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ABSTRACT We explored the role of lyrics and melodies in conveying emotions in songs. Participants rated the intensity of four types of emotions in instrumental music or the same music paired with lyrics. Melodies and lyrics conveyed the same intended emotion in Experiments 1 and 3 but were mismatched in Experiments 2 and 4. The major findings in Experiments 1 and 2 were that lyrics detracted from the emotion in happy and calm music (positive emotions), but enhanced the emotion in sad and angry music (negative emotions). In all cases, melodies of songs were more dominant than the lyrics in eliciting emotions. In addition, in Experiments 3 and 4, the emotion in the songs appeared to transfer, simply by association, to pictures of common objects arbitrarily paired with the songs.

KEYWORDS: *circumplex theory, music*

Introduction

Music, like language, can both express and induce emotion (e.g. Juslin and Sloboda, 2001; Peretz and Hébert, 2000). Indeed, a variety of studies have explored the relationship between musical variables (e.g. tempo, dynamics, and rhythm) and judgments of emotion in music (e.g. Cooke, 1959). For instance, strong associations have been observed between fast and slow tempo in music and ratings of happiness and sadness (e.g. Bella et al., 2001; Hevner, 1936), as well as ratings of anger and fear (Gabrielsson and Juslin, 1996; Juslin, 2000), respectively. Similar associations have been observed between simple melodies, containing fewer variations of melodic contour and more repetition, and ratings of happiness and peacefulness; between complex melodies, containing more variation and less repetition, and ratings of sadness and anger (Gerardi and Gerken, 1995; Vitz, 1966); as well as

between regular rhythms and positive moods, and irregular rhythms and negative moods (Hevner, 1935; Rigg, 1964). Indeed, filmmakers and marketing executives make use of the connection between music and emotion, either to enhance a scene in a movie (e.g. Cohen, 2001) or to sell more of a product (e.g. Bruner, 1990).

North and Hargreaves (1997) have linked the specific emotions expressed by music to its likeability and arousal potential using a modified version of the circumplex theory of emotion (e.g. Russell et al., 1981). More specifically, they divided the circumplex into quadrants, where each quadrant represented different combinations of likeability (i.e. 'like/dislike', specified by the x-axis) and arousal potential (i.e. 'low/high arousal potential', specified by the y-axis). For instance, 'exciting' and 'festive' would be in the like/high arousal quadrant, 'relaxing' and 'peaceful' in the like/low arousal quadrant, 'unsettling' and 'disconcerting' in the dislike/high arousal quadrant, and 'boring' and 'unstimulating' in the dislike/low arousal quadrant. One group of participants rated musical excerpts on the extent to which they expressed the specific emotions, and a second group rated the same excerpts on how much they liked the music and how arousing they thought the music was. The ratings from the first group correlated with those from the second group in support of the circumplex theory of emotion. More recently, Ritossa and Rickard (2004) have also found support for the circumplex theory of emotion while demonstrating that 'pleasantness' was a more useful predictor of emotions expressed by music than was 'liking'.

Songs are special in that they comprise both melodic and lyrical information. Although the two components can be processed independently (e.g. Bonnel et al., 2001), they are often quite integrated in that recognition of one component is enhanced by the simultaneous presence of the other component (Serafine et al., 1984), and such integration occurs regardless of the semantic content of the lyrics (Serafine et al., 1986). Indeed, temporal contiguity of melody and lyrics has been shown to be enough to account for the integration (Crowder et al., 1990). In the present study, we explored the relationship of melodies and lyrics in songs with respect to emotion. More specifically, we wanted to see whether the presence of lyrical information that conveyed the same emotion as the melody increased the intensity of the emotion induced by the melody alone, as well as whether one component was more dominant than the other.

Some studies focusing on the effects of lyrics in popular songs on negative behaviors and attitudes have reported that lyrics do indeed make a difference (e.g. Burt, 1980). For instance, Anderson et al. (2003), Arnett (1991), Hansen and Hansen (1990), and Harris et al. (1992) have observed positive correlations between increased exposure to hard rock/heavy-metal music with lyrics and more frequent negative behaviors. However, other studies have not shown such a relationship (e.g. Ballard and Coates, 1995; Maguire and Snipes, 1995; Wanamaker and Reznikoff, 1989). In addition, in all of

such studies to date, either the effects of the presence or absence of lyrics and the type of music were confounded, or there were no control conditions (i.e. music without lyrics) to tease out the effects of the lyrics per se.

More pertinent to present purposes, Galizio and Hendrick (1972) found that a more positive emotional state, as well as an increased acceptance for the message portrayed through the lyrics, occurred when they were coupled with melodies. Additionally, Gfeller and Coffman (1991) found that, in trained musicians, music paired with spoken text increased perceived complexity and lowered both liking and affective ratings from baseline compared to just the melody or just the spoken text, leading to the speculation that perhaps training made musicians respond analytically to the music, diminishing their emotional response to it. Thus, in both studies, the presence of lyrics influenced the perception of emotion in songs.

The two studies that have explored the effects of melody with and without lyrics on mood more systematically have yielded mixed results. Stratton and Zalanowski (1994) have found that the melody of a sad song was perceived as pleasant and had positive effects on mood. However, both the lyrics of the sad song, as well as the lyrics coupled with the melody of the sad song, were perceived as unpleasant and had negative effects on mood. Furthermore, the melody of the sad song played in an up-beat tempo was perceived as pleasant and had positive effects on mood, whereas the lyrics coupled with the melody of a sad song and played in an up-beat tempo was perceived as unpleasant and had negative effects on mood. Finally, the melody of the sad song coupled with 'positive' lyrics and played in the original (i.e. slow) tempo was perceived as pleasant and had positive effects on mood. Thus, Stratton and Zalanowski (1994) concluded that the lyrics of a song have a greater ability to affect mood than does the melody.

Sousou (1997) also examined the effects of music with and without lyrics on mood. In this study, participants read either happy or sad lyrics while listening to happy, sad, or no music, and rated their mood and psychological arousal before and after the presentation of the stimuli. Participants who listened to the sad melody rated their mood as sad, and participants who listened to the happy melody rated their mood as happy, regardless of the type of lyrics that they read. Participants who read the lyrics while listening to no music rated their mood as neutral. Furthermore, participants reported increased arousal from their baseline ratings while listening to the happy melody, regardless of the type of lyrics that they read, compared to those participants who listened to the sad melody or no music. Hence, even though the lyrics were presented visually and the melodies auditory, which may have inflated the importance of the melody, Sousou (1997) concluded that, unlike Stratton and Zalanowski's (1994) findings, the melody of a song has a greater ability to affect mood than does its lyrics.

In addition to the conflicting conclusions, although their interpretations were couched in the circumplex theory (cf. Russell et al., 1981), both Stratton

and Zalanowski (1994) and Sousou (1997) concentrated only on happy and sad emotions. Happiness and sadness indeed are the most identified and distinguishable emotions expressed through music (Haack, 1980). However, the emotions of anger (e.g. Behrens and Green, 1993; Terwogt and van Grinsven, 1991) and peacefulness (Terwogt and van Grinsven, 1991; Thompson and Robitaille, 1992) have been identified in music, as well.

