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Affective Responses to Music Without Recognition: Beyond the Cognitivist Hypothesis

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A recent topic of concern for those interested in the science of music is whether affective responses to music are the result of *recognition* or actual *affective experience*. Cognitivist researchers have found that individuals *recognize* rather than *feel* an affective response when listening to music, while emotivist proponents posit that people have an intrinsic affective experience to music. While it has been promoted that biological methods must be used in order to answer this recognition-experience problem cited above, the current authors employed a more traditional technique (i.e., paper and pencil self-report surveys). Data from the present study show that participants reported statistically similar levels of five different categories of affect, regardless of whether they recognized the intended emotion of the musical clips. Results suggest that the induction of affect while listening to music is not reliant upon recognition, and are supportive of the emotivist position regarding musical emotions. These results may have implications regarding the ultimate origins of musicality in humans.

Keywords: affective response, musical stimuli, emotions, mood, cognitivist, emotivist

Psychological research on musical phenomena has long been plagued by both theoretical and methodological criticisms. A major theoretical criticism of the field of music-based affect research has been that of the cognitivist position: That people merely *recognize* the intended affective response of a piece of music rather than *feel* any affective response when listening to music (Konečni, 2008; Manuel, in press; Payne, 1980; Pratt, 1952). This stands in contrast to the emotivist position that people actually experience affective responses to music analogous to other real-world affective responses (Davies, 1994; Robinson, 1994). Although some research has provided empirical support for the notion that listening to certain types of music can elicit affective change in individuals (Hill & Palmer, 2010; Scherer & Zentner, 2001), there continues to be a need for empirical support within this specific field of study. Further, most studies supporting the claims that music elicits affective responses fail methodologically to account for the recognition problem by not empirically asking participants to report the intended affect, or intended emotion of the musical clip.

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The Recognition Problem

That listening to music elicits affective responses in individuals has been well-documented over the past two decades (Blood, Zatorre, & Bermudez, 1999; Hill & Palmer, 2010; Krumhansl, 1997; Trainor & Schmidt, 2003). Despite this substantial research, debate continues over the processes by which humans have affective responses as a result of listening to music (Peretz, 2001). Some studies (Hill & Palmer, 2010) showing changes in affective states after listening to music have not sufficiently accounted for the possibility that people merely recognize the affect or emotion intended by the composer in a piece of music, as opposed to feeling the emotion elicited by the music. The current trend in psychological research suggests that highly technical approaches, such as physiological measurements, may be the most promising avenues by which researchers can solve the recognition-experience problem (Chamberlain

& Broderickk, 2007; Kassam & Mendes, 2013). However, before proceeding to such approaches, the current authors believe a traditional method can provide some insight, as well. Therefore, the present study used a traditional self-report survey as the experimental methodology.

Methodological Constraints in Music Research

Advances in methodology and technological materials also tend to advance the systematic study of psychological processes (e.g., psychology of emotions and facial expressions; Ekman & Friesen, 1976). However, contrary to the methodological advances in other areas of research on emotion, mood, and affect, the psychological study of music's effects on these constructs have used highly variable sets of stimuli, potentially leading to a slow start in methodological consistency. For example, Krumhansl (1997) used orchestral excerpts to represent the emotions of sadness and happiness. Krumhansl then tested participant reactions to those excerpts by measuring heart rate, skin conductance, blood pressure and skin temperature. Etzel, Johnsen, Dickerson, Tranel, and Adolphs (2006) used similar physiological measurements (e.g. heart rate, diastolic blood pressure), but they used musical excerpts from various films to elicit those respective emotions instead of the orchestral excerpts used by Krumhansl. These physiological indicators of emotion and music represent only one example of the lack of methodological consistency in the study of musical emotions. However, Vieillard et al. (2008) have recently made a significant move toward the advancement of methodological consistency in research on musical emotions, by creating an archive of emotionally categorized music.

