Journal of Music Therapy, XLVI (1), 2009, 15–31

The Effect of Background Music and Song Texts on the Emotional Understanding of Children with Autism

June Katagiri, MM, MT-BC

The Florida State University

The purpose of this study was to examine the effect of background music and song texts to teach emotional understanding to children with autism. Participants were 12 students (mean age 11.5 years) with a primary diagnosis of autism who were attending schools in Japan. Each participant was taught four emotions to decode and encode: happiness, sadness, anger, and fear by the counterbalanced treatment-order. The treatment consisted of the four conditions: (a) no contact control (NCC)—no purposeful teaching of the selected emotion, (b) contact control (CC)—teaching the selected emotion using verbal instructions alone, (c) background music (BM)—teaching the selected emotion by verbal instructions with background music representing the emotion, and singing songs (SS)—teaching the selected emotion by singing specially composed songs about the emotion. Participants were given a pretest and a posttest and received 8 individual sessions between these tests. The results indicated that all participants improved significantly in their understanding of the four selected emotions. Background music was significantly more effective than the other three conditions in improving participants' emotional understanding. The findings suggest that background music can be an effective tool to increase emotional understanding in children with autism, which is crucial to their social interactions.

Emotional understanding involves the ability to recognize others' emotions and express one's emotions, using situational

This study was conducted in partial fulfillment of the requirements for the Master of Music in Music Therapy at The Florida State University. The author would like to thank Dr. Alice-Ann Darrow for her continual guidance and support throughout the process.

and expressive cues (Saarni, 1999). Children with autism have impairments in multiple nonverbal behaviors related to emotional understanding. Children with autism do not display emotions in an appropriate manner, and consequently, social interactions are likely to be limited. Meanwhile, children with autism often fail to recognize the nonverbal behaviors displayed by others; hence, they often lack the interest and skills needed to respond effectively to others' social or emotional behaviors (McGee & Morrier, 2003). As a result of difficulties in social and emotional understanding, children with autism are caught in a vicious circle of social isolation (Bauminger, 2002).

Researchers have found that children with autism have specific impairments in the perception and production of bodily emotional expressions (Hobson, 1986; Snow, Hertzig, & Shapiro, 1987). Hobson asserted that the perceptual difficulties of children with autism are specifically related to reading others' faces. Neurological studies have recently confirmed abnormal facial emotion processing in specific parts of the brain of individuals with autism such as in the fusiform gyrus for face and body recognition and in the amygdala for recognition of multiple negative basic emotions (Adolphs & Tranel, 2004; Wang, Dapretto, Hariri, Sigman, & Bookheimer, 2004). Children with autism also show deficits in determining the appropriate timing and use of expression (McGee & Morrier, 2003; Snow et al., 1987). Bieberich and Morgan (1998) suggested that self-regulation may be one missing mechanism underlying these deficient skills in children with autism. Although social and emotional understanding normally develops spontaneously in childhood, children with autism need direct instruction to learn it.

A number of researchers have found that emotions can be taught and that social and emotional understanding can be improved as an outcome of training (Bauminger, 2002; Golan & Baron-Cohen, 2006; Hadwin, Baron-Cohen, Howlin, & Hill, 1996). Because the face is central in both the expression and communication of emotion, most of the studies have focused on the face to examine emotional understanding in children with autism (Ekman & Friesen, 1971). Hadwin et al. (1996) demonstrated approaches to teaching emotional recognition to children with autism using facial photographs, facial schematic drawings, and cartoons. Gena, Couloura, and Kymissis (2005) taught

contextually appropriate emotional expressions to preschool children with autism using live and video modeling. Moreover, a wide range of techniques including computer-interventions has been developed for teaching emotional understanding (Golan & Baron-Cohen, 2006; Silver & Oakes, 2001). These results have shown positive effect on improving emotional understanding in children with autism.