In the present study, we systematically examined the effects of music with and without lyrics on a range of emotional responses, spanning all four quadrants of the circumplex theory of emotion, which included 'happy', 'sad', 'calm', and 'angry'. More specifically, in Experiment 1, we examined whether there were any differences in the intensities of affective responses to instrumental music with and without lyrics. In Experiment 2, the lyrics and melodies were sometimes mismatched with respect to emotion to see whether the melody dominated over the lyrics or vice versa. Finally, in Experiments 3 and 4, we examined whether music with and without lyrics affected emotions attached to non-musical stimuli, such as pictures of common objects, through being paired with emotion-conveying music. That is, of interest was whether one's emotional responses to incidentally heard music somehow transfer to other stimuli, simply by association.

We were also interested in observing whether any gender effects would emerge. In general, women seem to report more intense emotions than do men (e.g. Brebner, 2003), and it has also been suggested that women may be more sensitive to the emotional aspects of instrumental music than men (e.g. Peretti, 1975). Coffman et al. (1995) have found that, for both lyrics and melodies, as well as when they were coupled together, affective response ratings of women were higher on negative dimensions such as 'evil' and 'depression', whereas those of men were higher on positive dimensions such as 'humor' and 'pastoral'. In a different vein, Iversen et al. (1989) have found that women rated the personal relevance of the lyrics higher when they were sung compared to when they were written and presented with no musical accompaniment, whereas men showed the opposite effect. One speculation was that men were distracted by the melody when judging the lyrics, whereas women were able to integrate the music with the lyrics and identify the jointly conveyed mood more easily.

Experiment 1

The purpose of this experiment was to determine whether the presence of lyrics affected emotional judgments of music and whether any differences emerged as a function of type of emotion. To this end, participants rated the intensity of the emotion conveyed by melodies alone and the same melodies paired with emotionally congruent lyrics.

METHOD

Participants

The participants were 32 adults (21 women and 11 men), students at American University, who participated for extra credit in psychology courses, and research personnel at the National Institutes of Health, who participated on a completely voluntary basis.

Materials

The stimuli comprised 32 musical excerpts of relatively low familiarity, all taken from instrumental classical and jazz pieces as well as soundtracks (see Appendix). The melodies were chosen to elicit four different types of emotional responses (e.g. happy, sad, calm and angry) corresponding to the four quadrants of the modified circumplex theory of emotion (e.g. North and Hargreaves, 1997). Eight melodies of approximately 20 seconds in length were used for each of the four emotions.

To create the music with and without lyrics, the eight melodies for each emotion were yoked and divided into two sets of four (Sets A and B), so that when those in Set A contained lyrics, those in Set B did not, and vice versa. There were 16 sets of lyrics of relatively low familiarity: four sets for each emotion, taken from other songs and modified to fit the target melodies (see Appendix). Extensive pilot testing ensured that these stimuli were not highly familiar to our participant population and that each set of lyrics and each melody fitted primarily the emotion it was meant to convey.

One female and one male vocalist sang the lyrics. Specifically, each set of lyrics was paired with one melody from Set A and with one melody from Set B for each emotion, and both vocalists sang each set of lyrics. Thus, two versions of each song were produced, one version with the female vocalist and one version with the male vocalist. The melodies and the lyrics were matched so that they were congruent with respect to the conveyed emotion (e.g. 'happy' melodies were paired with 'happy' lyrics, and 'sad' melodies with 'sad' lyrics).

The melodies were taken from original source recordings and the vocalists recorded the lyrics to go with these melodies at a recording studio in the Department of Computer Science, Audio Technology, and Physics at American University. The recorded lyrics were mixed with melodies using Pro Tools HD (Avid Technology, Inc., Tewksbury, MA) and a Power Macintosh G4 computer (Apple Computer, Inc., Cupertino, CA).

Design and procedure

The participants were tested either individually or in small groups. All of the participants heard all 32 excerpts, half with lyrics and half without lyrics from each emotion type, with half of the excerpts with lyrics sung by the female vocalist and the other half sung by the male vocalist. Half of the participants received Set A melodies with lyrics (with half of the melodies

sung by the female vocalist and the other half sung by the male vocalist) and Set B melodies without lyrics, and the other half of the participants received vice versa. In that way, across four groups of participants, all of the melodies in the lyric and non-lyric conditions, as well as whether the lyrics were sung by a male or a female vocalist, were tested equally often. The excerpts were presented to the participants randomly with respect to intended emotion, lyric condition (i.e. with or without lyrics), and gender of the vocalist.

After hearing each excerpt, the participants rated their emotional judgments on response sheets for all four emotions: (1) happy, joyful, exciting, and/or festive, (2) sad, depressing, and/or melancholy, (3) calm, relaxing, and/or peaceful, and (4) angry, unsettling, disconcerting, and/or stressful, always in that order, regardless of the intended emotion to be conveyed. The ratings were given on nine-point scales, where '1' represented 'not' (e.g. not 'happy') and '9' represented 'very' (e.g. very 'happy'). Participants made their ratings at any time during the 20-second presentation of each excerpt and were given as much time as needed to complete them before listening to the next excerpt. At the end of the session, participants were asked to fill out a short demographic questionnaire indicating age, gender, whether they grew up listening to western-style music, and whether they currently had any mood or emotional disorders that required treatment.

RESULTS AND DISCUSSION

Of interest were the differences between the intensity of emotional responses as a function of the particular intended emotion of the music (happy, sad, calm, angry), the lyric condition of the music (lyrics, no lyrics), and the gender of the participants. The results are summarized in Table 1.

A 4 × 2 × 2 analysis of variance (ANOVA) showed a main effect of intended emotion, F (3, 90) = 20.43, MSE = 1.84, $p < .001$, and post-hoc comparisons showed that, collapsed across the presence or absence of lyrics, the participants gave higher ratings for the happy music than the sad, calm, and angry music, ts (126) = 5.95, 3.92, 7.09, respectively, all ps < .05. The ratings for the sad, calm, and angry music were not different from each other,

TABLE 1 *Experiment 1: Mean intensity ratings (1–9) of emotional responses to music as a function of the type of emotion, lyric condition, and the gender of the participants*

	Lyric condition					
	No lyrics			Lyrics		
Emotion	Women	Men	Overall	Women	Men	Overall
Happy	7.85	8.18	7.96	6.62	6.91	6.72
Sad	5.79	5.20	5.59	6.51	6.11	6.38
Calm	7.75	7.95	7.82	4.05	5.41	4.52
Angry	5.00	4.41	4.80	6.08	6.59	6.26
Overall	6.60	6.44	6.54	5.82	6.26	5.97

all *p*s > .10. A more detailed examination of these results, however, led to the observation that the participants gave higher ratings to music that conveyed positive emotions (i.e. happy and calm combined) than music that conveyed negative emotions (i.e. sad and angry combined), F (1, 30) = 21.81, MSE = 1.68, $p < .001$. It is of course possible that the music selected to convey the positive emotions just happened to be intrinsically more effective and hence rated to be more intense than the music selected to convey the negative emotions. However, it is also possible that the participants had a tendency to rate the stimuli conveying positive emotions as more intense than the stimuli conveying negative emotions (cf., Pfister and Böhm, 1992).

There was also a main effect for the lyric condition of the music, F (1, 30) = 11.81, MSE = 1.13, $p < .01$. Overall, participants rated the emotion conveyed only by melodies as more intense than that conveyed by the same melodies coupled with lyrics. Although there was no main effect for the gender of the participants, F (1, 30) = 0.30, MSE = 3.81, $p > .10$, there was a small but significant interaction between the lyric condition and gender of the participants, F (1, 30) = 4.57, MSE = 1.13, $p < .05$. Lyrics appeared to detract from the emotion conveyed by the melody only for women, t (166) = 2.91, $p < .05$ and not for men, t (86) = 0.48, $p > .10$.