The current study presented participants with many musical clips each lasting very short durations (e.g., 15 seconds) during the experimental procedure. It is less likely that participants will feel any complex emotional reaction to music during a short duration of presentation. Emotions are "a complex set of interrelated sub-events concerned with a specific object" (Russell & Barrett, 1999, p. 806), suggesting a time component longer than that required for an affective response. Affect is considered a less complex, but always-occurring feeling (Ekkekakis, 2012), suggesting that it may be easier to measure in short durations of time.

It is, therefore, more appropriate to consider the reactions reported by participants in the present study to be affective responses. Thus, the cognitivist and emotivist positions are translated here into affective responses instead. The cognitivist hypothesis argues that individuals merely recognize the intended affect of music rather than experience any affective response to the music (Payne, 1980; Pratt, 1952). This hypothesis would predict that there should be a significant difference between the affective responses of those who correctly and incorrectly recognize the intended emotion of the music; correct and incorrect recognition being determined by the congruency of a participant's responses with the intended emotion of a piece of music as dictated by the composer. Conversely, if there is no relationship between the participant's affective response to music and that individual's cognitive recognition of the music's intended emotion, one would expect no significant differences in affective responses between those who correctly and incorrectly recognized the intended emotion of the musical clips. The latter hypothesis is consistent with predictions of the emotivist position (Davies, 1994; Robinson, 1994).

Hypothesis

The present study was designed such that the two plausible statistical outcomes would lend support in two different directions. One outcome would lend support for the cognitivist position (a main effect for recognition), while the other outcome would fail to lend support for the cognitivist position (no main effect for recognition) and thereby indirectly lend support for the competing emotivist position. Although a null finding would seem to indicate indirect support for the emotivist position, it is well-established that using null findings as evidence is problematic. Therefore, a main effect for recognition, and support for the cognitivist position, would be the strongest possible empirical outcome from the current study.

Method

Participants

Participants in this study were 205 undergraduate psychology students from a regional university in the southern U.S. One hundred forty-two of the participants were female, 61 of the participants were male, and two participants did not indicate their gender (age: $M = 20.95$, $SD = 2.23$). One hundred seventeen participants listed themselves as Caucasian, 71 as African American, seven as Asian-American, three as Hispanic, and four as Other. Three of the participants did not indicate their ethnicity. Students in various university psychology courses were offered extra credit by their professors for participating in the study. Those who did not participate were given alternative options for extra credit.

Materials

Musical stimuli. Musical clips developed by Vieillard et al. (2008) were used to attempt mood induction in the participants. The original Vieillard et al. (2008) archive[1] consists of 56 musical excerpts. The 56 excerpts are divided into four groups (i.e., happy, sad, fearful, and peaceful), with each group containing 14 musical excerpts. The "happy" excerpts were composed in a major key signature with an average tempo of 137 Metronome Marking (MM). The "sad" excerpts were composed in a minor key signature at a slow tempo ($M_{MM} = 46$) . The "fearful" excerpts were composed with minor chords on the third and sixth degrees, leading to the use of many out-of-key notes and making the piece sound "odd" and "eerie." The "peaceful" excerpts were composed in the major key signature with an intermediate tempo ($M_{MM} = 74$) in addition to the compositions including arpeggio accompaniment (Vieillard et al., 2008). These excerpts were constructed similar to the trends of most Western music (Cooke, 1959). Henceforth, the various clips and their associated experimental conditions will be referred to as happy, sad, fearful, and peaceful music, respectively.

Audience response system. An audience response system (TurningPoint, 2008) was used to collect data for this project. The response system requires the experimenter to create interactive slides through the TurningPoint toolbar in Microsoft PowerPoint. When interactive slides are created, each participant is given a response card resembling a small remote control device. When a slide is shown on a projection screen students may indicate how they feel by pressing a number, 1 through 5, on their response device. Each number corresponds to a specific feeling depending upon the question number (e.g., Right now I feel: 1–*Quite dejected*, to 5–*Quite cheerful*).

