (Zajonc, 1980, 1984), is active in the mere exposure paradigm with musical stimuli, but the cognitive system may exert an additional influence in a means that is not conceptualized by the fluency misattribution hypothesis.

To better interpret these results, reaction time data would have been useful. The affective precedence hypothesis is based on the idea that affective processes are faster than the cognitive processes and that affective judgments rely on the affective system only (Zajonc, 1980, 1984). If I had been able to measure the reaction times of familiarity and preference judgments, the comparisons between these reaction times would be a further testing of the affective precedence hypothesis. That is, affective precedence hypothesis would predict that affective judgments would be made faster compared to familiarity judgments. Moreover, the absence of any differences in reaction times to affective judgments between different types of tune would also imply that these affective judgments were not based the structural features of the stimuli.

In addition, a cognitive measure in the test phase may provide a further testing of the two accounts of the mere exposure effect. Instead of an affective judgment in the test phase, participants could be asked to make yet another cognitive judgment, such as rating which of the two tunes seems faster. If such a cognitive measure demonstrates a direct relationship with familiarity ratings I have some grounds to believe that affective judgments are qualitatively distinct from non-affective judgments. If, on the other hand, similar trends are observed between tempo and preference judgments, one can argue that the two judgments are similar, which would suggest that preference judgments do involve cognitive operations. Such results may also suggest that familiarity ratings are not apt for measuring fluency.

This research is a valuable contribution to the mere exposure literature since it a) investigates how musical structure relates to the mere exposure effect and b) tests the predictions of the two important accounts of this effect. Furthermore, the use of nontonal tunes in the mere exposure paradigm is also beneficial from the standpoint of music cognition; repetition is vital to the musical expression (Hutchins & Palmer, 2008), and how repetition is linked with affective

reception in music is an important question. The present results suggest that repetition of any tune, regardless of its tonal and rhythmic regularity, is sufficient to invoke a liking effect in the listeners. In addition, it seems that increases in familiarity via repetition are not directly linked to the increases in affect. Although the tunes I employed in this thesis were monotonic and thus did not sound natural to most of the listeners, these results may still have implications for the music world. The use of more natural tunes might be a possibility for more ecologically valid data, however the use of real music pieces which consist of aggregated layers of tunes and harmonies complicates experimental control because the factors to be controlled in these tunes are diverse compared to monotonic tunes.

It should also be noted that the present study evaluated the mere exposure effect in the musical domain and making inferences to other domains from these results might be problematic. For instance, nontonal tunes might not have any counterparts in the visual domain, for that reason, these results might not mean much when vision is taken into account (however for a mere exposure study done with “impossible shapes”, see Seamon et al., 1995). Nevertheless, the linguistic domain might allow for stimuli which vary in their structural regularity to some extent. For example, in a mere exposure study done with American participants, Zajonc (1968) used Turkish words which resemble random tunes in this study and found a mere exposure effect for these words (for a general overview of the relationship between linguistic and musical processing in the brain, see Patel, 2003). But Turkish, after all, is a natural language that developed just like other languages, hence it is not easy to say that just because someone does not know the language its words would appear to her as random. With musical stimuli, on the other hand, one can create a great range of variety in structural and rhythmic regularity, thus making it an almost perfect study material with respect to the mere exposure

effect, e. g., in one case rhythmical regularity can be manipulated whereas in another case random pitches from two octaves can be employed. The flexibility of musical stimuli is advantageous for the mere exposure research in that tunes varying in structure might produce perfect mediums to test different explanations of the mere exposure effect.

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