Psychology of Aesthetics, Creativity, and the Arts
2012, Vol. 6, No. 2, 146–154

1931-3896/11/$12.00 DOI: 10.1037/a0024671

Liking Unfamiliar Music: Effects of Felt Emotion and Individual Differences

Olivia Ladinig
Ohio State University

E. Glenn Schellenberg
University of Toronto

We examined liking for excerpts of unfamiliar music taken from a wide variety of genres. The excerpts varied in tempo (fast or slow) and mode (major or minor). Listeners provided liking ratings for each excerpt as well as ratings of their emotional responses (intensity, happiness, and sadness). We also measured personality and history of music lessons. In general, listeners tended to like music associated with stronger feelings and happy feelings, and to dislike music that evoked sad feelings. Mixed happy and sad feelings were evoked by music with inconsistent cues to happiness and sadness. Listeners who scored high on Agreeableness had more intense emotional responses to music in general, whereas stronger sad feelings were evoked among those who scored high on Agreeableness or Neuroticism. Listeners who liked music that made them feel sad tended to score high on Openness-to-Experience or low on Extraversion, whereas liking for music that evoked mixed feelings was associated positively with music training. The results confirm that liking for music varies as a function of the emotions it evokes and individual differences in personality and music training.

Keywords: liking music, music and personality, music and emotion, music preferences

Why do people like some works of art (i.e., paintings, literature, fashion, or films) more than others? Music represents one artistic domain in which preferences are often quite specific, even among those who are not particularly interested in the arts in general. For example, music preferences are believed to define and convey one's identity (North & Hargreaves, 1999), such that tastes in music are often discussed when people are trying to get to know one another (Rentfrow & Gosling, 2006). Nevertheless, little is known about what shapes an individual's music preferences. In the present investigation, we examined whether liking a wide variety of different types of unfamiliar music varies as a function of (a) the listener's emotional response to the music, and (b) individual differences in personality and music training.

Typically, positive responding to music increases with familiarity (Hunter & Schellenberg, 2011; Schellenberg, Peretz, & Vieillard, 2008; Szpunar, Schellenberg, & Pliner, 2004), which is consistent with the more general finding that people tend to be wary of novel stimuli, with such wariness dissipating after exposure. The *mere exposure effect* (Zajonc, 1980; for an overview see Bornstein, 1989) refers to liking for a previously encountered stimulus even when the perceiver cannot remember the stimulus explicitly. Overexposure to music, however, often leads to decreases in liking (Hunter & Schellenberg, 2011; Schellenberg et al., 2008; Szpunar et al., 2004), and these satiety effects extend beyond music to visual stimuli (Zajonc, Shaver, Tavris, & Van Kreveld, 1972).

Liking music is also related to emotional responding. In the present study, we use *emotional responding* as a general term distinct from liking, which encompasses the particular emotion a listener feels and the intensity of that emotion. Several decades ago, Gatewood (1927) found that listeners prefer music that induces stronger emotions. In Western cultures, moreover, people often listen to music precisely because of its emotion-inducing and mood-regulating properties (Knobloch & Zillman, 2002; Panksepp, 1995; Sloboda, 1992). In other words, music arouses emotions (Juslin & Laukka, 2004; Juslin & Västfjäll, 2008), and emotions in an aesthetic context are typically experienced as pleasurable.

In the laboratory, listeners tend to like happy- more than sad-sounding music (Gosselin et al., 2005; Hunter, Schellenberg, & Schimmack, 2008, 2010; Husain, Thompson, & Schellenberg, 2002; Schellenberg et al., 2008; Thompson, Schellenberg, & Husain, 2001). In everyday listening situations, however, people often choose to listen to sad-sounding music. The phenomenon that listeners appreciate negatively valenced music has puzzled philosophers and psychologists since Aristotle. Moreover, contemporary theoretical explanations (Kivy, 2002; Levinson, 1990; Schubert, 1996) have virtually no empirical support. We know that the appeal of sad-sounding music increases when listeners are fatigued or in a negative mood state (Schellenberg et al., 2008), or when they are feeling sad (Hunter, Schellenberg, & Griffith, in press). The preference for happy- over sad-sounding music also dissipates after listeners hear a long series of happy-sounding excerpts prior to hearing a sad-sounding excerpt (Ladinig, Schellenberg, & Huron, 2010).

Specific characteristics of music are associated reliably with emotions such as happiness and sadness (for an overview, see

This article was published Online First July 18, 2011.

Olivia Ladinig, Cognitive and Systematic Musicology Laboratory, Ohio State University; E. Glenn Schellenberg, Department of Psychology, University of Toronto Mississauga.

Supported by the Social Sciences and Humanities Research Council of Canada.

Correspondence concerning this article should be addressed to E. Glenn Schellenberg, Department of Psychology, University of Toronto Mississauga, Mississauga, ON Canada L5L 1C6. E-mail: g.schellenberg@utoronto.ca

Hunter & Schellenberg, 2010), which, in turn, affect liking. For example, fast tempo and major mode are linked with happiness, whereas slow tempo and minor mode are linked with sadness. These associations extend beyond listeners' perception of emotions to actual feelings of happiness and sadness (Hunter et al., 2008, 2010). Whereas tempo variations are linked primarily to differences in arousal levels, differences in mode are more closely associated with changes in valence (Husain et al., 2002). An inconsistent combination of tempo and mode (i.e., fast tempo and minor mode or slow tempo and major mode) leads to perceptions of ambiguity and mixed feelings of happiness *and* sadness (Hunter et al., 2008, 2010). Mixed emotional responses are also observed in domains other than music (Hemenover & Schimmack, 2007; Larsen & McGraw, in press; Larsen, McGraw, & Cacioppo, 2001; Larsen, McGraw, Mellers, & Cacioppo, 2004; Schimmack, 2001, 2005; Schimmack & Colcombe, 2008). These findings challenge Russell's (1980) *circumplex model* of emotions, which posits that emotions can be mapped in two-dimensional space, with one dimension representing valence (positive vs. negative) and the other representing arousal (high vs. low). By definition, the circumplex model excludes the possibility of simultaneous activation of positive *and* negative feelings. Because of the theoretical importance of mixed feelings and debates about how to measure these properly (e.g., Larsen, Norris, McGraw, Hawkley, & Cacioppo, 2009; Russell & Carroll, 1999; Schimmack, 2001, 2005), a secondary goal of the present investigation was to explore the possibility of mixed feelings in response to music using a new method of measurement.