Specific strategies can encourage children with autism to improve and generalize their emotional understanding (Attwood, 2000; Howlin, Baron-Cohen, & Hadwin, 1999; McConnell, 2002; Silver & Oakes, 2001). Since children with autism have difficulties in dealing with change, naturalistic settings such as classrooms and homes—with peers and adults as interactive partners, are advised for practicing new social skills. Predictable procedures are more helpful than novel ones because they result in less confusion for the child with autism. Repetition is another important factor in working with children who have autism. Teaching interventions usually involve feedback and repetition—which allows the child to predict what will happen. Howlin et al. (1999) emphasized making learning enjoyable by using multiple interventions. Music can be one intervention to enhance emotional understanding in children with autism.

Music can elicit emotions in the listener (Sloboda, 1991). Research has shown that the basic emotions of happiness, sadness, fear, and anger in music are communicated quite consistently to listeners (Hevner, 1936; Juslin, 2000; Rigg, 1964). Musical cues that facilitate emotional responses are embedded in music's tempo, sound level, timing, intonation, articulation, timbre, vibrato, tone attacks, tone decays, and pauses (Juslin, 2000). Research indicates that children with autism demonstrate unusual sensitivity and attention to music (Brownell, 2002; Thaut, 1987). As early as 1976, Purvis and Samet found that music could be a highly effective means for developing the social-emotional skills of children with autism. They provided music experiences to develop emotional understanding of children with autism through listening, playing, singing, moving, creating, and verbalizing.

A number of studies provide supports for the use of background music and song texts with children who have autism. The effect of background music on the moods, emotions, and

behaviors of both individuals and groups has been noted (Hallam, Price, & Katsarou, 2002). Ziv and Goshen (2006) found that children who heard a story with happy or sad music succeeded in understanding the emotional context of the story. Heaton, Hermelin, and Pring (1999) found that the children with autism could recognize emotional expression in music as well as children without autism. It appears from these studies (Heaton et al., 1999; Ziv & Goshen, 2006) that emotional background music can be used to enhance emotions and to develop emotional understanding in children with autism.

Concerning song texts, Blackstock (1978) found the study showed that children with autism prefer sung versions of songs rather than spoken versions. One of the recommended strategies for improving social skills is the use of visually illustrating "social stories" (Attwood, 2000). "Social stories" are written providing significant social cues and appropriate responses associated with a particular social situation. The "social stories" are used for modifying problematic behaviors of children with autism (Gray, 1998). Brownell (2002) adapted "social stories" to songs and successfully modified target behaviors of children with autism. The researcher suggested that the musical adaptation is effective and that the spontaneous recall of musical information is the most important benefit of musically adapting "social stories." Pasiali (2004) also investigated the effect of prescriptive therapeutic songs on prompting social skills acquisition in children with autism. The results indicated that prescriptive therapeutic songs also conveyed pertinent information regarding a social situation and appropriate responses. Pasiali suggested that children with autism tend to follow directions imbedded in song lyrics. These studies (Brownell, 2002; Pasiali, 2004) indicated that singing of song texts on emotions can help participants with autism remember some of the complicated "rules" of social and emotional interactions.

These studies support the possibilities for employing background music and song texts in teaching emotional understanding to children with autism. The present study employs the use of background music to interpret emotions and the use of song texts to enhance emotional understanding in children with autism. Specific research questions were:

TABLE 1
Counterbalanced Treatment-Order for Each Group

	Happiness	Sadness	Anger	Fear
Group 1	CC	BM	SS	NCC
Group 2	BM	NCC	CC	SS
Group 3	SS	CC	NCC	BM
Group 4	NCC	SS	BM	CC

1. Which of the four conditions (NCC, CC, BM, and SS) is the most effective in improving participants' understanding of the four selected emotions?
2. The understanding of which emotion (happiness, sadness, anger, and fear) will be most improved by the intervention conditions?
3. Which receptive or expressive skill of emotional understanding will be most improved by the intervention conditions?
   (1) Recognition of emotions from facial photographs
   (2) Recognition of emotions from schematic drawings
   (3) Identification of emotions in contextual situations from pictures
   (4) Expression of emotions

Method

Participants

Participants were 12 students with a primary diagnosis of autism who were attending schools in a northern city of Osaka Prefecture, Japan. Criteria for participation were that children be within the ages of 9 and 15, and have difficulty in decoding and encoding nonverbal expressions of emotion. Participants were recruited from a weekly community activity that involved parents of children with autism. For the purpose of counterbalancing the treatment order, participants were randomly assigned to one of four groups. The counterbalanced treatment order for each group appears in Table 1.