Feeling and Mood questionnaire. The participants' feelings and moods were assessed via the Semantic Differential Feeling and Mood Scale (SDFMS; Lorr & Wunderlich, 1988). The SDFMS is a scale consisting of 35 items which are divided into five subcategories of seven questions each: Elation (A), Relaxed (B), Unsure (C), Fatigue (D), and Grouchiness (E). The paper/pencil forms require participants to place a check in the box describing how they feel at a given moment (e.g., *quite elated*, *slightly elated*). For example, a single question assessing elation (SDFMS-A) states: "Right now I feel: (1) [*Quite Dejected*], (2) [*Slightly Dejected*], (3) [*Neutral*], (4) [*Slightly Cheerful*], or (5) [*Quite Cheerful*]. The SDFMS is not designed to assess emotions, but instead moods and feelings, the latter being a core component of affect. The SDFMS has an internal consistency of .74 (Lorr & Wunderlich, 1988). It most accurately assesses affective responses to the presentation of stimuli, and has been used and described as such (Ho & MacDorman, 2010; Wasylkiw, Fabrigar, Rainboth, Reid, & Steen, 2010).

Procedure

All data collection took place in the afternoon in order to control for unintended fatigue effects not induced by the musical clips themselves[2]. The experiment was conducted on groups of students clustered in the different classes the researchers recruited from. Each of the four classes was randomly assigned to listen to only one of the four different types of music (i.e., happy, sad, peaceful, or scary).

Prior to each class, the musical clips and TurningPoint slides were loaded onto the classroom's computer. As students arrived for class, they were notified of the possibility of participating in the study.

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[1]Musical clips are available at the website of the University of Montreal's International Laboratory for Brain Music and Sound Research (BRAMS): www.brams.umontreal.ca/plab/publications/article/96#downloads

[2]Although time of day was monitored for data collection in an effort to keep data collection times consistent, no data were recorded for the day of the week. Thus, we cannot rule out possible fatigue effects due to day of the week.

Interested students were provided with informed consent forms. Any questions about the experimental procedure were answered by the researchers prior to beginning the study.

After signing the informed consent documents, participants were given an audience response device. The researcher then briefly explained the methodology of the experiment and proceeded to show participants two sample slides in order to familiarize each student with the audience response system.

The researcher then began to play the designated type of music for a period of five minutes over each classroom's audio system, with the volume set to be identical for each of the four classes. The music consisted of fourteen musical clips designed with the same intended emotion in mind, and each having a period of only approximately 10–11 seconds. The participants heard each 150 second clip twice, without interruption.

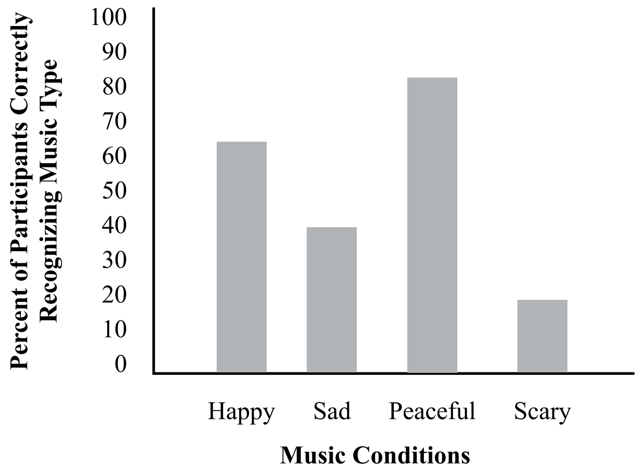
Subsequently, the experimenter stopped the music and posted one last slide asking the participants to guess the intended emotion of the music that had been played throughout the experiment. Participants were debriefed by telling them that we were measuring affective, or emotional, reactions to music.

Results

Prior to any of the primary analyses, the data were examined to check the accuracy of recognizing an intended emotion of the musical excerpts. Overall accuracy was 48%; however, the accuracy changed depending on the specific musical condition (Figure 1). Based on correct or incorrect recognition, each participant and their SDFMS responses were assigned to the "correct" or "incorrect" recognition conditions for further analysis.