Music liking also varies as a function of the listener's personality (Rentfrow & McDonald, 2010), both in a long-term sense, as in relatively well-established preferences for particular pieces and genres (Rentfrow & Gosling, 2006), and in the short term, when listeners hear novel music in the laboratory (Hunter & Schellenberg, 2011). The most widely used measures of personality are based on the Five Factor Model. Rooted in empirical research, this model considers individuals to vary on five broad personality dimensions: Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism (Cattell, 1957; Costa & McCrae, 1985; Digman, 1990). According to personality theorists and researchers (Costa & McCrae, 1985; McCrae & John, 1992; Matthews & Deary, 1998), higher scores on the Openness to Experience dimension are related to increased aesthetic sensitivity, active imagination, curiosity, creativity, and awareness of inner feelings. Personalities with higher scores on the Conscientiousness dimension are usually characterized by self-discipline, organization, and deliberation. Higher scores on the Extraversion dimension are related to a tendency to be outgoing and assertive, and to display interest in seeking out excitement, whereas lower scores point to Introversion. Personalities with higher scores on the Agreeableness dimension are characterized as being concerned by others' well-being, showing high levels of empathy, acting altruistically, and believing that other people are honest and trustworthy. Finally, high scores on Neuroticism are related to experiencing frequent negative emotional states, such as anxiety and anger, interpreting ambiguous situations as negative, and having a poor ability to respond to stress. By contrast, individuals with low levels of Neuroticism are characterized by a high degree of emotional stability. Personality in the present study was measured with the freely available Big Five Inventory (BFI), a brief 44-item test that has excellent reliability and validity (Benet-Martinez & John, 1998; John, Naumann, & Soto, 2008; John, Donahue, & Kentle, 1991).

Although personality dimensions are undoubtedly associated with music preferences, many of the available findings are inconclusive (Arnett, 1992; Delsing, ter Bogt, Engels, & Meeus, 2008; Dollinger, 1993; Litle & Zuckerman, 1986; McNamara & Ballard, 1999; Rawlings & Ciancarelli, 1997; Rentfrow & Goslin, 2003, 2006; Weaver, 1991). To date, the most reliable outcomes are that (a) Openness to Experience is predictive of liking a large variety of styles of music, including those considered to be intense or complex, and (b) Extraversion is associated with liking music that sounds energetic and exciting (Dollinger, 1993; Pearson & Dollinger, 2004; Rawlings & Ciancarelli, 1997; Rawlings, Barrantes i Vidal, & Furnham, 2000; Rentfrow & Gosling, 2003). To the best of our knowledge, only one study has examined liking unfamiliar music, but the focus was on the interaction between personality variables and frequency of exposure (Hunter & Schellenberg, 2011). The findings revealed that Openness to Experience was associated positively with liking novel music at initial exposure, but negatively after a piece was heard repeatedly.

In the present study, we examined liking for unfamiliar music as a function of emotional responding. We also tested the hypothesis that personality influences emotional responses (Revelle & Scherer, 2009) and liking. The stimuli were excerpts from happy- and sad-sounding music, as well as from music that sounded both happy *and* sad. For each excerpt, listeners rated how much they liked it, the intensity of their emotional response, and whether the music made them feel happy and/or sad. A control variable required listeners to rate how complex the music sounded, specifically its rhythmic complexity, which is known to be influenced by the number of events (i.e., notes or beats) per unit of time and the use of syncopations (Ladinig & Honing, 2011). We also collected information about personality and music training.

In line with previous research, we expected that (a) feelings of happiness would be strongest in response to fast music in major mode, and that sad feelings would be elevated in response to slow music in minor mode, (b) liking ratings would increase as a function of the number of musical cues to happiness (i.e., none, one, or two), but decrease as a function of the number of cues to sadness, (c) more intense emotional responses would arise from music with consistent emotional cues (fast and major, slow and minor) than from music with inconsistent cues (fast and minor, slow and major), and (d) mixed happy and sad feelings would be elevated in response to music with inconsistent emotional cues. We also expected that liking ratings would be associated positively with the strength of the listener's emotional response (Gatewood, 1927).

For personality, we predicted that emotional responses would be more intense for listeners who scored highly on Agreeableness because of their tendency to empathize in emotional situations. Neuroticism was expected to be associated positively with feeling sad in response to music because these individuals tend to focus on negative emotions. Agreeableness was also expected to be correlated positively with sad responding because of its association with empathy. Personality variables were also expected to be associated with liking music, particularly sad-sounding music. More specifically, listeners who scored highly on Openness to Experience were expected to like music that made them feel sad because they

tend to respond positively to the arts in general. By contrast, listeners who scored highly on Extraversion were expected to dislike music that made them feel sad because extraverts show a preference for positive stimulation, whereas introverts prefer stimulation that gives rise to deep thoughts and self-reflection. Finally, liking music that evokes mixed emotions was expected to be higher among listeners with more years of music training, because these listeners should have a more sophisticated appreciation of music that extends to the enjoyment of emotional ambiguity in music. For the control variable, perceived complexity, we had no predictions about associations with liking music or personality, although complexity ratings should vary as a function of the characteristics of the music (particularly tempo).

Method

Participants

Sixty-one undergraduates (88% female) in an introductory psychology course participated for partial course credit. Their average age was 18.3 years ($SD = 1.2$). They were recruited without regard to music training. On average, the participants had 1.8 years of music lessons ($SD = 2.9$, Range: 1–12).

