

THE EFFECTS OF INTERACTIVE MUSIC THERAPY ON HOSPITALIZED CHILDREN WITH CANCER: A PILOT STUDY

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SUMMARY

Background. The use of music therapy with children in health settings has been documented, but its effectiveness has not yet been well established. This pilot study is a preliminary exploration of the effectiveness of interactive music therapy in reducing anxiety and increasing the comfort of hospitalized children with cancer.

Methods. Pre- and post-music therapy measures were obtained from children ($N = 65$) and parents. The measures consisted of children's ratings of mood using schematic faces, parental ratings of the child's play performance, and satisfaction questionnaires completed by parents, children and staff.

Results. There was a significant improvement in children's ratings of their feelings from pre- to post-music therapy. Parents perceived an improved play performance after music therapy in pre-schoolers and adolescents but not in school-aged children. Qualitative analyses of children's and parents' comments suggested a positive impact of music therapy on the child's well-being.

Conclusions. These preliminary findings are encouraging and suggest beneficial effects of interactive music therapy with hospitalized pediatric hematology/oncology patients. In future studies replicating these findings should be conducted in a randomized control trial. Copyright © 2002 John Wiley & Sons, Ltd.

Key Words: music therapy; pediatric hematology/oncology

INTRODUCTION

Since the discovery of the phonograph in the 1800s music has been used in hospitals to promote sleep and aid in surgery and anesthesia (Taylor, 1981). In the early 1900s there was interest in audio analgesia, the use of sound to suppress pain (Gatewood, 1921), but it was not until recently that a resurgence of interest in the use of music in medical settings took place (Burke and Burke, 1995; Maranto, 1991; Spingte and Droh, 1992; Standley, 1986). The use of music therapy with children in health settings was documented in the

1980s (Brodsky, 1989; Fagen, 1982; Froehlich, 1984; Marley, 1984), but its effectiveness has not yet been well established.

Helping children and families cope effectively with the many discomforts inherent with the diagnosis and treatment of a life-threatening disease such as cancer is a major challenge for members of the health care team, particularly during hospitalization. Because of its appeal and potential therapeutic qualities, music therapy is likely to enhance coping and provide physical and emotional comfort.

Live interactive music therapy delivered by a trained music therapist using voice, body language, and facial expression can engage the child in a way that recorded music cannot (Standley and Hanser, 1995). An early comprehensive meta-analysis of 30 music research studies in medical and dental treatment provides some support to

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this contention (Standley, 1986). Live music has been found to be more effective than taped music with cancer patients over 17 years of age (MacGill, 1983). Live music therapy allows for personalized musical expression of feelings and thoughts that may be improvised within the context of the moment. This may be particularly crucial for young children who relate best to songs that can be made relevant to their immediate experience (Stecher, *et al.*, 1972).

The potential benefits of music therapy for children have been illustrated in some descriptive (Marley, 1984) or case studies (Edwards, 1995; Fagen, 1982) with children experiencing painful procedures for burn treatment, children with cancer fearing death, or children experiencing anxiety while in isolation (Brodsky, 1989). In fact, a few empirical studies have been conducted evaluating music therapy. In one study, music therapy was used with children undergoing needle insertions (e.g. intravenous starts, venipunctures, injections, heel sticks), none of whom were cancer patients (Malone, 1996). In another study, anxiety reduction was inferred by measures of salivary IgA after interactive music therapy for sick children, including some oncology patients. (Lane, 1994), but no behavioral outcomes were reported. More recently, 10 hospitalized pediatric oncology patients were found to engage more actively than control patients in their environment after music therapy (Robb, 2000). Although these empirical studies represent positive steps in an effort to build an empirical body of music therapy research, their validity has been limited by a small sample size, poor methodological designs and limited description of the actual music therapy intervention.

This pilot study represents our preliminary attempt to examine the general benefits of music therapy for hospitalized pediatric cancer patients. To this end, we asked the following question: will interactive music therapy reduce anxiety and increase positive mood in hospitalized children with cancer? This question is derived from the previous empirical findings described above and the conceptual model of stress and coping proposed by Varni *et al.* (1989). Based on this model, a chronic or life-threatening illness and factors associated with the illness are considered as stressors that may lead to psychological distress. A similar model was used by Robb (2000) in the study mentioned earlier to assess the effects of music therapy on pediatric hospitalized patients. In the current pilot study, being hospitalized for

cancer treatment is considered a major stressor that may lead to anxiety and discomfort in the child. Symptoms of anxiety and discomfort may vary, depending on a number of factors such as the child's developmental level (Siegel *et al.*, 1991), family and hospital environment (who was with the child at the time), and the child's coping strategies. In this study, the child's developmental level was taken into consideration in designing the music therapy intervention and the effect of the family environment was minimized by allowing the child to participate with or without the family present, depending on the child's choice.