Although the finding that the lyrics detracted from the intensity of emotion conveyed by the melody, at least for women, perhaps parallels Sousou's (1997) conclusion that melodies have a greater ability to affect mood than lyrics, the explanation appears to be more complicated. There was an interaction between the lyric condition and the intended emotion of the music, F (3, 90) = 54.91, MSE = 1.2, $p < .001$. As illustrated in Table 1, participants rated the happy and calm melodies without lyrics as more intense in their intended emotion than that conveyed by the same melodies coupled with lyrics, and this was true even when the two positive emotions were analyzed separately, *t*s (62) = 5.63, 9.84, respectively, *p*s < .05. However, participants rated the sad and angry melodies coupled with lyrics as more intense in their intended emotion than that elicited by the same melody without the lyrics, again, even when the two negative emotions were analyzed separately, *t*s (62) = 2.20, 3.68, respectively, *p*s < .05. Thus, it appears that lyrics detracted from music that conveyed positive emotions (i.e. happy, calm), but bolstered music that conveyed negative emotions (i.e. sad, angry).

This finding may have again been due to the chance selection of more salient melodies for positive emotions and more salient lyrics for negative emotions. In fact, this possibility was tested more directly in Experiments 2 and 4. Another possibility, however, is that the participants indeed relied more on the melody for the music that conveyed positive emotion, but relied more on the lyrics for the music that conveyed negative emotion. It has been speculated that positive emotions are associated with the left hemisphere, whereas negative emotions are associated with the right hemisphere of the

brain (e.g. Heilman, 1997). For instance, Gagnon and Peretz's (2000) participants have shown a left-hemisphere predominance when rating tonal melodies as 'pleasant' and a right-hemisphere predominance when rating atonal melodies as 'unpleasant' (and for a review, see Davidson, 1995). In the present study, the finding that the lyrics for the music that conveyed negative emotions enhanced these emotions and detracted from the positive emotions appears to be inconsistent with these findings. That is, because the lyrics themselves should be processed in the left hemisphere, and the left hemisphere is associated with positive emotions, the positive emotions should have been intensified by the presence of lyrics. One possible explanation for this discrepancy might be that it is only the semantic meaning of the lyrics that is processed in the left hemisphere; the negative emotional meaning of the lyrics (as well as the integrated song) is processed in the right hemisphere (cf. Besson et al., 1998; Samson and Zatorre, 1991), thus adding to the negativity of the emotions since the right hemisphere is associated with the processing of negative emotions.

There were no interactions between the intended emotion and gender of the participants. Women and men gave similar ratings, regardless of the intended emotion, $F\ (3,\ 90) = 2.29$, $MSE = 1.84$, $p > .10$. In addition, separate analyses indicated no effect of the gender of the vocalists in influencing the participants' intensity ratings, $F\ (1,\ 30) = 0.80$, $MSE = 1.02$, $p > .10$. Even though perhaps one might have speculated that the gender of the vocalist would have had more (or less) of an effect on the same-gendered listener, there was no interaction between the gender of the vocalists and the gender of the participants, $F\ (1,\ 30) = 0.65$, $MSE = 1.02$, $p > .10$.

The participants had rated each musical excerpt on all four emotions, regardless of the specific intended emotion of the excerpt. Hence, in addition to the congruent ratings (e.g. 'happy' rating for happy music) that were of main interest, there were three other ratings made for each excerpt (e.g. 'sad', 'calm', and 'angry' ratings for happy music). Primarily as a manipulation check, to see if what was classified as the specific intended emotion of each excerpt matched the participants' perception of it, we compared the congruent ratings with the other ratings. We found that the participants' congruent emotion ratings were always higher than the 'other' emotion ratings, thus matching the perceptions of the intended emotion of each excerpt (all $ps < .05$).

Experiment 2

In Experiment 1, the presence of lyrics seemed to dampen the positive emotions but enhance the negative emotions conveyed by the melodies. The purpose of this experiment was to examine the relative influences of the lyrics and the melodies in these excerpts more carefully, and to look directly at whether the melody or the lyrics emerged as the more dominant component

in eliciting each of the emotions in question. Thus, in this experiment we used only music with lyrics and also added a condition in which the melodies and lyrics in some of the excerpts were not congruent with respect to the emotion that was to be conveyed.

METHOD

Participants

The participants were 32 students (19 women and 13 men) at American University, who participated for extra credit in psychology courses or for a chance to win $100. None had participated in Experiment 1.

Materials, design, and procedure

The stimuli included a randomly selected 16 of the 32 excerpts from Experiment 1, with four of each emotion, and all of the excerpts were presented with lyrics. In addition, the excerpts were re-recorded to obtain melody–lyric pairs for which the lyrics were not congruent with respect to the emotion conveyed by the melody (e.g. 'happy' melodies were paired with 'sad', 'calm', or 'angry' lyrics, as well). In fact, for each participant, of the 16 excerpts that were presented, four were congruent (as in Experiment 1, except only one of each emotion), and 12 were incongruent (three of each emotion, with one excerpt from each incongruent melody–lyric combination). Thus, for example, a given participant heard a 'happy' melody with 'happy' lyrics, as well as a 'happy' melody with 'sad' lyrics, a 'happy' melody with 'angry' lyrics, and a 'happy' melody with 'calm' lyrics. The lyrics were rotated through the melodies so that across four groups of participants, each excerpt served in the congruent and each of the incongruent conditions equally often. That is, for example, a 'happy' melody that was paired with 'happy' lyrics for one participant group was paired with 'sad' lyrics for the second participant group, with 'calm' lyrics for the third participant group, and with 'angry' lyrics for the fourth participant group, and no lyrics or melodies were repeated in any participant group.

Given that in Experiment 1 no differences had emerged as a function of the gender of the vocalists, the male vocalist from Experiment 1 sang all of the songs in this experiment. The same recording apparatus was used as before; however, the excerpts were recorded at Omega Recording Studios, Inc., in Rockville, MD.

The excerpts were presented to the participants randomly with respect to the intended emotion and congruency (whether lyrics and melodies matched with respect to emotion). The remaining procedural details were identical to those of Experiment 1.

RESULTS AND DISCUSSION

The differences between the intensity of the emotional responses as a function of (1) the congruency condition (melodies and lyrics congruent

TABLE 2 *Experiment 2: Mean intensity ratings (1–9) of emotional responses to music as a function of the type of emotion and the congruency condition (i.e. melody and lyrics emotionally congruent with the intended emotion, melody emotionally congruent with the intended emotion and lyrics mismatched, lyrics emotionally congruent with the intended emotion and melody mismatched)*

	Congruency condition			
Intended emotion	Melody and lyrics congruent	Melody congruent and lyrics mismatched	Lyrics congruent and melody mismatched	Overall mismatched
Happy	6.94	6.42	4.11	5.27
Sad	7.00	5.73	5.50	5.61
Calm	6.47	5.81	3.98	4.90
Angry	6.25	4.81	3.41	4.11
Overall	6.66	5.69	4.25	4.97

with respect to the emotion of interest, melodies congruent and lyrics mismatched with respect to the emotion of interest, and melodies mismatched and lyrics congruent with respect to the emotion of interest); (2) the particular intended emotion of interest; and (3) the gender of the participants were examined. Table 2 summarizes the results.