Apparatus

Stimuli were presented via high-quality stereophonic headphones while participants sat in front of an iMac computer. Stimulus presentation and response recording were controlled using customized software created with PsyScript (Bates & D'Oliveiro, 2003).

Stimuli and Measures

The stimuli were 48 excerpts from commercially available audio recordings saved as monaural CD-quality sound files. Each excerpt was approximately 30 s in duration and normalized to have identical maximum amplitude. The 48 excerpts varied systematically in tempo (fast or slow) and mode (major or minor). One-quarter of the excerpts had consistent cues to happiness (fast tempo and major mode). Another quarter had consistent cues to sadness (slow and minor). The remaining 24 stimuli had inconsistent cues (12 fast and minor, 12 slow and major). The excerpts, taken from Hunter et al. (2008), were used here because they comprised a wide variety of music genres (e.g., classical, pop, folk, electronic) likely to evoke a wide range of liking from each participant, and because Hunter et al. reported that the excerpts evoked systematic differences in happy feelings, sad feelings, and mixed happy and sad feelings. A previous study conducted in our laboratory with the same stimuli and a different sample from the same population (Hunter et al., 2008) indicated that participants were unfamiliar with these excerpts. Interviews conducted after the completion of the present study confirmed that this was again the case. The vast majority of our participants listened primarily to dance/R&B/hip-hop music (e.g., Beyoncé, Black Eyed Peas, Lady Gaga), genres that were not represented in our stimuli.

Music training was measured as a continuous variable (i.e., years of private music lessons).[1] The BFI (Benet-Martinez & John, 1998; John et al., 1991, 2008) was used as a measure of the Big Five personality traits. It had 44 original items that were rated on 5-point scales. The scale provided five scores, with each score averaged across eight to ten original items. Thus, each participant had separate scores for Openness to Experience ($M = 3.48$, $SD = .66$, Range: 1.40–4.80), Conscientiousness ($M = 3.50$, $SD = .56$, Range: 1.89–4.67), Extraversion ($M = 3.26$, $SD = .78$, Range: 1.38–4.62), Agreeableness ($M = 3.83$, $SD = .49$, Range: 2.22–4.78), and Neuroticism ($M = 3.01$, $SD = .74$, Range: 1.25–4.38).

Procedure

Participants were tested individually in a sound-attenuating booth. After completing the paper-and-pencil measures, they were informed that they would hear 48 short excerpts of music, and that for each they would be asked to provide ratings of perceived complexity, liking, the intensity of their emotional response, and which emotion they felt. The excerpts were presented in random order. After each excerpt, four five-point response scales were displayed sequentially. The first asked, "How complex did you find the rhythm?" with 1 labeled "Extremely simple", 3 labeled "Moderately" and 5 labeled "Extremely complex". The second asked, "How much did you like the music?" with 1 labeled "Not at all", 3 labeled "Moderately", and 5 labeled "Extremely". The third question—"How strong was the emotion you felt?"—had ratings of 1 labeled "Not at all/I felt nothing", 3 labeled "Somewhat emotional", and 5 labeled "Extremely emotional". The fourth question, which appeared only if the third question received a rating of 2 or higher, asked, "How did the music make you feel?" with ratings of 1 labeled "Purely sad", 2 labeled "Mostly sad, but a little bit happy", 3 labeled "Equally happy and sad", 4 labeled "Mostly happy, but a little sad", and 5 labeled "Purely happy".

Felt happiness was subsequently calculated as the product of the intensity rating and the emotion rating (scaled from 0 to 4), whereas felt sadness was the product of the intensity rating and the emotion rating after it was reverse coded (and scaled from 0 to 4). Mixed happy *and* sad feelings were calculated so that they were measured on the same scale as the pure feelings, with a possible range from 0 to 20. For the original emotion ratings (scaled from 0 to 4), a rating of 2 (Equally sad and happy) represented the highest level of mixed feelings, ratings of 1 (Mostly sad, but a little bit happy) and 3 (Mostly happy, but a little bit sad) represented slightly mixed feelings, whereas ratings of 0 (Purely sad) and 4 (Purely happy) represented no mixed feelings. Hence, ratings of 2 (most mixed), 1 and 3 (somewhat mixed), and 0 and 4 (pure) were recoded as 4, 2 and 0, respectively. These scores were then multiplied by the intensity rating (1 to 5) to give us our measure of mixed feelings, which reflected both the degree and the intensity of ambiguous emotional responding to the music.

Results

The outcome measures included six continuous individual-difference variables that varied between subjects (i.e., the five

[1] We also measured musical sophistication using the Ollen Musical Sophistication Index (Ollen, 2006), and music eclecticism (e.g., liking a variety of music genres) using a measure that we devised for this study. Due to a lack of variability on both measures, we excluded them from our analyses.

personality measures and music training) and six music-response variables that varied within subjects: liking, emotional intensity, happy feelings, sad feelings, mixed feelings, and perceived complexity. Preliminary analyses examined correlations among the individual-difference variables and the music-response variables. After correcting for multiple (i.e., 15) tests using the Bonferroni method, we found no significant correlations among the individual-difference variables. To examine associations among the six music-response variables, we calculated a single score for each variable separately for each participant, which was an average of their 48 responses. These variables measured responding to the excerpts considered as a set. After correcting for multiple tests, the results were consistent with our hypotheses. Participants who reported more intense emotional responding to the excerpts were also more likely to provide higher liking ratings, $r(59) = .68$, $p < .001$. Greater emotional intensity was associated with higher levels of felt happiness, $r(59) = .46$, $p < .001$, as well as with higher levels of felt sadness, $r(59) = .44$, $p < .001$, whereas liking the excerpts was associated positively with feeling happy in response to them, $r(59) = .47$, $p < .001$, but negatively with feeling sad, $r(59) = -.39$, $p = .002$. Each averaged measure of emotional responding and liking was independent of responses on the control measure (perceived complexity).