Procedures

All groups were taught four emotions: happiness, sadness, anger, and fear in one of the four treatment-order groups found

in Table 1. The two treatment and two control conditions were: (a) NCC—no contact control, (b) CC—contact control, (c) BM—background music, and (d) SS—singing songs. Sessions were individual and were held during or after school in a room at school or at home which were natural settings for participants (McConnell, 2002). Participants were given a pretest on the first day and a posttest on the last day of the study. They received eight individual 30-minute sessions two times a week between the pre- and posttests. All teaching sessions began with an introduction period, treatment interventions following the counterbalanced order in Table 1, and a closing period. The introduction period and the closing period consisted of an opening song and a closing song with live vocals and guitar accompaniment to orientate the participant to the structure of the session. In order to reinforce the child's attempts to cooperate, verbal praise and encouragement were given throughout the sessions, and at the end of the session, a sticker was given as a reward for completion of the session. Once errors were made, the child was immediately prompted with the correct response in order to avoid continued mistakes or misunderstanding (Howlin et al., 1999).

Description of Control Conditions

No contact control condition (NCC). Emotions assigned to this condition were not purposefully taught to participants through any specific intervention.

Contact Control Condition (CC). Emotions were taught using the verbal instructions and teaching procedures found in *Teaching Children with Autism to Mind-Read* by Howlin, Baron-Cohen, and Hadwin (1999). The verbal instructions and teaching procedures were designed to teach emotional understanding to children with autism.

Description of Treatment Conditions

Musical condition (BM). Background music was improvised on the piano and recorded by four pianists skilled at improvisation. Improvisations were structured to reference the four specified emotions. Musical cues were taken from Juslin (2000), in which each emotion was associated with a specified tempo, sound level, frequency spectrum, articulation (legato-staccato) and articulation variability. Music recordings representing the four emotions

were matched to the corresponding emotion with 100% reliability by a panel of four judges. The recordings of the improvised music were played as background music during the verbal instruction for each emotion. The volume of the background music was adjusted for each participant by asking if it could be heard, and if it interfered with the verbal instruction.

Musical condition (SS). Songs were used to teach the selected emotions. Song lyrics were matched to the scenario of the text and set to melodies composed by the researcher. Japanese children's songs designed to teach emotions were also used. Songs were sung interactively between the child and the therapist.

Description of Dependent Variables

The *dependent variables* for this study were decoding and encoding assessments of the four emotions: happiness, sadness, anger, and fear. Participants were given a pretest and a posttest to assess their skills in decoding and encoding a set of facial expressions of these four emotions. The pre- and posttests consisted of four subtests: (a) recognition of facial expression from a set of photographs, (b) recognition of facial expression from a set of schematic drawings, (c) identification of situation-based emotions suggested in a set of pictures, and (d) facial expression of emotions by the participants. The first three subtests were based upon developmental skills for decoding emotions, with subtest one being the simplest level, and subtest three being the most complex. Each subtest consisted of three different sets of tasks. For each subtest, participants were required to demonstrate a satisfactory understanding of the concept being tested. This task involved identifying each emotion correctly three times. Photographs used in the study were selected from Matsumoto and Ekman's *Japanese and Caucasian Facial Expressions of Emotion* (JACFEE), which demonstrated high reliability and validity worldwide in identifying the emotions portrayed in the photos (Biehl et al., 1997). Schematic drawings were drawn by a Japanese painter referring to the text, *Teaching Children with Autism to Mind-Read* (Howlin et al., 1999). Pictures were taken from the same text. Subtest four was designed to assess participants' emotional encoding skills. To measure participants' expressive skills, a picture was taken of participants facially encoding each of the specified emotions. The researcher and three reliability observers

matched the four pictures to the four emotions. The criterion set for a response to be considered correct was .75. All responses were recorded as correct or incorrect.