We hypothesized that interactive music therapy may engage a child and elicit positive feelings, which may lead to the reduction of distress (measured by ratings of the child's mood) and increase play activity (measured by the child's play performance). Interactive music therapy was defined as an accredited music therapist being with the child (and family) for at least 15 min, engaging in interactive music experiences that were calming, enjoyable and/or facilitated expression of feelings or concerns leading to health promotion and well being. Through music, the therapist engaged the child in activities that varied depending on the child's age and family environment at the time of the music therapy session.

METHOD

Participants

In order to obtain a broader scope of the use of music therapy we invited every oncology patient admitted in the Hematology–Oncology unit of a large urban teaching hospital unit during a period of 4 months to participate in the study. Although no family that was approached refused music therapy, five of the 70 available families did not complete the evaluation either because parents did not speak English (3) or due to logistic problems (2). There were 33 girls and 32 boys, ranging in age from 6 months to 17 years ($M = 7$ years, $S.D. = 4.8$ years). The wide age range created some methodological challenges. To address developmental differences due to this wide age range, we stratified the sample into three age groups: pre-school age between 0 and 5 years ($n = 33$), school age 6–10 years ($n = 16$), and teenage 11–17 years ($n = 16$). The children were at different stages of their illness

and treatment, that is, newly diagnosed (40%), receiving chemotherapy treatment (25%), palliative care (10%), and other treatment complications (25%). Diagnoses included leukemias ($n=45$) and other malignancies ($n=20$) such as brain tumors, lymphoma, osteogenic sarcoma, Ewing's sarcoma, and neuroblastoma. The potential effect of these variables was examined in preliminary analyses described below.

Design and procedure

The design for the study consisted of pre- and post-intervention evaluation. The same accredited music therapist conducted all the music therapy sessions in the child's room. The child could have a session when she/he was having difficulties with procedures such as access to a central line, taking medication, blood work, lying down following lumbar puncture, or dressing change. Depending on the duration of the child's hospitalization, children received one to three music therapy sessions. The duration of a session ranged from 15 to 45 min. For analysis, the frequency of sessions was grouped by having one or more than one, and the duration of sessions by less than 25 min vs. more than 25 min, based on median distribution of duration. After each session, the therapist recorded the duration of the session, her observations, impressions and whether or not the child was actively involved during the session. These observations were later coded independently by the research assistant to determine the therapist's perception of the child's active or inactive engagement during the music therapy session.

Because the hospital follows a family-centered model of care to minimize psychological distress in sick children, families are encouraged to spend as much time as possible with the hospitalized child. Thus, children who were with a parent at the time of the music therapy session had the option of having a session with or without parent(s) present. At the end of each therapy session the therapist asked parents to complete the PPS and PSQ (see below) at their convenience and to return them to the ward after completion.

Music therapy intervention

Music therapy involved live, interactive and developmentally appropriate music-making with the child (and family) engaged in one or more activities aimed at facilitating expression of feel-

ings, reducing distress and promoting well being. The child/family participated in the choice of the songs and/or instruments used during the sessions. Adolescents and school-age children were engaged typically by camp songs, signing, song writing, instrumental improvisation, and listening to pre-recorded music of their choice. Pre-schoolers and toddlers were engaged typically by animated play songs, rhymes, and playing instruments. Infants and toddlers participated in vocal play, play songs, lullabies, rhymes, and playing instruments. Lullabies often helped infants to sleep or they comforted children who did not feel well enough to participate more actively. Playing and/or singing together was useful in distracting the young children during medical procedures.

Music therapy materials included small percussion instruments (e.g. bells, drums, pentatonic tone bars, shakers), a classical guitar, an Omnichord (electronic autoharp), an electronic keyboard, and songbooks. A small tape recorder was available to record singing and playing. Pre-recorded music was sometimes included, at the patient's request (mainly adolescents), and supplied by patients.