The 3 × 4 × 2 ANOVA showed a main effect for congruency, $F\ (2,\ 60) = 69.48$, $MSE = 2.76$, $p < .001$. As expected, overall, the participants rated the emotion conveyed by the music when melodies and lyrics were emotionally congruent as more intense than that elicited by the music when melodies and lyrics were emotionally incongruent. This was true both when the lyrics were mismatched, $t\ (254) = 4.15$, $p < .05$, and when the melodies were mismatched, $t\ (254) = 10.21$, $p < .05$. In fact, the participants gave higher ratings for the congruent music than for the incongruent music (both for mismatched melodies and mismatched lyrics) for every single emotion, all *p*s $< .05$. Thus, in all cases, both melodies and lyrics appeared to be contributing to the elicited emotion.

Furthermore, the ratings were higher when melodies were congruent with respect to the emotion of interest and lyrics were mismatched than when lyrics were congruent with respect to the emotion of interest and melodies were mismatched, $t\ (254) = 6.83$, $p < .05$. Thus, the melodies, rather than the lyrics, emerged as the more dominant component in eliciting the intended emotion conveyed by the excerpt. It is of course possible that again the melodies that were selected just happened to be intrinsically more effective at conveying emotion than the lyrics; however, this time because different melodies were paired with different lyrics for different participants, the asymmetry in the mismatches is more likely to be real and not just an artifact.

There was no main effect of gender, $F\ (1,\ 30) = 1.08$, $MSE = 10.68$, $p > .10$, and no interactions between congruency and gender, $F\ (2,\ 60) = 1.22$,

MSE = 2.76, $p > .10$, or between intended emotion and gender, $F(3, 90) = 1.96$, *MSE* = 3.53, $p > .10$. Thus, as in Experiment 1, there were no gender effects and women and men gave similar ratings in all cases.

There was a main effect for type of intended emotion, $F(3, 90) = 7.14$, *MSE* = 3.53, $p < .001$. Post-hoc comparisons showed that the participants gave higher ratings for happy and sad excerpts than for angry excerpts, *t*s (190) = 3.51, 4.59, respectively, both *p*s < .05, but not for calm excerpts, both *p*s > .10. These results differ from those in Experiment 1 in that the differentiation was not between positive and negative emotions. Because in Experiment 1 the intended emotion was always defined by both lyrics and melodies, we also examined only the conditions when the melodies and lyrics were congruent, but still there was no main effect for type of emotion, $F(3, 90) = 1.37$, *MSE* = 3.18, $p > .10$. Given that the main purpose of Experiment 2 was to explore the effects of melody and lyric mismatches, there were very few instances of the control condition of congruent lyrics and melodies and the lack of such a main effect is perhaps not surprising.

There was also an interaction between emotion and congruency, $F(6, 180) = 3.83$, *MSE* = 1.68, $p < .01$. As illustrated in Table 2, the participants rated the excerpts in the congruent condition higher than the excerpts in the mismatched condition for the negative emotions (sad and angry), both *p*s < .05, but only when the melodies were congruent and the lyrics were mismatched with respect to the intended emotion. However, the participants rated the excerpts in the congruent condition higher than the excerpts in the mismatched condition for each of the emotions separately, all *p*s < .05, but only when the lyrics were congruent and the melodies were mismatched with respect to the intended emotion. Thus, when melodies were congruent and lyrics mismatched, the effect was closer to that elicited by entirely congruent music, demonstrating once again that the melodies were indeed the dominant element. The participants also rated the excerpts with congruent melodies and mismatched lyrics as being more intense than the excerpts with congruent lyrics and mismatched melodies for happy, calm and angry emotions (all *p*s < .05).

Thus far, all of the mismatched emotions have been combined in the analyses. For example, for lyrics mismatched with respect to 'happy' (the intended emotion), the ratings of happy melodies paired with sad, calm and angry lyrics were examined without discriminating between these types of lyrics. Similarly, for melodies mismatched with respect to 'happy' (the intended emotion), the ratings of happy lyrics paired with sad, calm, and angry melodies were examined without discriminating between these types of melodies. However, the differences, if any, between the *specific* mismatched emotions for the lyrics (e.g. between happy melodies paired with sad lyrics and happy melodies paired with calm lyrics or with angry lyrics) as well as for the melodies (e.g. between happy lyrics paired with sad melodies and happy lyrics paired with calm melodies or with angry melodies) were also of

interest. To see if the dominance of the melody mattered more or less depending on the specific emotion conveyed by the lyrics, first we examined the differences between the intensity of emotional responses when the melodies were congruent with the intended emotion and the lyrics were mismatched. There emerged no interactions between the particular intended emotion of the melody and the emotion of the lyrics, F (6, 180) = 1.99, MSE = 4.22, $p > .10$, which suggests that what type of mismatched lyrics the critical melodies were paired with did not matter.

The reverse did show an interaction, however, F (6, 180) = 6.03, MSE = 3.86, $p < .001$. The type of melody the lyrics were paired with did matter. In particular, sad lyrics led to more intense emotions when paired with happy melodies than with calm melodies, t (62) = 6.69, $p < .05$. Similarly, calm lyrics led to more intense emotions when paired with sad melodies than with angry melodies, t (62) = 4.50, $p < .05$. It is plausible that the participants easily confused 'sad' and 'calm' lyrics, perhaps because both emotions are characterized by having low arousal properties by the circumplex theory (e.g. Russell et al., 1981). Thus, it appears that although the type of lyrics does not influence the melodies, at least some melodies are important in modulating the emotions elicited by some of the lyrics. These results are also consistent with the observation that the melodies tend to dominate over the lyrics in conveying emotion.

In addition, up to this point, only the *intended* emotion ratings given by the participants have been examined. For example, if the intended emotion was happy, only the 'happy' ratings of happy melodies paired with happy lyrics, the 'happy' ratings of happy melodies paired with sad lyrics, and the 'happy' ratings of sad melodies paired with happy lyrics were looked at. However, in the case of this particular example for instance, it would have made just as much sense, in both of the mismatched conditions, to look at the participants' 'sad' ratings too. Thus, it was of interest to compare the intended emotion ratings, which were congruent with respect to the melody and/or the lyrics, with the 'other' ratings that were congruent with respect to the mismatched emotion. These comparisons would in fact determine more directly if the participants were indeed attending to the melody part of the excerpt more than the lyric part, and thus provide more evidence as to whether the melodies dominate over the lyrics in eliciting emotion. Scheffé multiple comparisons demonstrated that the participants rated the emotion elicited by (1) the happy melodies paired with sad lyrics as more intense on the 'happy' scale than on the 'sad' scale; (2) the sad melodies paired with happy lyrics as more intense on the 'sad' scale than on the 'happy' scale; (3) the happy melodies paired with calm lyrics as more intense on the 'happy' scale than on the 'calm' scale; (4) the calm melodies paired with happy lyrics as more intense on the 'calm' scale than on the 'happy' scale; (5) the happy melodies paired with angry lyrics as more intense on the 'happy' scale than on the 'angry' scale; 6) the sad melodies paired with angry lyrics as more

intense on the 'sad' scale than on the 'angry' scale; and (7) the calm melodies paired with angry lyrics as more intense on the 'calm' scale than on the 'angry' scale, all *p*s < .05. Other comparisons did not reach statistical significance. In addition, for all of the mismatched music, participants gave higher ratings on the scales that were emotionally congruent with the melodies than for the lyrics, all *p*s < .05. Thus, in general, these comparisons also support the previous observations that the emotion of the melody dominates over the emotion of the lyrics. When conflicting emotions are presented, the ratings congruent with respect to the melodies tend to be higher than the ratings congruent with respect to the lyrics.