Results

Data Analyses for Research Question 1

Which of the four conditions (NCC, CC, BM, and SS) is the most effective in improving participants' understanding of the four selected emotions?

Data indicate that all conditions resulted in participant gains from pre- to posttest. The four emotions and conditions were counterbalanced across participants; therefore, participants learned three out of the four emotions during the treatment period. Through the process of elimination, they were able to decode the remaining emotion; therefore, explaining why the no contact control condition was still effective. However, in subtest four—which evaluated participants' ability to *encode* a specified emotion, participants could not use the process elimination, and therefore subtest four showed a gain score of zero.

Paired t tests were used to determine if pre- to posttest gains were significant for each of the four conditions. Results of the paired t tests revealed that all four conditions resulted in participants' making significant gains from pre- to posttest; therefore, indicating that the four conditions were equally effective in improving participants' understanding of the four emotions. Because repeated measurements were made on the same participants, a Repeated Measures Analysis of Variance was used to determine if any one condition was significantly more effective than the other conditions. The repeated measures analysis revealed that none of the four conditions was significantly more effective than the others in improving participants' understanding of the four emotions, $F = 2.09$, $df = 3$, $p = .13$. Though not typically used with such data, an Analysis of Covariance (ANCOVA), using pretest scores as a covariate, was also computed to take into account participants' pretest scores. When taking into account where participants' were at the pretest, the ANCOVA revealed that the background music condition was the most effective, followed by the song texts condition, and the conversational condition. These analyses are shown in Table 2.

TABLE 2
ANCOVA Summary Four Condition

	F	*df*	*p*
NCC	1.04	3, 8	.43
CC	1.21	3, 8	.37
BM	8.28	3, 8	.01*
SS	2.28	3, 8	.16

* Indicates a significant difference, $p < .05$.

Data Analyses for Research Question 2

The understanding of which emotion (happiness, sadness, anger, and fear) will be most improved by the intervention conditions?

Results of the paired *t* tests revealed that participants' understanding of the four emotions was significantly improved from pre- to posttest; therefore, indicating that the understanding of all four emotions was improved by the intervention conditions. The repeated measures analysis revealed that there was a significant difference in understanding among the four emotions ($F = 4.72$, $df = 3$, $p = .01$). A follow up test revealed no significant difference in understanding for fear, anger, and sadness, but a significant difference between the understanding of happiness and these three emotions (see Table 3). Pre- and posttest scores were highest for happiness, resulting in the lowest gain score for happiness. These data indicate that understanding of happiness was the least affected by the intervention conditions due to high pretest scores. Understanding of sadness, anger, and fear was significantly more improved by the intervention conditions than the understanding of happiness, and the understanding of anger was most improved under the background music condition.

TABLE 3
Post Hoc Follow up Test to ANOVA of Emotion Gain Scores

Emotions	Happiness	Sadness	Anger	Fear
	.75	1.50	1.67	1.75

Note. Underline indicates no significant difference, $p < .05$.

TABLE 4
Post Hoc Follow up Test to ANOVA of Subtest Gain Scores

Subtest	Subtest 1	Subtest 2	Subtest 3	Subtest 4
	1.67	1.25	1.75	1.00

Note. Underline indicates no significant difference, $p < .05$.

Data Analyses for Research Question 3

Which receptive or expressive skill of emotional understanding will be most improved by the intervention conditions?

Results of the paired t tests revealed that all four subtests resulted in participants' making significant gains from pre- to posttest; therefore, indicating that all receptive and expressive skills of emotional understanding were significantly improved by the intervention conditions. The repeated measures analysis revealed that there was a significant difference among the four subtests ($F = 9.90$, $df = 3$, $p = .00$). A follow up test revealed no significant difference between subtests 1 and 3 and between subtests 2 and 4, but a significant difference between these two pairs of subtests (see Table 4).