Music Structure

The next analyses tested whether the six music-response variables varied reliably as a function of the music structure of the excerpts. We conducted two-way repeated-measures Analyses of Variance (ANOVAs) separately for each variable, with tempo (fast or slow) and mode (major or minor) as within-subject variables. Each participant had four scores for each analysis, with each score averaged over 12 original ratings. Descriptive statistics are illustrated in Figure 1, and the results from the ANOVAs summarized in Table 1. Because both main effects and the interaction were tested six times, α was lowered to .008 for these tests. (When there was an interaction between tempo and mode, follow-up tests of simple effects had a standard $\alpha = .05$.)

The results were generally in line with predictions. Liking ratings were higher for fast than for slow excerpts and for major than for minor excerpts, but there was no interaction between tempo and mode. For intensity ratings, although there were no main effects of tempo or mode, a cross-over interaction revealed that emotional responses were more intense in response to excerpts with consistent cues to happiness or sadness (fast/major and slow/minor) than they were in response to excerpts with conflicting cues (fast/minor and slow/major). More specifically, at fast tempi, intensity ratings were higher for excerpts in major than in minor mode, $p < .001$; at slow tempi, intensity ratings were higher for minor-mode excerpts, $p = .011$.

As with liking ratings, ratings of happy feelings were higher for fast- than for slow-tempo excerpts, for major over minor excerpts, and there was no two-way interaction. Sad feelings showed the exact opposite pattern: higher for slow-tempo than for fast-tempo excerpts, for excerpts in minor compared to major mode, and no interaction. Although mixed happy and sad feelings were higher for minor than for major modes, this effect was qualified by a robust cross-over interaction between tempo and mode, with higher levels of mixed feelings in response to excerpts with conflicting cues to happiness and sadness compared to excerpts with consistent cues. At fast tempi, listeners felt more ambivalent in response to excerpts in minor mode, $p < .001$; at slow tempi, mixed feelings were elevated in response to major mode, $p < .001$.

Finally, ratings of perceived complexity were higher for fast- than for slow-tempo excerpts. Complexity ratings were also higher for major than for minor excerpts. Both main effects were qualified by a two-way interaction, which revealed that the mode effect was stronger for excerpts with a slow tempo, $p < .001$, compared to those with a fast tempo, $p = .005$.

Individual Differences

Because the next set of analyses was more exploratory in nature, we did not correct for multiple tests in order to maximize statistical power. We first examined whether individual differences in personality and music training could predict listeners' responses averaged across the 48 excerpts, each time controlling for the other five individual-difference variables. Three partial correlations were significant. Even when individual differences in music lessons and the other personality variables were held constant, listeners who scored higher on Agreeableness tended to provide higher ratings of felt sadness, $pr(54) = .30$, $p = .023$, and emotional intensity, $pr(54) = .30$, $p = .023$, whereas listeners with higher levels of Neuroticism tended to report stronger sad feelings, $pr(54) = .30$, $p = .025$.

We next asked whether individual differences in personality and music training could help to identify listeners who liked music that made them feel happy, listeners who liked music that made them feel sad, and so on. We formed five new (latent) variables from the original ratings. For each participant, we regressed their liking ratings separately on each of the five other music-response variables (i.e., emotion intensity, happy feelings, sad feelings, mixed feelings, and perceived complexity). The slopes were then used as the data in subsequent analyses. These slopes quantified the steepness of the association between two variables. For example, listeners who provided high liking ratings for excerpts that made them feel happy had relatively high slopes (after regressing liking on happy feelings) compared to listeners whose liking ratings were independent of their happy ratings. Descriptive statistics (means and standard deviations) are reported in Table 2 separately for each set of slopes. One-sample t tests compared the mean slope with 0 (no association), separately for each set. Liking ratings tended to increase in tandem with ratings of emotional intensity, happy feelings, and perceived complexity, but to decrease for excerpts that made listeners feel sad. There was no association between liking and mixed feelings.

When we examined whether the slopes were associated with individual-difference variables (again using partial correlations to hold constant the five other individual differences), three partial associations were significant. Listeners who liked excerpts that made them feel sad tended to have lower scores on Extraversion, $pr(54) = -.35$, $p = .009$, but higher scores on Openness to Experience, $pr(54) = .35$, $p = .009$. In other words, as Openness to Experience increased or Extraversion decreased (and Introversion increased), liking for music that induced sad feelings increased, even with the other personality variables and music training held constant. There was also a