Experiments 3 and 4

In the following two experiments, we explored whether affective responses to music generalize to pictures of common objects paired with the music simply by association, or whether they remain solely linked to the musical excerpt. In addition, we wanted to see, in case of a transfer of emotionality to these pictures, whether it was the lyrics or the melodies that were more influential in creating such a transfer. Even though in Experiment 2 the melodies appeared to dominate over the lyrics, when the targets of the ratings were pictures of objects, easily described in words, perhaps the lyrics would gain in importance. Thus, in Experiment 3, the melodies and lyrics were congruent with respect to emotion as in Experiment 1, and, in Experiment 4, the melodies and lyrics were sometimes congruent and sometimes incongruent as in Experiment 2.

METHOD

Participants

The participants were 72 students at American University. Of those, 36 participated in Experiment 3 and 36 participated in Experiment 4. Participants took part in Experiment 3 for extra credit in psychology courses, and in Experiment 4 either for extra credit in psychology courses or for a chance to win $100. None had participated in any of the previous experiments.

Materials, design, and procedure

The methods of Experiments 3 and 4 were similar to those of Experiments 1 and 2, respectively, except that the participants viewed pictures of common objects while listening to the musical excerpts. The pictures were taken from the Peabody Picture Vocabulary Test – Revised (Form L; Dunn and Dunn, 1981) and the Boston Naming Test – Second Edition (Kaplan et al., 2001). Thus, in Experiment 3, the participants viewed 48 pictures, 16 pictures with musical excerpts containing emotionally congruent melody and lyrics (four of each emotion), 16 pictures with musical excerpts without lyrics (again,

four of each emotion), and 16 pictures with no music. In Experiment 4, the only difference was that when the pictures were paired with music with lyrics, the melodies and lyrics were not always emotionally congruent. In fact, as in Experiment 2, four melodies had emotionally congruent lyrics and 12 melodies had emotionally incongruent lyrics. In both experiments, the 'no music' condition served as a baseline for the affective responses to the pictures of the common objects themselves.

In Experiment 3, across 12 groups of participants, the pictures were counterbalanced so that each one appeared equally often with music with lyrics sung by the male vocalist, music with lyrics sung by the female vocalist, music without lyrics, and no music. It should be noted that because no effects in Experiments 1 and 2 were observed, gender was not of interest here; however, to remain faithful to the design of Experiment 1, the gender of the vocalist was also counterbalanced. The pictures were presented to the participants randomly with respect to the presence or absence of music, the emotional content of the music, the presence or absence of lyrics, and the gender of the vocalist. In Experiment 4, across 12 groups of participants, the pictures were counterbalanced so that each one appeared equally often with music with emotionally congruent lyrics, music with emotionally incongruent lyrics, music with no lyrics, and no music.

As in the previous experiments, the participants were asked to rate their affective reactions on all four emotions, but this time the reactions were to be to each of the pictures rather than to the music. The music would be there merely as background.

RESULTS AND DISCUSSION

Experiment 3

The differences between the intensity of emotional responses as a function of the music condition (i.e. pictures paired with melodies and lyrics, pictures paired with only melodies, and pictures paired with no music), and the type of emotion were examined. The pictures paired with no music were evaluated using only the directly corresponding congruent emotion ratings. Thus, for example, the 'happy' ratings for pictures paired with no music were compared only with the 'happy' ratings for pictures paired with happy melodies and lyrics and the 'happy' ratings for pictures paired with only happy melodies. Table 3 summarizes the results.

The 3 × 4 ANOVA showed a main effect for the music condition, $F(2, 68) = 25.22$, $MSE = 1.03$, $p < .001$. Overall, the presence of music in the background affected the ratings of the pictures of common objects. Both pictures paired with melodies and lyrics as well as pictures paired with only melodies were rated higher than pictures paired with no music, $ts(286) = 4.07$ and 2.72, respectively, both $ps < .05$.

Because the ratings from the pictures with no music condition were included in this general ANOVA, the effects of type of emotion on the

TABLE 3 *Experiment 3: Mean intensity ratings (1–9) of emotional responses to pictures as a function of the type of emotion and the lyric condition of the music*

	Lyric condition			
Emotion	Pictures paired with music with lyrics	Pictures paired with music with no lyrics	Pictures paired with no music	Overall
Happy	5.26	5.64	4.69	5.19
Sad	3.63	3.74	2.57	3.31
Calm	4.61	5.74	4.99	5.11
Angry	3.29	2.95	2.19	2.81
Overall	4.20	4.52	3.61	4.11

picture–music pairs or any interactions could not be examined. Thus, a separate analysis was performed, where the differences between the intensity of the emotional responses as a function of the music condition involving only the pictures paired with melodies (with or without lyrics) were examined. This 2 × 4 ANOVA showed a main effect for the type of emotion, $F(3, 102) = 37.53$, $MSE = 2.20$, $p < .001$. Post-hoc comparisons showed that the participants gave higher ratings to the pictures paired with happy music than to those paired with sad and angry music, ts $(142) = 6.37$ and 8.19, respectively, ps $< .05$, and there were no differences between pictures paired with happy and calm music, $t(142) = 1.07$, $p > .05$. Pictures paired with calm music were also given higher ratings than those paired with sad and angry music, ts $(142) = 5.44, 7.29$, respectively, ps $< .05$. It appears that participants rated pictures paired with music that conveyed positive emotions higher in emotional content than pictures paired with music that conveyed negative emotions. Thus, the findings from Experiment 1, where positive emotions were rated to be more intense than negative emotions, remained the same through transference to pictures of objects, as well.

There was no main effect for the music condition, $F(1, 34) = 3.23$, $MSE = 0.93$, $p > .10$, but there was an interaction between the music condition and the type of emotion, $F(3, 102) = 4.92$, $MSE = 1.15$, $p < .01$. Participants rated the pictures paired with calm melodies with no lyrics as more intense in their intended emotion than that elicited by the pictures paired with the same melodies with lyrics, $t(70) = 3.34$, $p < .01$. The ratings for the pictures presented with happy, sad, and angry melodies with no lyrics, however, were not different from the pictures presented with the same melodies with lyrics (all ps $> .10$). These results are somewhat different from those of Experiment 1, where lyrics detracted from the positive emotions and enhanced the negative emotions. Here, the lyrics did not detract from the 'happy' music component of the positive emotions and the lyrics did not enhance either of the two negative emotions. Thus, one difference between the emotions

conveyed by the music itself and the transference of those emotions to pictures of objects appears to be the further decreased effects of the lyrics.

In addition, the participants gave the pictures paired with music that conveyed positive emotions similar ratings on the 'happy' and 'calm' scales (all *p*s > .05), but both were higher than those on both the 'sad' and 'angry' scales (all *p*s < .05). Likewise, the participants gave the pictures paired with music that conveyed negative emotions similar ratings on the 'sad' and 'angry' scales (all *p*s > .10), but both were higher than those on both the 'happy' and 'calm' scales (all *p*s < .05). Thus, even though the differentiation of the individual emotions observed in Experiment 1 was lost, the valence or polarity effects were still preserved. The presence of the pictures seems to have dampened the specific emotion but preserved the general tenor of the emotion that was conveyed by the music.

Experiment 4

Of interest were the differences between the intensity ratings as a function of type of emotion and the music condition (i.e. pictures paired with congruent melodies and lyrics, pictures paired with music with congruent melodies and mismatched lyrics, and pictures paired with mismatched melodies and congruent lyrics with respect to the intended emotion, as well as pictures paired with no music). Again, the pictures paired with no music were evaluated using only the directly corresponding congruent emotion ratings. Table 4 summarizes the results.