Subtests for decoding skills (subtests 1–3) are developmental—with subtest one being the simplest and subtest three being the most complex. Subtest three—which evaluated participants' ability to decode a specified emotion in a contextual situation, was the most improved by the intervention conditions. Participants' decoding skill for the emotion "fear" was the most improved by the intervention conditions. Concerning encoding skills, subtest four—which measured participants' encoding skills, had the lowest gain score, indicating that participants' encoding skills were the least improved by the intervention conditions. The encoding skill for the emotion "happiness" was least affected among the four emotions by the intervention conditions because the pretest scores were higher than for any of the other emotions.

Discussion

The purpose of this study was to determine the effectiveness of background music and song texts on emotional understanding of children with autism. Results revealed that all participants

improved significantly in their understanding of the four selected emotions. Results of the present study are consistent with those of Hadwin et al. (1996) who examined whether it is possible to teach emotional understanding to children with autism using verbal instructions. In their study and the present study, participants significantly improved in their abilities to decode the four selected emotions through simple tasks and moving on to more complex tasks, and by generalizing from practice tasks to novel situations. Results of the present study also corroborate those of Gena et al. (2005) who taught emotional expressions to children with autism using modeling, reinforcement and prompting. In the present study, participants improved their encoding skills of emotions by imitating the therapist's facial expressions of emotion, as well as photographs and schematic drawings of facial expressions, while being prompted for appropriate expressions and provided verbal praise and stickers as rewards. These findings suggest that decoding and encoding skills of emotions can be taught to children with autism by instructional interventions and systematic rewards.

Consistent with the writing of Thaut (1999), children with autism in the present study responded positively to music, therefore, treatment conditions using background music and song texts were more effective than the two control conditions that used no music. These results corroborate the findings of previous research that also revealed background music and song texts were effective interventions to enhance emotional understanding and behaviors of children with autism (Brownell, 2002; Heaton et al., 1999; Pasiali, 2004). As in the Boone and Cunningham study (2001), the background music intervention in the present study resulted in participants' significant improvement in decoding and encoding emotions. These results indicate that participants were able to perceive emotions expressed in the music. In addition, the song texts conveyed information about emotions (Brownell, 2002; Pasiali, 2004) and may have improved participants' emotional understanding (Wimpory, Chadwick, & Nash, 1995). According to parents' reports, participants also found the two musical conditions to be more enjoyable than the contact control condition that used verbal instruction alone. These findings suggest that music can be a vital tool to teach emotional understanding to children with autism.

Regarding the second research question, participants' understanding of the emotions of sadness, fear, and anger improved significantly more than their understanding of happiness, primarily because participants already had shown a greater understanding of happiness at the time of the pretest. This finding corroborates previous research that revealed happy faces are more accurately recognizable than any other facial expressions (Castelli, 2005; Ekman & Friesen, 1971). Neurological studies have also indicated that individuals with amygdala damage, such as those with autism, are impaired in the recognition of negative emotions, though not positive emotions such as happiness (Adolphs & Tranel, 2004; Ashwin, Chapman, & Baron-Cohen, 2006). Ashwin et al. (2006) suggested that individuals with amygdala damage can improve their abilities to decode negative emotions by simply telling them to look at individual's eyes. Children with autism in the present study often confused sadness with anger and fear; it may be because research has shown that the ability to recognize happiness and sadness emerges at an earlier age than the ability to recognize the difference between two negative emotions such as anger and fear (Nawrot, 2003). Participants' mothers in this study reported that their children had seldom or never observed anger and fear, but they had observed individuals displaying happiness and sadness in their daily lives— thus supporting Rutherford and McIntosh (2007) premise that individuals with autism may be more sensitive and responsive to naturally occurring emotions. Cultural influences on display rules may also have attributed to the findings of the present study. Japanese belong to a collective culture that promotes harmony, cohesion, cooperation, and conformity between the self and others. Persons in such collective cultures suppress negative emotions toward in-group members because the display of such emotions will upset the harmony of the group (Matsumoto, 1991). Mothers of the participants in the present study appeared to avoid displaying negative emotions toward their children; therefore, the children might have lacked real experiences with negative emotions.