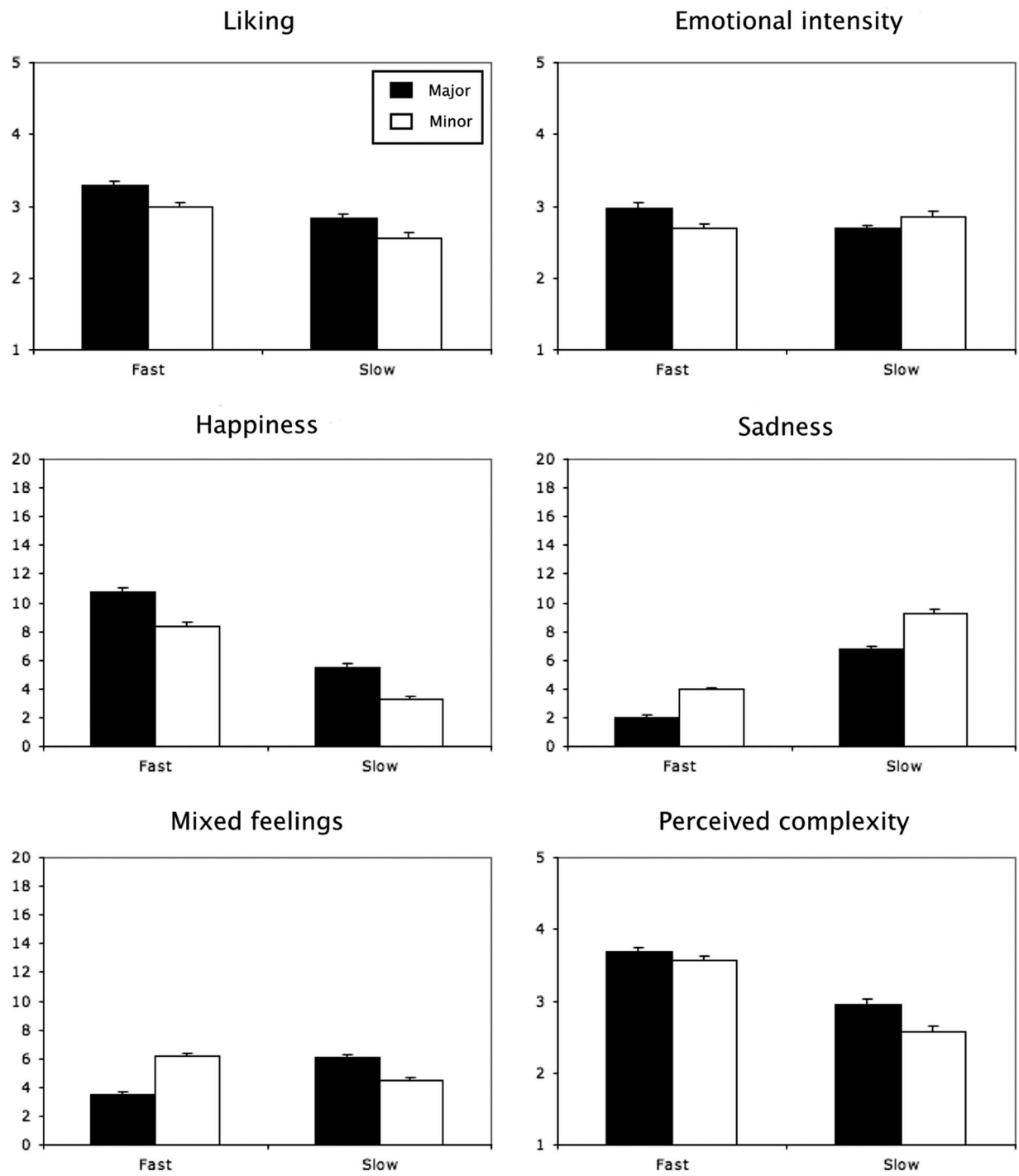

Figure 1. Mean ratings of liking, emotional intensity, felt happiness, felt sadness, felt mixed emotions, and perceived complexity as a function of tempo (fast or slow) and mode (major or minor). Error bars are standard errors.

partial association between liking music that evoked mixed feelings and music training, $pr(54) = .30$, $p = .027$. Listeners with more training tended to like excerpts that made them feel simultaneously happy *and* sad, even after accounting for individual differences in personality.

Discussion

Different people listen to different types of music, which motivated our exploration about whether this variation is associated with individual differences in the way music is experienced in the

Table 1
F Values From Repeated-Measures ANOVAs on the Music-Response Variables, With Tempo (Fast and Slow) and Mode (Major and Minor) as Independent Variables. Each F Has 1 Df in the Numerator and 60 Df in the Denominator

Dependent variable	Main effect		
	Tempo	Mode	Interaction
Liking	61.77***	38.87***	<1
Emotional intensity	1.46	1.13	31.66***
Happy feelings	349.57***	92.61***	<1
Sad feelings	369.68***	120.08***	4.74
Mixed feelings	4.56	10.09**	101.69***
Perceived complexity	183.71***	39.17***	13.41**

** $p < .005$. *** $p < .001$.

first place. One possibility is that listeners in general tend to like music that makes them feel a certain way (e.g., happy), although the most effective music in this regard could vary across listeners. Another possibility is that individuals vary according to which emotional response determines how much they like a particular piece. Our results provided support for both perspectives.

In line with findings from many years ago (Gatewood, 1927), liking music in general was associated positively with the intensity of the listener's emotional response. Moreover, as we predicted, listeners tended to like music that made them feel happy and to dislike music that made them feel sad, and the most intense emotional responding occurred when the music was unambiguously happy- or sad-sounding. Whereas happy feelings were evoked by music with a fast tempo composed in major mode, sad feelings were evoked by music that was slow and minor. We also replicated findings of mixed happy and sad feelings in response to music with mixed emotional cues (fast tempo and minor mode, slow tempo and major mode).

Previous research on mixed emotions and music (Hunter et al., 2008, 2010) measured happiness and sadness on separate unipolar scales (ranging from "not at all" to "extremely"), taking the minimum of the two ratings as a measure of listener's mixed feelings. This method ignored the *difference* between happy and sad ratings. By contrast, the present listeners rated the intensity of their emotional response, and if they felt anything, they subsequently indicated on a bipolar scale whether the feeling was happy, sad, or a mixture of happiness and sadness. Because the results mirrored those observed previously (Hunter et al., 2008, 2010), evidence of mixed emotional responding does not require one particular method of measurement. Rather, regardless of method, mixed feelings are systematic and predictable from dimensions of music that are associated with emotional responding (i.e., tempo and mode). Considered jointly with previous findings (Hunter et al., 2008, 2010), our results imply that Russell's (1980) model is inadequate for describing emotional responding to music. Indeed, mixed feelings in response to music appear to be relatively common, as they are in nonmusical contexts (Hemenover & Schimmack, 2007; Larsen & McGraw, in press; Larsen et al., 2001, 2004; Schimmack, 2001, 2005; Schimmack & Colcombe, 2008).