Outcome measures

The outcome measures consisted of (a) children's ratings of their feelings measured by an adaptation of the faces pain scales (Bieri *et al.*, 1990) for children aged 3 years or older; the participating parent completed the faces rating for the child under 3 years of age ($n=5$); (b) parental ratings of the child's play performance using the play-performance scale (Lansky *et al.*, 1987); and (c) satisfaction questionnaires completed by parents, the child (who was over 3 years of age), and staff members who have cared for a participating child.

The faces pain scale (FACES, Bieri *et al.*, 1990) consists of seven drawn schematic faces depicting expressions varying from very happy to very unhappy ones. Its test-retest reliability was 0.79 and content validity was reported to be adequate. To ensure that children aged 3 years or older were able to use the faces to express how they felt (Champion, 1994), we used only 3 faces (faces 1, 4 and 6 of the original faces) with anchor points labeled 'very comfortable' (3) to 'very uncomfortable' (1). Children were asked to point to the face that showed best how they were feeling

twice, once before and once after each music therapy intervention.

The play-performance scale (PPS) (Lansky *et al.*, 1987) consists of 10 global behavioral statements with numerical ratings, describing the child's play and activity ranging from 0 (unresponsive) and 10 (does not play, does not get out of bed) to 90 (minor restrictions in physically strenuous activity) and 100 (fully active, normal). For the pre-intervention, parents chose the statement that best described the child's play during the past week. For the post-intervention, parents were instructed to choose the statement that best described the child following the music therapy session within 24 h. The PPS reliability has been measured with a mother-father correlation ($r=0.71$). Content validity was measured by comparing parental ratings to nurses' ($r=0.75$) and interviewers' ($r=0.91$) ratings. At the end of each therapy session, the therapist asked parents to complete the PPS at their convenience and to return them to the ward after completion.

The Satisfaction Questionnaires were developed by the authors to be completed by children (CSQ, 2 items) and parents (PSQ, 5 items) after a music therapy session, and by staff (SSQ, 6 items) at the end of the study enrolment (4 months). Table 1 presents the items of the questionnaires. For the CSQ, the therapist asked each child two open-ended questions after the session (e.g. 'How did the music make you feel?'); their answers were recorded verbatim. For the PSQ and SSQ we used a Likert scale with ratings from 'not helpful at all'

(1) to 'very helpful' (5) for parents and staff. The last question in each questionnaire asked for their comments. Face validity of the questionnaires was established by asking eight staff nurses and two parents to review the questions for their clarity, meaning, relevance, and acceptability. An agreement among the reviewers was reached by consensus before the questions were used in this study.

RESULTS

Preliminary analysis

Pre-post intervention assessment and child's age were identified a priori as independent variables. The child's gender and diagnosis (leukemia vs other), duration and frequency of sessions, and the child's engagement during the session (active vs passive) were explored as five potential factors that might influence the outcome of the variables (children's ratings of their feelings, FACES, and parents' ratings of the children's play performance, PPS). For the FACES and PPS, separately, we calculated *t*-tests on each of the five variables. Except for level of the child's engagement during the session, which seemed to differentiate PPS scores, none of the other variables showed any significant differences in the FACES or PPS scores. Thus, in subsequent analyses, child's age (pre-schooler, school age, adolescent), level of

Table 1. Music therapy satisfaction survey

Child

1. How did the music make you feel?
2. What else do you want to tell us about the music?

Parent

1. How helpful was the music therapy in providing comfort to your child while in the hospital?
2. How helpful was the music therapy in making your child feel less anxious while in the hospital?
3. Do you feel that the music therapy was helpful in reducing your own anxieties and/or stress?
4. Do you feel that the music therapy was able to provide comfort to you?

Staff

1. Please indicate the approximate number of children in your care who participated in music therapy interventions.
 2. How helpful was the music therapy in providing comfort to children during their hospitalization?
 3. How helpful was the music therapy in reducing children's level of distress/anxiety while in the hospital?
 4. Do you feel that the music therapy was helpful in reducing parents' anxieties and/or stress.
 5. Do you feel that the music therapy was able to provide comfort to parents?
 6. How helpful was the music therapy for you as a caregiver?
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engagement (active vs passive), and time (pre- vs post-music therapy) were used as the factors in three-way ANOVAs for the children's and parents' ratings separately.

To complement the quantitative results and provide a more in-depth meaning of the effects of music therapy on the child and family we conducted a qualitative analysis of children's, parents', and staff's comments. To this end, a research assistant first entered all the comments verbatim into the computer. Subsequently, one of the researchers read the comments and subdivided them into themes (e.g. feelings elicited by music therapy, general comments/suggestions). A second researcher independently read the comments, refined the classification of themes (enjoyment of music, change in mood and comfort and general comments/suggestions), and reduced the data based on the frequency and content of statements. A third reader reviewed the themes for final consensus.

