

## Original Article

# Group Music Intervention Reduces Aggression and Improves Self-esteem in Children with Highly Aggressive Behavior: A Pilot Controlled Trial

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We investigated the effects of group music intervention on aggression and self-esteem in children with highly aggressive behavior. Forty-eight children were allocated to either a music intervention group or an untreated control group. The music intervention group received 50 min of music intervention twice weekly for 15 consecutive weeks. The outcome measures were Child Behavior Checklist Aggression Problems Scale (Parents), Child Aggression Assessment Inventory (Teachers) and Rosenberg Self-esteem Scale. After 15 weeks, the music intervention group showed significant reduction of aggression and improvement of self-esteem compared with the control group. All outcome measures were significantly lower in the music intervention group than prior to treatment, while there was no change in the control group. These findings suggest that music can reduce aggressive behavior and improve self-esteem in children with highly aggressive behavior. Music intervention is an easily accessible therapy for children and as such may be an effective intervention for aggressive behavior. Further more, objective and replicable measures are required from a randomized controlled trial with a larger sample size and active comparable control.

**Keywords:** Aggression – child – music intervention – self-esteem

## Introduction

In the past several decades, child aggression in school has become a major concern since self-reported aggressive and violent behavior continues to rise among children (1). Aggressive behavior may be associated with poorer psychosocial health and a greater number of adjustment problems among children (1). Aggressive behavior may present a potential threat to psychosocial development in youth (1). This is particularly important since aggressive children are more likely to display antisocial and violent

behavior at a later age. Controlling aggressive behavior should be a part of children's emotional socialization in both families and school (1).

Treatments for aggression include behavioral techniques aimed at reducing impulsive behavior, such as anger management techniques, drama therapy, music therapy, art therapy and dance therapy (2). Music therapy is one of option for controlling aggression. Studies in adults have found that music provides opportunities for enhancing a sense of control over emotions, especially aggression and anger, through emotional catharsis (3–5).

Music therapy can be defined as the controlled use of music and its influence on the human being to aid in physiological, psychological and emotional integration of the individual during the treatment of an illness or disease (6). It also benefits healthy individuals. Active

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and passive music therapy can be distinguished (7). In active music therapy, the therapist and patient are actively involved in playing music using instruments and voice. Passive music therapy is conducted with the patient at rest. The therapist plays calming music and invites the patient to visualize peaceful images with the aim of producing a state of mental relaxation (7). Generally music therapies are applied as combined forms of active and passive music therapy.

Several previous trials and reviews have determined that music therapy is beneficial for pain control (8–12), reducing anxiety (13–15), stress (4,16), anger and agitation (17) and improving mood states (18). It is used as psychotherapy under certain conditions and in various populations (19–22). Meta-analysis reported that music therapy are an effective intervention for children and adolescents with psychopathology (23) and applicable across a wide variety of educational/therapeutic endeavors (24). Based on these findings, it is reasonable to assume that music intervention may reduce children's aggression by enabling good psychological health; however, no studies have been conducted on the effect of music intervention on aggression control in children. The present study clinically assesses the effects of music intervention on aggression and self-esteem in children with highly aggressive behavior.

## Methods

### Participants

Children were recruited from a social welfare center's after-school program (not aimed at treatment but for just normal care system) and from a primary school in South Korea, advertising a 15-week music intervention program. A total of 153 families were approached and in 120 of these, the parents/caregivers accepted the invitation. We screened about 120 children, whose parents or caregivers agreed to participate, and tested with the Korean version of the Child Behavior Checklist (K-CBCL) (25). Children were eligible to participate in the program if (i) their score of K-CBCL was above 60T; (ii) they were able to understand the content of questionnaires and experimental schedules and (iii) their ages were between 10 and 12 years.

A total of 157 families were approached and in 120 of these, the parents/caregivers accepted the invitation. Of these 120, 62 met the inclusion criteria. Of these 62, 1 refrained from participating and 13 were not offered participation since the planned number of study subjects, 48, had already been reached. All the children completed the program with no dropouts from either the music intervention or control groups, so both pre- and post-test data for the 15-week study were available.

Subjects and their parents or caregivers were informed about the music intervention program when we explained the nature of aggressiveness and the study procedures. The study received approval from the Institutional Review Board of the University Hospital before we approached the subjects, who all provided written informed consent. No adverse effects occurred during the experiment.

### Outcome Measures

#### *Child Behavior Checklist Aggression Problems Scale (Parents)*

The Child Behavior Checklist (CBCL) is a parent questionnaire for assessing problems in 6–18-year-olds (26). The aggression section of the CBCL used in the present study contains 20 items on aggression problems during the past 6 months. The response scale is: 0, not true; 1, somewhat or sometimes true; 2, very true or often true. Syndrome scores are derived by summing the item responses for each problem. Good reliability and validity of the CBCL Aggression Problems Scale were confirmed for the Korean translation (25). In the present study's sample, Cronbach's  $\alpha$  were .86 (parents) for the CBCL Aggression Problems Scale.