To test whether a cognitive component (recognition) is needed for affective responses in music listening, a series of five separate 4 (music type) x 2 (recognition; correct/incorrect) analyses of variance were conducted, one for each of the five subcategories of the SDFMS. All post-hoc comparisons were performed using a Bonferroni adjustment on SPSS statistical software. A priori power analyses using MorePower 6.0.1 (Campbell & Thompson, 2012) indicated that a sample size of 56 would be needed in order to find a statistically significant interaction

Figure 1. Musical emotion recognition performance for each of the experimental conditions, and the average recognition collapsed across experimental conditions.



between music type and recognition[3]. The analyses presented below were performed on data from 205 participants, a number well beyond the prescribed sample size.

SDFMS-A: Elation

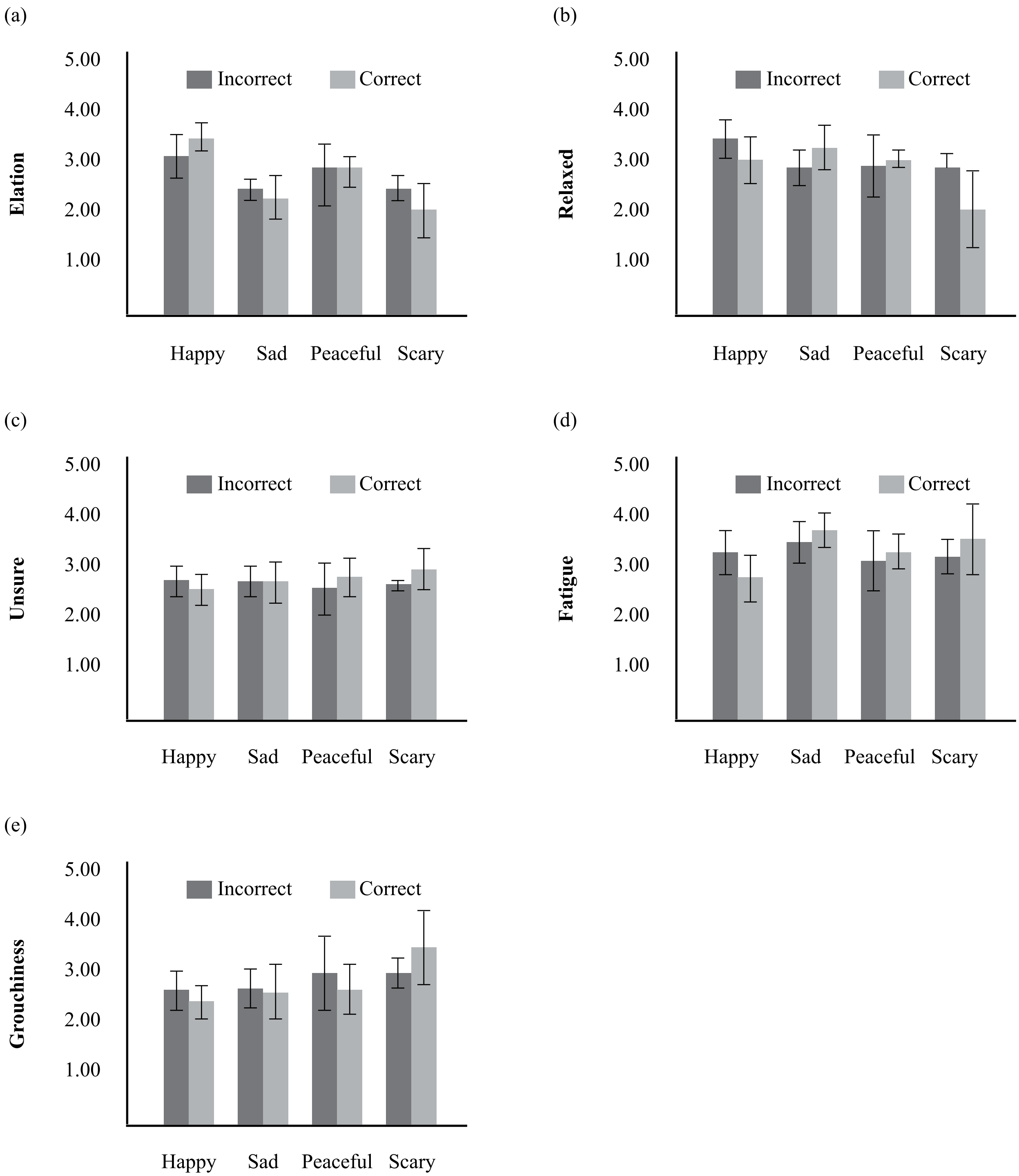
Results showed a statistically significant main effect for music type, $F(3, 197) = 8.13$, $p < .001$, partial $\eta^2 = .11$. Multiple comparisons showed that happy music ($M = 3.62$, $SD = 0.75$) elicited stronger feelings of elation than sad ($M = 3.03$, $SD = 0.69$) and scary music ($M = 2.94$, $SD = 0.69$) but did not elicit stronger feelings of elation than peaceful music ($M = 3.26$, $SD = 0.75$). There was not a significant main effect for recognition, $F(1, 197) = 0.34$, $p = .559$, partial $\eta^2 < .01$, or a significant interaction between recognition and music type, $F(3, 197) = 1.18$, $p = .318$, partial $\eta^2 = .02$ (Figure 2a).