The 4 × 4 ANOVA showed a main effect for the music condition, $F(3, 90) = 13.12$, $MSE = 2.08$, $p < .001$. Overall, the presence of music in the background affected the ratings of the pictures of objects. Post-hoc contrasts showed that the emotion elicited by the pictures paired with congruent

TABLE 4 *Experiment 4: Mean intensity ratings (1–9) of emotional responses to pictures as a function of the type of emotion and the congruency condition (i.e. melody and lyrics emotionally congruent with the intended emotion, melody emotionally congruent with the intended emotion and lyrics mismatched, lyrics emotionally congruent with the intended emotion and melody mismatched)*

	Congruency condition				
Intended emotion	Melody and lyrics congruent	Melody congruent and lyrics mismatched	Lyrics congruent and melody mismatched	No music	Overall
Happy	5.03	5.11	4.54	4.31	4.75
Sad	3.53	3.42	2.86	2.45	3.07
Calm	6.38	5.18	4.40	4.57	5.13
Angry	3.13	3.22	2.57	2.30	2.80
Overall	4.52	4.23	3.59	3.41	3.94

melodies and lyrics was higher than that elicited by pictures with no music, $t\,(254) = 4.09$, $p < .05$, as well as higher than that elicited by emotionally incongruent melodies and lyrics, but only when melodies mismatched, $t\,(254) = 3.29$, $p < .05$, and not when lyrics mismatched, $t\,(254) = 1.00$, $p > .10$. Additionally, the emotion elicited by the pictures paired with congruent melodies and mismatched lyrics was higher than that elicited by mismatched melodies and congruent lyrics, $t\,(254) = 2.84$, $p < .05$. Finally, the emotion elicited by the pictures paired with music when melodies and lyrics were emotionally incongruent was higher than that when there was no music, but only when lyrics mismatched, $t\,(254) = 3.89$, $p < .05$, and not when melodies mismatched, $t\,(254) = 0.90$, $p > .10$. Thus, the findings of Experiment 3 were replicated in that the emotion conveyed by the music did transfer to the pictures, simply through association. In addition, consistent with Experiment 2, the melodies, rather than the lyrics, emerged as the more dominant component in conveying the intended emotion through the transfer, as well.

As in Experiment 3, the pictures in the no music condition were removed and a separate analysis was done to examine the differences between the intensity of the emotional responses as a function of the music condition. The 3 × 4 ANOVA showed a main effect for the type of emotion, $F\,(3, 90) = 32.04$, $MSE = 3.21$, $p < .001$. Overall, the participants gave higher ratings for pictures paired with happy and calm excerpts than those paired with sad and angry excerpts, all ps $< .05$. Incidentally, this effect remained even when just the condition when the pictures were paired with emotionally congruent melodies and lyrics was examined, $F\,(3, 90) = 14.48$, $MSE = 4.21$, $p < .05$. Participants rated the picture-congruent music pairs that conveyed happy and calm emotions higher than the picture-congruent music pairs that conveyed sad and angry emotions, all ps $< .05$. Thus, again, participants gave higher ratings for positive emotions than for negative emotions.

There was a main effect for the music condition, $F\,(2, 60) = 9.90$, $MSE = 2.30$, $p < .001$. Overall, pictures paired with emotionally congruent melodies and lyrics were given higher ratings than those paired with emotionally incongruent melodies and lyrics. This was true when the melodies were mismatched, $t\,(254) = 3.29$, $p < .05$, but not when the lyrics were mismatched, $t\,(254) = 1.00$, $p > .10$. Furthermore, the participants gave higher ratings when melodies were congruent and lyrics were mismatched than when lyrics were congruent and melodies were mismatched, $t\,(254) = 2.84$, $p < .05$, showing once again the melodies to be the more dominant component in influencing conveyed emotion even as transferred to pictures.

In addition, as in Experiment 2, we found that it did not matter what types of lyrics the critical melodies were paired with ($F\,(6, 180) = 0.25$, $MSE = 4.36$, $p > .05$), suggesting that all of the different emotion lyrics had similar influences when paired with emotionally incongruent melodies. Again, the type of melody the critical lyrics were paired with did matter ($F\,(6, 180) = 3.18$, $MSE = 3.24$, $p < .01$). Calm lyrics led to more intense emotions when

paired with happy melodies than with angry melodies, $t\,(62) = 3.88$, $p < .05$, possibly because in the former case both components conveyed positive emotions and the combination had a synergistic effect. In addition, we did not replicate the finding where sad lyrics led to more intense emotions when paired with happy melodies than with calm melodies, and where calm lyrics led to more intense emotions when paired with sad melodies than with angry melodies, both *p*s > .05. Perhaps the pictures prevented the possible confusion between 'sad' and 'calm' lyrics that had emerged in Experiment 2, possibly due to the low arousal properties of both.

When the differences between the ratings when melodies were congruent and the lyrics were mismatched, but still congruent with respect to the polarity of emotion, or mismatched on both counts were examined, the 4 × 2 ANOVA did not show any interaction between the particular intended emotion of the melody and the emotion of the lyrics, $F\,(3, 90) = 0.88$, $MSE = 3.18$, $p > .05$. Thus, when there was a mismatch, whether the lyrics conveyed positive or negative emotions was unimportant in influencing the intended emotion conveyed by the melody. However, whether the melodies conveyed positive or negative emotions was in fact important in influencing the intended emotion conveyed by the lyrics, $F\,(3, 90) = 4.15$, $MSE = 2.63$, $p < .05$, again suggesting the dominance of melodies over the lyrics.

As in Experiment 2, we also compared the intended emotion ratings, which were congruent with respect to the melody and/or the lyrics that the pictures were paired with, with the 'other' ratings, which were congruent with respect to the mismatched emotion. Scheffé multiple comparisons demonstrated that the participants rated the emotion elicited by the pictures paired with the music with (1) happy melodies and sad lyrics as more intense on the 'happy' scale than on the 'sad' scale; (2) happy melodies and angry lyrics as more intense on the 'happy' scale than on the 'angry' scale; and (3) calm melodies and angry lyrics as more intense on the 'calm' scale than on the 'angry' scale, all *p*s < .05. In addition, for all of the pictures paired with mismatched music, the participants gave higher ratings on the scales that were emotionally congruent with the melodies than for the lyrics. Thus, in general, these comparisons support the previous observations that the emotion of the melody dominates over the emotion of the lyrics even in transference to pictures easily described in words.

Discussion

This study explored whether lyrics and melodies of songs were equal partners in their effectiveness in conveying emotions, and how they affected each other. Although intuitively one might have predicted that lyrics conveying the same emotion as the melodies would enhance the overall emotion, we found that this happened only for negative emotions. Lyrics indeed bolstered the emotion conveyed by sad or angry music. However, unexpectedly, lyrics

detracted from the emotion elicited by happy or calm music, that is, positive emotions. Thus, it appears that lyrics can indeed influence the overall emotional valence of music, allowing music to more easily convey negative emotions when they are present, and allowing music to more easily convey positive emotions when they are absent. There were no gender differences in any of the findings.