#### *Child Aggression Assessment Inventory (Teachers)*

The Child Aggression Assessment Inventory (CAAI) was used to measure children's level of aggression as perceived by teachers (27). The CAAI is a 12-item questionnaire that has been modified for Korea. It assesses the current level of aggressiveness over the past week, and has been shown to possess good internal consistency ( $\alpha = .95$  in the present study). Teachers indicate their level of endorsement of each item on a five-point scale ranging from 'rarely or none of the time (<1 day)' to 'all of the time (5–7 days)'.

#### *Self-esteem*

The individual level of self-esteem was measured using the Rosenberg Self-esteem Scale (RSES) (28). The RSES consists of 10 statements dealing with a person's general beliefs about him/herself. Each item is answered on a four-point scale, from 'strongly agree' to 'strongly disagree', with five items being reverse scored so that a higher score indicates higher self-esteem. The RSES was originally validated in a large sample of high school students (28), and has since been used for adults in psychiatric care and the general population (29), and has been shown to exhibit high reliability: test-retest correlations are typically in the range of 0.82–0.88 and Cronbach's  $\alpha$  for various samples range from 0.77 to 0.88 (29). In the present study the Cronbach's  $\alpha$  was 0.77.

### Music Intervention Program

Music intervention includes singing songs, analysis of libretto, making musical instrument, playing instruments such as pianos and hand bells, song drawing and song writing. The intervention was performed using the same method a total of 30 times by three certified professional music therapists (one of them has worked as a therapist for 10 years and others for 2 years).

The music intervention comprised four phases. In the first, the program focused on building rapport. The second phase aimed at accepting and understanding emotions. During the third phase, the catharsis phase, children express their inner anger by playing a percussion instrument. This helps them to become more relaxed, regulates excessive activity and reduces catharsis negative emotions. In the fourth and last phase, they accept their changed status and support themselves. This program was developed with three certified professional music therapists based on previous clinical application (over 8 years) of group music intervention for children.

Children in the music intervention group attended two group music classes per week, led by a certified music therapist, for 15 weeks. Children in the control group received no treatment, and did not participate in any structured therapeutic programs during the study period. Control children were contacted by researchers each week by telephone to confirm they were not taking part in any other exercise activities and to provide impetus to keep them engaged in the study. Control group subjects who were interested in music intervention were provided with a complementary music intervention program after the study was completed.

### Statistical Analysis

The results were statistically analyzed using Systat windows (ver 3.5). All data satisfied normality tests, which were conducted via the Kolmogorov–Smirnov test. The data were not normally distributed and results are presented as median and interquartile range (IRQs). All outcomes were compared using non-parametric Mann–Whitney *U*-test between two groups and Wilcoxon signed rank tests across treatment time for each group. Unpaired *t*-tests and  $\chi^2$  were used to evaluate statistical differences in the demographic data and to compare differences between the control and music groups.

## Results

### No Differences in Baseline Homogeneity Between Two Groups

The demographic characteristics of the subjects are listed in Table 1. The groups did not differ significantly in age, sex, or intelligence. All subjects completed the study,

with no dropouts or withdrawal and so the data from all participants were available for analysis.

### Music Intervention Reduced Aggression

Table 2 lists the medians and IRQs of the Korean Child Behavior Checklist (K-CBCL) aggression scores, child aggression scores from teachers and self-esteem scores in the music intervention and control groups, both prior to and following treatment. The pretreatment K-CBCL aggression scores from parents and child aggression scores from teachers did not differ between the two groups, and both scores were reduced in both groups (music intervention and control,  $P < 0.001$ ) following treatment compared with pretreatment. A non-parametric Mann–Whitney *U*-test revealed that the K-CBCL aggression scores differed significantly between the groups at post-treatment in both K-CBCL and child aggression scores ( $P < 0.001$ ).

### Music Intervention Improved Self-esteem

The pretreatment self-esteem score did not differ significantly between the groups, and was reduced in the music intervention group, while there was no change in

**Table 1.** Demographic characteristics of subjects

	Music intervention ( <i>n</i> = 24)	Control ( <i>n</i> = 24)	<i>t</i> or $\chi^2$	<i>P</i>
Age (years, mean $\pm$ SD)	11.0 $\pm$ 0.83	11.0 $\pm$ 0.83	0	0.99
Gender (M/F)	12/12	12/12	0.08	0.78
Intelligence quotient (IQ) <sup>a</sup> (mean $\pm$ SD)	114.0 $\pm$ 1.08.9	114.8 $\pm$ 8.0	−0.34	0.73

<sup>a</sup>Information of IQ were received from the participants' school under permission of those of parents/caregivers.