Our most novel and important results concerned personality differences in the emotional experience of listening to music. Previous findings indicated that (a) Openness to Experience is associated with liking a wide variety of music, including music that sounds intense or complex, and (b) Extraversion is associated with liking high-energy or exciting-sounding music (Dollinger, 1993; Rawlings & Ciancarelli, 1997). In the present study, we extended these findings by showing that listeners who scored high on Agreeableness, which is characterized by a tendency for compassion and empathy, had relatively intense emotional responses to music in general. High scores on the Agreeableness dimension were also predictive of more sad feelings in response to music, as were high scores on Neuroticism. To our knowledge, our study is the first to examine associations between personality traits and listeners' emotional responses to music.

In addition to finding individual differences in emotional responding to music, we also found that liking music as a function of the emotional experience it evokes varied across individuals as a function of personality and music training. Although liking for happy-sounding music was relatively consistent across individuals, our results informed the more provocative question of liking music that evokes sadness or mixed feelings of happiness and sadness. Previous findings highlighted contextual differences that eliminate the usual preference for happy- over sad-sounding music (Gosselin et al., 2005; Hunter et al., 2008, 2010; Husain et al., 2002; Schellenberg et al., 2008; Thompson et al., 2001), such as when listeners are fatigued by an arduous task (Schellenberg et al., 2008) or in a sad mood (Hunter et al., in press), and when they have previously heard many examples of happy-sounding music (Ladinig et al., 2010). Instead of asking *when* and *where* listeners like music that evokes sadness or mixed feelings, we asked *who* likes music that makes them feel sad. Our results were consistent with our hypotheses. Liking music that evoked sadness tended to be stronger among participants who scored (a) high in Introversion (or low in Extroversion), which is characterized by seeking internal stimulation and avoiding social contexts; or (b) high in Openness-to-Experience, which is characterized by curiosity, imagination, and the appreciation of a variety of experiences.

We also found that liking music that evoked mixed feelings was associated positively with music training. Presumably, listeners with more training would have a more sophisticated appreciation of music, with relatively positive dispositions toward music that is more complicated in terms of its emotional cues. In turn, such music would elicit more nuances and subtleties in the emotions perceived and felt by the listener, which are known to vary in tandem (Hunter et al., 2010). By contrast, music that is obviously happy- or sad-sounding, with consistent cues to happiness and

Table 2
Mean Slopes and Standard Deviations After Regressing Liking Ratings on Emotional Intensity, Happy Feelings, Sad Feelings, Mixed Feelings, and Perceived Complexity Separately for Each Listener

	Emotional intensity	Happy feelings	Sad feelings	Mixed feelings	Perceived complexity
Mean	.68*	−.06*	.11*	−.01	.31*
SD	.26	.07	.05	.05	.27

* $p < .001$.

sadness, might sound somewhat obvious or even trite to a musically trained listener, akin to an emotional cliché.

Our approach differed from previous studies in multiple ways. The majority of studies on music preferences focused on the influence of personality on the preference for certain musical genres (e.g., Delsing et al., 2008; Dollinger, 1993; Litle & Zuckerman, 1986; Rentfrow & Gosling, 2003, 2006), with a few exceptions that focused on preferences for musical attributes, such as discordant triads (Rawlings, Hodge, Sherr, & Dempsey, 1995), vocal versus instrumental music (Rentfrow & Gosling, 2006), or low-frequency tones (McCown, Keiser, Mulhearn, & Williamson, 1997). To the best of our knowledge, our study is the first to focus on emotions, including those that are predefined by using variations of tempo and mode, as well as those that are experienced subjectively by the participants. Moreover, whereas previous studies used a few genres that were familiar to the participants (e.g., jazz, classical; Cattell & Anderson, 1953; Cattell & Saunders, 1954), our approach examined liking for unfamiliar pieces of music drawn from a wide variety of genres. Lastly, previous studies typically collected preference ratings for verbal descriptions of music genres (i.e., not actual music; Litle & Zuckerman, 1986; Rentfrow & Gosling, 2003), which could lead to biased responses related to social desirability or unfamiliarity with certain genres. In the present study, participants rated music excerpts immediately after hearing them, without any descriptive labels attached to the excerpts.

Our findings of individual differences in liking music fit nicely with a recent biological perspective that subsumes the Big Five personality factors into two higher-order traits, which represent opposing but complementary functions (DeYoung, 2006; Digman, 1997). Two factors, Openness to Experience and Extraversion, are subsumed under the higher-order trait *plasticity*, which is associated primarily with the dopaminergic system and responsible for reward regulation and incorporating novel information. In the present study, these factors were predictive of liking music as a function of the listener's particular emotional response. The remaining three factors, Agreeableness, Neuroticism, and Conscientiousness, are subsumed under the higher-order trait *stability*, which is associated primarily with the serotonergic system and responsible for mood regulation and stabilization. In the present study, we found that two of these factors were related to emotional responding to music—in terms of general intensity as well as in a proclivity to feel sadness—but not to liking music. In other words, personality differences in our study appear to be well explained by a model that considers two higher-order traits instead of all five personality dimensions. Future research could use both biological and behavioral measures to delineate which experimental contexts—musical or otherwise—require two rather than five personality variables to provide a good account of individual differences in responding.

Although the present study represents a good first attempt at examining associations among personality variables, liking music, and emotional responses that occur as a consequence of music listening, various factors limit the degree to which the results generalize. First, the participants were a convenience sample of undergraduates. Second, the listening situation in our experiment was based in a laboratory and thus artificial. Third, the music stimuli were preselected by the experimenters, trimmed to 30 sec, and presented in random order, which would produce sequences of musical pieces that are unlikely to occur in natural listening situations. Future research could attempt to replicate the results in more natural music-listening settings, testing listeners from various age groups and musical backgrounds who also vary in preexisting music preferences and socioeconomic status.