Melodies and lyrics might be processed as independent components at the perceptual level (e.g. Bonnel et al., 2001). In addition, even if they form a Gestalt at a more cognitive level (e.g. Serafine et al., 1984), the two components may not contribute equally to this Gestalt. Thus, we examined whether the melody and the lyrics contributed differentially to conveying emotion in songs. We used songs in which the melodies and the lyrics in some of the excerpts were not emotionally congruent and found that it was the melodies, rather than the lyrics, that emerged as the more dominant component in eliciting emotion for all four of the emotions that were examined. This finding was consistent with that of Sousou (1997), which showed that the melody of a song had a greater ability to affect mood than the lyrics, rather than the opposite finding shown by Stratton and Zalanowski (1994). When conflicting emotions were presented, the ratings congruent with respect to the melodies tended to be higher than the ratings congruent with respect to the lyrics.

We also explored whether or not affective responses to music generalized to emotionally neutral stimuli paired with the music simply by association, or whether they remained solely linked to the musical excerpt. This issue would perhaps be of interest in the areas of advertising and marketing. For instance, calm background music has been found to enhance salespersons' persuasive efforts (Chebat et al., 2000) as well as buyers' cognitive activity and attention (Chebat et al., 2001). This study found that the presence of the music had an impact on individual stimuli as well. In fact, even the more detailed findings from the first two experiments, where positive emotions were rated to be more intense than negative emotions and melodies tended to dominate over the lyrics, remained the same through transference, although the finding that lyrics detracted from happy and calm music, but bolstered sad and angry music, were somewhat dampened.

In all of the experiments, the participants rated the music that conveyed positive emotions higher than the music that conveyed negative emotions. It is possible that by chance the melodies and lyrics selected to convey the positive emotions were intrinsically more effective at eliciting the positive emotions than those selected to convey the negative emotions. However, these results are consistent with those of Balkwill and Thompson (1999), who found that there was a tendency for the participants to rate their intensity of 'joy' and 'peace' to be higher than that of 'anger'. Balkwill and Thompson (1999) also found that 'sadness' was rated to be as intense as 'joy' and 'peace'. Perhaps their participants have confused 'sad' with 'calm', as

both emotions are characterized by having low arousal properties by the circumplex theory (e.g. Russell et al., 1981).

In sum, we found that lyrics detracted from emotional responses to happy and calm music (positive emotions), but enhanced emotional responses to sad and angry music (negative emotions). The melody of music was more dominant than the lyrics in eliciting emotional responses. And these effects, for the large part, remained the same through transference to pictures of objects.

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REFERENCES

Anderson, C.A., Carnagey, N.L. and Eubanks, J. (2003) 'Exposure to Violent Media: The Effects of Songs with Violent Lyrics on Aggressive Thoughts and Feelings', *Journal of Personality and Social Psychology* 84: 960–71.

Arnett, J. (1991) 'Heavy Metal Music and Reckless Behavior among Adolescents', *Journal of Youth and Adolescents* 20: 573–92.

Balkwill, L.L. and Thompson, W.F. (1999) 'A Cross-cultural Investigation of the Perception of Emotion in Music: Psychophysical and Cultural Cues', *Music Perception* 17: 43–64.

Ballard, M.E. and Coates, S. (1995) 'The Immediate Effects of Homicidal, Suicidal, and Nonviolent Heavy Metal and Rap Songs on the Moods of College Students', *Youth and Society* 27: 148–68.

Behrens, G.A. and Green, S. (1993) 'The Ability to Identify Emotional Content of Solo Improvisations Performed Vocally and on Three Different Instruments', *Psychology of Music* 21: 20–33.

Bella, S.D., Peretz, I., Rousseau, L. and Gosselin, N. (2001) 'A Developmental Study of the Affective Value of Tempo and Mode in Music', *Cognition* 80: B1–B10.

Besson, M., Faieta, F., Peretz, I., Bonnel, A.M. and Requin, J. (1998) 'Singing in the Brain: Independence of Lyrics and Tunes', *Psychological Science* 9: 494–8.

Bonnel, A.M., Faita, F., Peretz, I. and Besson, M. (2001) 'Divided Attention between Lyrics and Tunes of Operatic Songs: Evidence for Independent Processing', *Perception and Psychophysics* 63: 1201–13.

Brebner, J. (2003) 'Gender and Emotions', *Personality and Individual Differences* 34: 387–94.

Bruner, G.C. (1990) 'Music, Mood and Marketing', *Journal of Marketing* 54: 94–105.

Burt, M.R. (1980) 'Cultural Myths and Supports for Rape', *Journal of Personality and Social Psychology* 3: 217–30.

Chebat, J.C., Chebat, C.G. and Vaillant, D. (2001) 'Environmental Background Music and In-store Selling', *Journal of Business Research* 54: 115–23.

Chebat, J.C., Vaillant, D. and Chebat, C.G. (2000) 'Does Background Music in a Store Enhance Salespersons' Persuasiveness?', *Perceptual and Motor Skills* 91: 405–24.

Coffman, D.D., Gfeller, K. and Eckert, M. (1995) 'Effect of Textual Setting, Training, and Gender on Emotional Response to Verbal and Musical Information', *Psychomusicology* 14: 117–36.
Cohen, A.J. (2001) 'Music as a Source of Emotion in Film', in P.N. Juslin and J.A. Sloboda (eds) *Music and Emotion: Theory and Research*, pp. 249–72. Oxford: Oxford University Press.
Cooke, D. (1959) *The Language of Music*. London: Oxford University Press.
Crowder, R.G., Serafine, M.L. and Repp, B. (1990) 'Physical Interaction and Association by Contiguity in Memory for the Words and Melodies of Songs', *Memory and Cognition* 18: 469–76.
Davidson, R.J. (1995) 'Cerebral Asymmetry, Emotion, and Affective Style', in R.J. Davidson, and K. Hugdahl (eds) *Brain Asymmetry* (pp. 361–87). Boston, MA: MIT Press.
Dunn, L.M. and Dunn, L.M. (1981) *Peabody Picture Vocabulary Test-Revised (Form L)*. Circle Pines, MN: American Guidance Service.
Gabrielsson, A. and Juslin, P.N. (1996) 'Emotional Expression in Music Performance: Between the Performer's Intention and the Listener's Experience', *Psychology of Music* 24: 68–91.
Gagnon, L. and Peretz, I. (2000) 'Laterality Effects in Processing Tonal and Atonal Melodies with Affective and Nonaffective Task Instructions', *Brain and Cognition* 43: 206–324.
Galizio, M. and Hendrick, C. (1972) 'Effects of Musical Accompaniment on Attitude: The Guitar as a Prop for Persuasion', *Journal of Applied Social Psychology* 2: 350–9.
Gerardi, G.M. and Gerken, L. (1995) 'The Development of Affective Responses to Modality and Melodic Contour', *Music Perception* 12: 279–90.
Gfeller, K. and Coffman, D.D. (1991) 'An Investigation of Emotional Response of Trained Musicians to Verbal and Music Information', *Psychomusicology* 10: 31–48.
Haack, P.A. (1980) 'The Behavior of Music Listeners', in D. Hodges (ed.) *Handbook of Music Psychology* (pp. 141–82). Lawrence, KS: National Association for Music Therapy.
Hansen, C. and Hansen, R. (1990) 'Rock Music Videos and Antisocial Behavior', *Basic and Applied Social Psychology* 11: 357–69.
Harris, C.S., Bradley, R.J. and Titus, S.K. (1992) 'A Comparison of the Effects of Hard Rock and Easy Listening on the Frequency of Observed Inappropriate Behaviors: Control of Environmental Antecedents in a Large Public Area', *Journal of Music Therapy* 29: 6–17.
Heilman K.M. (1997) 'The Neurobiology of Emotional Experience', *Journal of Neuropsychiatry and Clinical Neurosciences* 9: 439–48.
Hevner, K. (1935) 'Expression in Music: A Discussion of Experimental Studies and Theories', *Psychological Review* 42: 186–204.
Hevner, K. (1936) 'Experimental Studies of the Elements of Expression in Music', *American Journal of Psychology* 48: 246–68.
Iverson, J., Reed, H. and Revlin, R. (1989) 'The Effect of Music on the Personal Relevance of Lyrics', *Psychology* 26: 15–22.
Juslin, P.N. (2000) 'Cue Utilization in Communication of Emotion in Music Performance: Relating Performance to Perception', *Journal of Experimental Psychology: Human Perception and Performance* 26: 1797–813.
Juslin, P.N. and Sloboda, J.A. (2001) 'Music and Emotion: Introduction', in P.N. Juslin and J.A. Sloboda (eds) *Music and Emotion: Theory and Research*, pp. 3–19. Oxford: Oxford University Press.