SDFMS-B: Relaxed

For the dependent variable of relaxation, there was a statistically significant main effect for music type, $F(3, 197) = 4.12$, $p = .007$, partial $\eta^2 = .06$,

[3]Parameters entered for MorePower 6.0.1 power analysis: ANOVA was selected, 2x2 was selected for the IM design factors, 2x2 was selected as the IM effect of interest, alpha level of .05, power of .80, and a medium eta-squared effect size of .13 were entered. Solve for sample size was also selected.

Figure 2. The relationship between various affective response types for those who correctly and incorrectly guessed the intended mood of the musical clips. Graphs are organized by SDFMS subcategory: (a) elation, (b) relaxed, (c) unsure, (d) fatigue, and (e) grouchiness.



Note: Error bars are 95% confidence intervals.

although post-hoc comparisons showed that none of the music types were significantly different from one another when compared one-on-one. Again, there was not a significant main effect for recognition, $F(1, 197) = 1.18$, $p = .280$, partial $\eta^2 = .01$. There also was not a statistically significant interaction between recognition and music type, $F(3, 197) = 2.60$, $p = .053$, partial $\eta^2 = .04$ (Figure 2b).

SDFMS-C: Unsure

For Unsure, there was not a statistically significant main effect for music type, $F(3, 197) = 0.94$, $p = .422$, partial $\eta^2 = .01$. Post-hoc comparisons showed no significant differences between the four music types. There also was not a significant main effect for recognition, $F(1, 197) = 1.89$, $p = .171$, partial $\eta^2 = .01$ or a significant recognition by music type interaction, $F(3, 197) = 0.87$, $p = .458$, partial $\eta^2 = .01$ (Figure 2c).

SDFMS-D: Fatigue

Fatigue showed a statistically significant main effect for music type, $F(3, 197) = 3.07$, $p = .029$, partial $\eta^2 = .05$. Further examination of this effect showed that sad music ($M = 3.57$, $SD = 0.81$) elicited significantly higher rates of fatigue in participants than happy music ($M = 3.01$, $SD = 0.98$). There were no other significant differences. Neither the main effect for recognition, $F(1, 197) = 0.40$, $p = .529$, partial $\eta^2 < .01$, nor the interaction between music type and recognition, $F(3, 197) = 1.27$, $p = .283$, partial $\eta^{22} = .01$, were statistically significant (Figure 2d).

SDFMS-E: Grouchy

The dependent variable grouchiness showed a statistically significant main effect for music type, $F(3, 197) = 3.82$, $p = .011$, partial $\eta^2 = .06$. Post-hoc comparisons showed that the scary music ($M = 2.93$, $SD = 0.73$) elicited significantly higher levels of grouchiness in participants than both happy music ($M = 2.48$, $SD = 0.66$) and peaceful music ($M = 2.60$, $SD = 0.59$). There were no other significant differences. Consistent with the other dependent variables, there was neither a statistically significant main effect for recognition, $F(1, 197) = 0.22$, $p = .637$, partial $\eta^2 < .01$, nor a statistically significant interaction, $F(3, 197) = 1.28$, $p = .281$, partial $\eta^2 = .02$ (Figure 2e).