In sum, our findings revealed interconnections among liking music, emotional responding to music, and individual differences in personality and music training. Different personalities respond differently to music, both in terms of the particular emotion experienced as well as the intensity of the emotional response. Moreover, different personalities appreciate different emotional experiences that arise from listening to music. Our results suggest that a comprehensive theory of music preferences and liking music needs to account for emotional responses, personality factors, and the interplay between the two, as well as broad preferences for music genres considered in conjunction with liking or disliking unfamiliar pieces. At present, it is unclear whether preferences and emotional reactions to novel music are predictive of long-term music preferences for genres. A complete model of positive and negative responding to music is also likely to include mood, contextual factors, and socioeconomic factors.

References

Arnett, J. (1992). The soundtrack of recklessness: Musical preferences and reckless behavior among adolescents. *Journal of Adolescent Research, 7,* 313–331.

Bates, T. C., & D'Oliveiro, L. (2003). PsyScript: A Macintosh application for scripting experiments. *Behaviour Research Methods, Instruments, & Computers, 35,* 565–576.

Benet-Martinez, V., & John, O. P. (1998). Los Cinco Grandes across cultures and ethnic groups: Multitrait multimethod analyses of the Big Five in Spanish and English. *Journal of Personality and Social Psychology, 75,* 729–750.

Bornstein, R. F. (1989). Exposure and affect: Overview and meta-analysis of research, 1968–1987. *Psychological Bulletin, 106,* 265–289.

Cattell, R. B. (1957). *Personality and motivation structure and measurement.* New York: World Book.

Cattell, R. B., & Anderson, J. C. (1953). The measurement of personality and behavior disorders by the I. P. A. T. music preference test. *Journal of Applied Psychology, 37,* 446–454.

Cattell, R. B., & Saunders, D. R. (1954). Musical preferences and personality diagnosis: A factorization of one hundred and twenty themes. *Journal of Social Psychology, 39,* 3–24.

Costa, P. T., & McCrae, R. R. (1985). *The NEO Personality Inventory manual.* Odessa, FL: Psychological Assessment Resources.

Delsing, M. J. M. H., ter Bogt, T. F. M., Engels, R. C. M. E., & Meeus, W. H. J. (2008). Adolescents' music preferences and personality characteristics. *European Journal of Personality, 22,* 109–130.

DeYoung, C. G. (2006). Higher-order factors of the Big Five in a multi-informant sample. *Journal of Personality and Social Personality, 91,* 1138–1151.

Digman, J. M. (1990). Personality structure: Emergence of the five-factor model. *Annual Review of Psychology, 41,* 417–440.

Digman, J. M. (1997). Higher-order factors of the Big Five. *Journal of Personality and Social Psychology, 73,* 1246–1256.

Dollinger, S. J. (1993). Research note: Personality and music preference: Extraversion and excitement seeking or openness to experience? *Psychology of Music, 21,* 73–77.

Gatewood, E. L. (1927). An experimental study of the nature of musical enjoyment. In M. Schoen (Ed.), *The effects of music* (pp. 78–127). Freeport, NY: Books for Libraries Press.

Gosselin, N., Peretz, I., Noulhiane, M., Hasboun, D., Beckett, C., Baulac, M., & Samson, S. (2005). Impaired recognition of scary music following unilateral temporal lobe excision. *Brain, 128,* 628–640.

Hemenover, S. H., & Schimmack, U. (2007). That's disgusting!. . .But very amusing: Mixed feelings of amusement and disgust. *Cognition and Emotion, 21,* 1102–1113.

Hunter, P. G., & Schellenberg, E. G. (2010). Music and emotion. In M. R. Jones, R. R. Fay, & A. N. Popper (Eds.), *Music perception* (pp. 129–164). New York: Springer.

Hunter, P. G., & Schellenberg, E. G. (2011). Interactive effects of personality and frequency of exposure on liking for music. *Personality and Individual Differences, 50,* 175–179.

Hunter, P. G., Schellenberg, E. G., & Griffith, A. T. (in press). Misery loves company: Mood-congruent emotional responding to music. *Emotion.*

Hunter, P. G., Schellenberg, E. G., & Schimmack, U. (2008). Mixed affective responses to music with conflicting cues. *Cognition and Emotion, 22,* 327–352.

Hunter, P. G., Schellenberg, E. G., & Schimmack, U. (2010). Feelings and perceptions of happiness and sadness induced by music: Similarities, differences, and mixed emotions. *Psychology of Aesthetics, Creativity, and the Arts, 4,* 47–56.

Husain, G., Thompson, W. F., & Schellenberg, E. G. (2002). Effects of musical tempo and mode on arousal, mood, and spatial abilities. *Music Perception, 20,* 149–169.

John, O. P., Donahue, E. M., & Kentle, R. L. (1991). *The Big Five inventory—Versions 4a and 54.* Berkeley, CA: University of California, Berkeley, Institute of Personality and Social Research.

John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative big-five trait taxonomy: History, measurement, and conceptual issues. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (pp. 114–158). New York: Guilford Press.

Juslin, P. N., & Laukka, P. (2004). Expression, perception and induction of musical emotions: A review and a questionnaire study of everyday music listening. *Journal of New Music Research, 33,* 217–238.

Juslin, P. N., & Västfjäll, D. (2008). Emotional responses to music: The need to consider underlying mechanisms. *Behavioural and Brain Sciences, 31,* 559–621.

Kivy, P. (2002). *Introduction to a philosophy of music.* Oxford: Clarendon Press.

Knobloch, S., & Zillman, D. (2002). Mood management via the digital jukebox. *Journal of Communication, 52,* 351–366.

Ladinig, O., & Honing, H. (2011). *Complexity judgments as a measure of event salience in musical rhythms.* Revised manuscript submitted for publication.

Ladinig, O., Schellenberg, E. G., & Huron, D. (2010). The role of contrasting musical characteristics in the appreciation of music. *Proceedings of the International Conference on Music Perception,* 728–731.

Larsen, J. T., & McGraw, A. P. (in press). Further evidence for mixed emotions. *Journal of Personality and Social Psychology.*

Larsen, J. T., McGraw, A. P., & Cacioppo, J. T. (2001). Can people feel happy and sad at the same time? *Journal of Personality and Social Psychology, 81,* 684–696.