**Table 2.** Changes in aggression and self-esteem scores by music intervention in children with high aggressive behavior

	Pretreatment	Post-treatment
Child Behavior Checklist Aggression Problems Scale (Parents)		
Music intervention	34.0 (32.0–34.5)	17.0 (14.0–22.0) <sup>a,b</sup>
Control	33.0 (31.5–34.0)	30.0 (28.0–33.0) <sup>a</sup>
Child Aggression Scale (Teachers)		
Music intervention	51.0 (48.0–53.0)	36.0 (30.0–39.5) <sup>a,b</sup>
Control	52.0 (50.5–53.0)	49.5 (48.5–51.5) <sup>a</sup>
Self-esteem		
Music intervention	25.0 (24.0–26.0)	29.5 (26.0–31.0) <sup>c,d</sup>
Control	25.0 (24.0–25.5)	25.0 (24.5–26.0)

Values are expressed as median (interquartile range).

<sup>c</sup> $P < 0.005$ ; <sup>a</sup> $P < 0.001$ : Wilcoxon signed rank test compared with pretest; <sup>d</sup> $P < 0.05$ ; <sup>b</sup> $P < 0.001$ : Mann–Whitney *U*-test compared with control.

the control group. There were significant differences following treatment between the two groups ( $P < 0.05$ ).

## Discussion

This preliminary controlled clinical trial was conducted to investigate the effects of music intervention on aggressive behavior in children. Children in the music intervention group showed greater improvement in self-esteem and reduction in aggressiveness after 15 weeks than controls. This result is in line with previous findings that music intervention is beneficial for reducing anxiety and improving mood under different conditions (7,13–15,30). There were also positive effects of music intervention on mild driver aggression (5), stress reduction (4,16) and therapeutic intervention in children and adolescents (19,31).

In this pilot study, we adopted active group music intervention as a treatment for highly aggressive children. We included singing songs, analyses of libretti, playing instruments, such as pianos and hand bells, song drawing and song writing as creative processes. In the program, the use of instruments was structured to involve all the sensory organs: the rhythmic and melodic components of music may be used as specific stimuli to obtain certain motor and emotional responses, thus combining motor movement with stimulation of different sensory pathways, that is, auditory and tactile (multiple sensory stimulation) with well-established emotional quality (7). Active group music intervention may enhance life force through classic biophysiological responses such as movement, relaxation and emotional catharsis, as well as through self-discovery and awareness, and increased self-esteem and pleasure (3).

One could argue that the program's effectiveness may depend on the attention and special characteristics of the therapist or group leader rather than the music intervention itself. Considering that participants in the music intervention group received a great deal of attention over a relatively long period of time, we cannot be completely elucidating the contribution of this to the reduction in aggression.

Assuming that music intervention is a potentially useful treatment option for aggression and self-esteem of children, its possible mechanism of action may be of interest. Possible mechanisms include relaxation effects (16), which may modulate the endocrinal responses and stabilize autonomic nervous systems (32–34). Music intervention also has effects on the brain function resulting in neural network activation, and ultimately leads to activation of different regions of the brain if performed regularly (35). These effects also produce better physical and psychological function, and therefore have beneficial effects on stress responses; reducing

anxiety, improving mood and lessening pain perception (36,37).

This study has several limitations. The research method is the main concern. The self-esteem measure used is one that has been validated with a group of subjects older than those used, and indeed has been largely used with adults. Since the measure is not commonly used for children, it is difficult to know if the change in score on this measure is a meaningful outcome and whether the validity is good. Future studies should consider whether valid outcome measures are related to the study population.

Another limitation is that the absence of attention control or an equivalent treatment control group means that we could not determine whether music intervention was the effective factor in reducing aggression. Along the same line, we cannot separate effects from the method in itself from specific effects of individual characteristics of the therapists. Moreover, since no one (except perhaps the teachers) can be blind to which child is in the intervention arm of the study, there are expectation and social desirability components to the reporting. The subjects and parents have been told that the music intervention may help with aggression, and that those in the control group are less likely to expect that their aggression will improve. Future study should be done with an equivalent treatment control group or at least attention control to estimate an expectation or attention effect and a randomized clinical trial to avoid selection bias with adequate allocation concealment or at least assessor blinding.

In conclusion, our results show that music intervention may reduce aggressive behavior and improve self-esteem in children with highly aggressive tendencies. However, further randomized studies with more objective measures such as hormones related with aggression, larger sample sizes based on appropriate calculation, measurement after multiple sessions and long-term follow-up are needed to verify the effect of music intervention on aggressive child behavior.

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