Participants' understanding of anger was most improved under the background music condition. Musical cues of the "angry" background music—fast tempo and high frequency energy (Juslin, 2000), seemed to have an impact on the participants

and to assist in their understanding of anger. Participants' understanding of fear was also more improved under the musical conditions than under the verbal instruction condition, even though anger and fear are both more difficult emotions to recognize and to express than happiness and sadness (Boone & Cunningham, 2001). These findings suggest that music can help children with autism develop understanding of emotions that are typically difficult to decode and encode.

Results of the third research question revealed that participants' decoding skills were more improved by the intervention conditions than their encoding skills. This finding corresponds with other studies that indicate that children perform better on decoding than encoding tasks (Boyatzis & Satyaprasad, 1994). Children's abilities to read nonverbal behaviors, such as facial expressions, appear to develop faster than their abilities to perform such expressions. Moreover, Gena et al. (2005) suggested that adjusting one's facial expression to match social demands is more difficult for children with autism than appropriately adjusting their verbal responses. In the present study, participants' abilities to encode facial expressions showed the least improvement. Among the decoding tasks in the present study, the task to decode a specified emotion in a contextual situation was the most complex (Hadwin et al., 1996) and the most improved. Participants' scores on the task were low in the pre-test; hence, increasing the probability that participants' ability to decode a specified emotion in a contextual situation would show the greatest improvement.

There are several factors that may have influenced the results of the present study. The sample size, participants' diverse ages and verbal abilities, and the time frame for treatment are all factors that may have contributed to the findings of the present study. The sample size for this study was limited to 12 participants; therefore, each counterbalanced treatment order group had only 3 participants. In order to balance age and gender representation, participants were assigned to specific treatment order groups. However, participants were not screened on the basis of their verbal abilities, and previous studies indicate that a verbal ability of 5 years of age is required for emotional understanding (Happe, 1995; Howlin et al., 1999). This lack of information on participants' verbal abilities may have influenced their acquisition

of emotional understanding. Furthermore, the time frame for the present study may have been appropriate for some participants, but too long for others. One participant had 100% correct and 8 participants had 80% correct on the posttest.

Finally, there were no assessment data to indicate that participants were able to generalize their understanding of emotions to new or real life situations. The participants were able to transfer their learning to novel materials presented within structurally similar tasks as evidenced by their posttest scores; however, no assessment data revealed whether they employed their learning to social interactions in the real world. During and after treatment, some parents verbally reported that their children often sang the song texts. One child used appropriate emotional verbal expressions and drew a schematic face, like one used for the present study, in a conversation between the child and the mother. Without specific data, however, the question still remains as to whether participants' were able to generalize their learning to social interactions in their daily lives. Participants may have learned strategies or rules to pass the posttest tasks rather than acquiring real understanding of the emotional concepts (Hadwin et al., 1996).

To confirm the effect of background music and song texts to teach emotional understanding to children with autism, the background music and the song text interventions should be examined using both experimental and control groups. In the present study, participants served as their own control. Participants in future research should also be screened on the basis of their age and verbal abilities (Happe, 1995; Howlin et al., 1999). In addition, an assessment should be administered after treatment in order to evaluate participants' ability to generalize emotional understanding to new situations. Such an assessment may evaluate children's receptive and expressive emotional skills by observing their behaviors in natural settings, or by questioning their parents and teachers as to their behaviors in daily social interactions. Since research has shown that children's nonverbal skills correlate significantly with peer popularity (Boyatzis & Satyaprasad, 1994), it may be helpful to include participants' peers in future treatment conditions. In addition, Howlin (2005) emphasized that early intensive behavioral interventions in natural environments, and ones that move from simple to more complex tasks are the most effective with children who have autism.

Emotional understanding in children with autism is crucial to their social interactions with others (Hobson 1993). The music interventions in the present study utilizing song texts and background music were effective in improving participants' abilities to decode and encode emotions. Music has been shown to be a vital tool for children with autism to increase their attention to tasks, to convey important information, and to make a more enjoyable learning environment (Buday, 1995). Future music therapy research with children who have autism should include their generalization of emotional receptive and expressive skills to daily life. The role of music therapy in teaching emotional understanding to children with autism has not yet been fully explored.

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