Larsen, J. T., McGraw, A. P., Mellers, B. A., & Cacioppo, J. T. (2004). The agony of victory and thrill of defeat: Mixed emotional reactions to disappointing wins and relieving losses. *Psychological Science, 15,* 325–330.

Larsen, J. T., Norris, C. J., McGraw, A. P., Hawkley, L. C., & Cacioppo, J. T. (2009). The evaluative space grid: A single-item measure of positivity and negativity. *Cognition and Emotion, 23,* 453–480.

Levinson, J. (1990). Music and negative emotions. In J. Levinson (Ed.), *Music, art, and metaphysics: Essays in philosophical aesthetics* (pp. 306–335). Ithaca: Cornell University Press.

Litle, P., & Zuckerman, M. (1986). Sensation seeking and music preferences. *Personality and Individual Differences, 7,* 575–577.

Matthews, G., & Deary, I. J. (1998). *Personality traits.* Cambridge, UK: Cambridge University Press.

McCown, W., Keiser, R., Mulhearn, S., & Williamson, D. (1997). The role of personality and gender in preference for exaggerated bass in music. *Personality and Individual Differences, 23,* 543–547.

McCrae, R. R., & John, O. P. (1992). An introduction to the five-factor model and its applications. *Journal of Personality, 60,* 175–215.

McNamara, L., & Ballard, M. E. (1999). Resting arousal, sensation seeking, and music preference. *Genetic, Social, and General Psychology Monographs, 125,* 229–250.

North, A. C., & Hargreaves, D. J. (1999). Music and adolescent identity. *Music Education Research, 1,* 75–92.

Ollen, J. E. (2006). *A criterion-related validity test of selected indicators of musical sophistication using expert ratings.* PhD thesis, Ohio State University, Columbus, OH.

Panksepp, J. (1995). The emotional sources of "chills" induced by music. *Music Perception, 13,* 171–207.

Pearson, J. L., & Dollinger, S. J. (2004). Music preference correlates of Jungian types. *Personality and Individual Differences, 36,* 1005–1008.

Rawlings, D., Barrantes i Vidal, N., & Furnham, A. (2000). Personality and aesthetic preference in Spain and England: Two studies relating sensation seeking and openness to experience to liking for paintings and music. *European Journal of Personality, 14,* 553–576.

Rawlings, D., & Ciancarelli, V. (1997). Music preference and the five-factor model of the NEO Personality Inventory, *Psychology of Music, 25,* 120–132.

Rawlings, D., Hodge, M., Sherr, D., & Dempsey, A. (1995). Toughmindedness and preference for musical excerpts, categories and triads. *Psychology of Music, 23,* 63–80.

Rentfrow, P. J., & Gosling, S. D. (2003). The do re mi's of everyday life: The structure and personality correlates of music preferences. *Journal of Personality and Social Psychology, 84,* 1236–1256.

Rentfrow, P. J., & Gosling, S. D. (2006). Message in a ballad: The role of music preferences in interpersonal perception. *Psychological Science, 17,* 236–242.

Rentfrow, P. J., & McDonald, J. A. (2010). Music preferences and personality. In P. N. Juslin & J. A. Sloboda (Eds.), *Handbook of music and emotion: Theory, research, applications* (pp. 669–695). New York: Oxford University Press.

Revelle, W., & Scherer, K. R. (2009). Personality and emotion. In D. Sander & K. R. Scherer (Eds.), *Oxford companion to emotion and the affective sciences* (pp. 303–305). Oxford, UK: Oxford University Press.

Russell, J. A. (1980). A circumplex model of affect. *Journal of Personality and Social Psychology, 39,* 1161–1178.

Russell, J. A., & Carroll, J. M. (1999). On the bipolarity of positive and negative affect. *Psychological Bulletin, 125,* 3–30.

Schellenberg, E. G., Peretz, I., & Vieillard, S. (2008). Liking for happy- and sad-sounding music: Effects of exposure. *Cognition and Emotion, 22,* 218–237.

Schimmack, U. (2001). Pleasure, displeasure, and mixed feelings? Are semantic opposites mutually exclusive? *Cognition and Emotion, 15,* 81–97.

Schimmack, U. (2005). Response latencies of pleasure and displeasure ratings: Further evidence for mixed feelings. *Cognition and Emotion, 19,* 671–691.

Schimmack, U., & Colcombe, S. (2008). Eliciting mixed feelings with the paired-picture paradigm: A tribute to Kellogg (1915). *Cognition & Emotion, 21,* 1546–1553.

Schubert, E. (1996). Enjoyment of negative emotions in music: An associative network explanation. *Psychology of Music, 24,* 18–28.

Sloboda, J. (1992). Empirical studies of emotional response to music. In M. R. Jones & S. Holleran (Eds.), *Cognitive bases of musical commu-*

nication (pp. 33–46). Washington, DC: American Psychological Association.

Szpunar, K. K., Schellenberg, E. G., & Pliner, P. (2004). Liking and memory for musical stimuli as a function of exposure. *Journal of Experimental Psychology: Learning, Memory, and Cognition, 30,* 370–381.

Thompson, W. F., Schellenberg, E. G., & Husain, G. (2001). Arousal, mood, and the Mozart effect. *Psychological Science, 12,* 248–251.

Weaver, J. B. (1991). Exploring the links between personality and media preferences. *Personality and Individual Differences, 12,* 1293–1299.

Zajonc, R. B. (1980). Feeling and thinking: Preferences need no inference. *American Psychologist, 35,* 151–175.

Zajonc, R. B., Shaver, P., Tavris, C., & van Kreveld, D. (1972). Exposure, satiation, and stimulus discriminability. *Journal of Personality and Social Psychology, 21,* 270–280.

Received March 13, 2011
Revision received May 9, 2011
Accepted May 10, 2011 ■