Discussion

The cognitivist hypothesis suggests that individuals, when listening to emotion-latent music, merely recognize the intended mood of music, thereby enabling them to internalize an emotional response to the music. However, results of this study suggest that individuals tend to have similar self-reported moods regardless of whether they correctly recognize the intended mood of the musical clip. Further, there were no significant interactions between music type and recognition for any of the various dependent variables (i.e., SDFMS subcategories), suggesting that the recognition explanation is not moderated by music type (Figure 2).

Post-hoc analyses showed the intuitive result that "happy" music makes participants feel higher levels of elation than "sad" and "scary" music. Other intuitive results were that "sad" music made participants feel higher levels of fatigue than "happy" music, and that grouchiness was significantly higher after participants listened to "sad" music compared to both "happy" and peaceful music. These intuitive findings help validate the utility of the Vieillard et al. (2008) musical clips for further use in music research.

Some of the findings were, however, unintuitive. Specifically, "peaceful" music did not induce higher levels of relaxation than the "scary" music, which seems a highly plausible outcome. Also, the unsure subscale did not reveal any differences between categories of musical clips. Collectively, these tertiary findings show some possible limitations to the Vieillard et al. (2008) musical clips; either the dependent measure is not sensitive enough to detect changes in participants after listening to the clips, or some of the musical clips are more effective than others at eliciting specific affective responses.

These results could also be due to the methodology used in this specific study. Participants were presented with music in large classrooms and tested as groups. This may create distracting effects that could have created the null findings for recognition. Although class meeting times were similar, there may have been individual differences in classes which could have led to artificially high or low affective responses in certain musical emotion conditions.

Another possible limitation of the study concerns the mismatch between the intended emotions of the Vieillard et al. (2008) musical clips and the subscales of the SDFMS. Although feeling and affect are important aspects of the more complex construct of emotion, and there is some overlap between the clips and the SDFMS (e.g., happy musical clips leads to higher scores on elation subscale), a more direct match may lend itself to more sensitive measurement. This increase in methodological sensitivity may lead to more fruitful results, and such improvements should be pursued with future research.

While cognitive-based hypotheses certainly have their places in experimental psychology, the process of eliciting affective reactions in people via music may not rely on inordinate amounts of cognitive processing. On the contrary, the processing of music-based affective responses may be quite automatic, as defined by Hasher and Zacks (1979), in the sense that it does not require the cognitive processing needed to accurately recognize an intended emotion of a musical excerpt.

Various researchers have suggested that common emotional and affective responses in humans and animals serve an adaptive function (Cosmides & Tooby, 2000; Darwin, 1871/1997); however, less arguments have been made for the adaptiveness of emotional and affective reactions to music. Since there is a concern over the similarities, between common emotions and those experienced when listening to music, this may be one reason why research on music-based emotions has been slow to start (Lundqvist, Carlsson, Hilmersson, & Juslin, 2009). The data presented in the current paper suggest that affective responses to music are relatively automatic in the sense that they do not require effortful cognitive processes; although reaction time was not measured, automaticity could be deduced from the observation that affective response was the same for those who correctly and incorrectly guessed the intended emotion of the musical clips. This apparent automaticity may lend credence to the notion that musical behavior (playing, perceiving, and emotionally experiencing) is an adaptation rather than, as Pinker (1997) suggests, an exaptation.

Future research should examine the nature of this automaticity found in the current study from different theoretical perspectives. Also, research is needed in order to understand the process by which participants in the current study experienced the emotions, leading to affective responses on self-report measures. Various researchers have suggested that emotional contagion—recognizing the emotion of a piece of music and then internalizing it, leading to actual experienced emotion—may explain emotional and affective responses to music (Dibben, 2004; Lundqvist et al., 2009; Scherer & Zentner, 2001). However, the current data suggest that conscious awareness of the correct emotion of a piece of music is not necessary in order to have affective experiences as a result of the music.

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