Kaplan, E., Goodglass H. and Weintraub S. (2001) *Boston Naming Test – Second Edition*. Philadelphia, PA: Lippincott Williams and Wilkins.
Maguire, E.R. and Snipes, J.B. (1994) 'Reassessing the Link between Country Music and Suicide', *Social Forces* 72: 1239–43.
North, A.C. and Hargreaves, D.J. (1997) 'Liking, Arousal Potential, and the Emotions Expressed by Music', *Scandinavian Journal of Psychology* 38: 45–53.
Peretti, P.O. (1975) 'Changes in Galvanic Skin Response as Affected by Musical Selection, Sex and Academic Discipline', *The Journal of Psychology* 89: 183–7.
Peretz, I. and Hébert, S. (2000) 'Toward a Biological Account of Music Experience', *Brain and Cognition* 42: 131–4.
Pfister, H.R., Böhm, G. (1992) 'The Function of Concrete Emotions in Rational Decision Making', *Acta Psychologia* 80: 199–211.
Rigg, M.G. (1964) 'The Mood Effects of Music: A Comparison of Data from Earlier Investigations', *Journal of Psychology* 58: 427–38.
Ritossa, D.A. and Rickard, N.S. (2004) 'The Relative Utility of "pleasantness" and "Liking" Dimensions in Predicting the Emotions Expressed by Music', *Psychology of Music* 32: 5–22.
Russell, J.A., Ward, L.M. and Pratt, G. (1981) 'Affective Qualities Attributed to Environments: A Factor Analytic Study', *Environment and Behaviour* 13: 259–88.
Samson, S. and Zatorre, R.J. (1991) 'Recognition Memory for Text and Melody of Songs after Unilateral Temporal Lobe Lesion: Evidence for Dual Encoding', *Journal of Experimental Psychology: Learning, Memory, and Cognition* 17: 793–804.
Serafine, M.L., Crowder, R.G. and Repp, B.H. (1984) 'Integration of Melody and Text in Memory for Songs', *Cognition* 16: 285–303.
Serafine, M.L., Davidson, J., Crowder, R.G. and Repp, B.H. (1986) 'On the Nature of Melody-text Integration in Memory for Songs', *Journal of Memory and Language* 25: 123–35.
Sousou, S.D. (1997) 'Effects of Melody and Lyrics on Mood and Memory', *Perceptual and Motor Skills* 85: 31–40.
Stratton, V.N. and Zalanowski, A.H. (1994) 'Affective Impact of Music vs. Lyrics', *Empirical Studies of the Arts* 12: 173–84.
Terwogt, M. and van Grinsven, F. (1991) 'Musical Expression of Moodstates', *Psychology of Music* 19: 99–109.
Thompson, W.F. and Robitaille, B. (1992) 'Can Composers Express Emotions through Music?' *Empirical Studies of the Arts* 10: 79–89.
Vitz, P.C. (1966) 'Affect as a Function of Stimulus Variation', *Journal of Experimental Psychology* 71: 74–9.
Wanamaker, C.E. and Reznikoff, M. (1989) 'Effects of Aggressive and Nonaggressive Rock Songs on Projective and Structured Tests', *Journal of Psychology* 123: 561–70.

Appendix: Materials used in the experiments

ORIGINAL SOURCE RECORDINGS FOR THE MUSICAL EXCERPTS (MELODIES)

Happy

- 'When it's Sleepy Time Down South' – Louis Armstrong
- 'Big Time Operator' – Big Bad Voodoo Daddy
- String Quartet 12 in F Major, Op. 96: No. 3 ('American') – Dvorak

- *Songs without Words*, Op. 102, No. 5 in A major ('The Joyous Peasant') – Mendelssohn
- Violin Concerto No. 2 in D Major, KV211: 3 – Mozart
- Violin Concerto No. 3 in G Major, K216: 3 – Mozart
- 'Ti-Pi Ti-Pi Tin' – Preservation Hall Jazz Band
- 'Go to the Mardi Gras' – Preservation Hall Jazz Band

Sad

- 'The Wind' – Chet Baker
- 'You Don't Know What Love Is' – Chet Baker
- 'Sleep Tight' – Big Bad Voodoo Daddy
- 'Summer Night' – Miles Davis
- *Songs without Words*, Op. 102, No. 4 in G minor – Mendelssohn
- Piano Concerto No. 23 in A, K488: 2 – Mozart
- Cello Sonata, D. 821 'Arpeggione' in A – Schubert
- Symphony No. 5 in E Minor, Op. 64: No. 1 – Tchaikovsky

Calm

- 'Blue in Green' – Miles Davis
- *Songs without Words*, Op. 30, No. 1 in E flat major – Mendelssohn
- *Songs without Words*, Op. 67, No. 3 in B flat major – Mendelssohn
- *Songs without Words*, Op. 85, No. 1 in F Major – Mendelssohn
- Violin Concerto No. 4 in D Major, KV218: 2 – Mozart
- 'Three Candles' – Richard Schönherz and Peter Scott
- 'Theme from Grace/Lament' – George Winston
- 'Young Man's Fancy' – George Winston

Angry

- *Symphonie fantastique*, Op. 14, No. 4 ('Marche au Supplice') – Berlioz
- 'Petits Machins' – Miles Davis
- 'The Time of the Barracudas' – Miles Davis
- 'Finally Home' – Jerry Goldsmith
- 'The Hunt Builds' – Wojciech Kilar
- *Pictures at an Exhibition* ('The Hut on Fowl's Legs (Baba Yaga)') – Mussorgsky
- 'High-Wire Stunts' – John Williams
- 'The Droid Invasion and the Appearance of Darth Maul' – John Williams

SONGS FROM WHICH THE LYRICS WERE ADAPTED

Happy

- 'Unconditional Love' – Victoria Beckham
- 'Be Your Friend' – Judy Gershorn and David Gershorn
- 'Paradise' – Kaci
- 'Here Comes Summer' – Jerry Keller

Sad

- 'I Miss You' – Darren Hayes
- 'Cold Day in July' – Dixie Chicks
- 'Am I Blue' – George Straight
- 'I'm Missing You' – Meja

Calm

- 'Dream Fairy' – Unknown
- 'Cradle Song' – Unknown
- 'Sleep' – Tom Polman and Kathy Norwine
- 'Dreams Come True' – Westlife

Angry

- 'No More Miss Nice' – Ashley Ballard
- 'Double Dare' – Bauhaus
- 'Forward to Death' – Dead Kennedys
- 'Touch of Evil' – Warlock

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