Children's ratings

The three-way ANOVA with the children's FACES scores yielded two significant main effects. There was a significant main effect of time, $F(1,59)=8.11$, $p<0.01$, suggesting a significant improvement in children's feelings from pre- to post-music therapy. The means at pre- and post-therapy were 2.55 (S.D.=0.61) and 2.76 (S.D.=0.35), respectively. There was also a significant main effect of engagement, indicating that the active children had higher scores than the passive children, $F=(1,57)=8.02$, $p<0.01$. The means were 2.77 (S.D.=0.39) for active and 2.29 (S.D.=0.61) for passive. No other significant findings were obtained in this analysis.

Parents' ratings

Analysis of PPS scores using the three-way ANOVA also indicated a significant main effect of engagement, $F(1,57)=9.04$, $p<0.01$. The means were 62.35 (S.D.=22.9) for active and 43.57 (S.D.=26.1) for passive. This finding suggests that children actively involved in music sessions were perceived by parents to have higher play performance scores after music therapy than children who were only passively engaged during music therapy. There was also a significant age by time

interaction $F(2,57)=3.08$, $p<0.05$, suggesting that parents' perception of the child's play performance varied depending on the age of the children. Post-hoc analysis of this interaction suggested that the play performance of adolescents ($p<0.05$) and pre-school children ($p<0.10$) tended to improve after the music therapy session, but that was not the case for the school-age children. The means for the adolescents were 51.25 (S.D.=22.1) at pre- and 53.75 (S.D.=18.6) at post-session, and that for the preschoolers were 60.3 (S.D.=26.6) at pre- and 61.6 (S.D.=29.2) at post-session.

Children's parents' and staff's satisfaction and comments

Table 2 presents the results of the CSQ grouped into three age groups: 0–5 years, 6–10 years, and 11–17 years. Only a few children under the age of 5 years provided comments. Their comments were concrete and focused on the actual instruments, particularly the guitar, which seemed to be the favorite instrument ('I liked the guitar, it was great') for this age group. The comments of children between 6 and 10 years of age focused on the enjoyment of music and feeling good ('I love music so this was a little different from the routine I'm on now', 'I like the silly songs'). The adolescents were more specific in their responses to positive changes in mood and comfort and in wanting to have more therapy sessions ('It helps me relax', 'It made my nausea go away a bit and it all around made me feel better', 'the music made me feel happy').

Parental responses to the questions in the PSQ were generally positive. Sixty four percent of parents reported that music therapy was very helpful in providing comfort to their child; 58% reported that music therapy was very helpful in reducing their child's anxiety; and 49% of the parents reported that it was very helpful in providing comfort to them or in reducing their own anxiety.

Approximately 50% of the parents included comments on the PSQ. These comments are also grouped according to the three age groups and are presented in Table 3. The majority (94%) of the parents who provided comments felt that the ill child benefited from the music therapy session: 'it takes their mind off their disease/treatments', 'seemed to rest easier both during and after', 'helps children and parents feel less anxious'. Some

Table 2. Children's comments*

Themes	Children 0–5 years	Children 6–10 years	Children 11–18 years
Enjoyment of music	'I liked the guitar, it was great' 'Likes best the guitar and the instruments'	'The music was fun.' (3) 'I like playing the guitar (3) and the instruments. Singing is OK.' 'I love music so this was a little different from the routine I'm on now.' 'Like I could be noisy and make my own music' 'I liked the feeling cards, furious and sad kind of music, I liked the silly songs.'	'Good. I like guitar music and songs.'(2) It was enjoyable and I'm glad you came.' 'Fun doing the music' (2) 'It gave me something pleasurable to do.'
Change in mood and comfort	'Fine, happy'	'Music makes me feel happy.' (3) 'The music makes me feel OK (good).' (3) 'Make me feel relaxed, in fact my headache was gone.' 'I seemed to have forgotten how sick I was for a moment.'	'It helps me relax.' (3) 'It takes away the bad things in my life.' 'The music made me feel at peace.' 'It made my nausea go away a bit and it all around made me feel better.' (2) 'It puts me in a good mood.' 'It was very soothing.' 'The music made me feel happy.' (3)
<i>Comments</i>		'She should be here every day.' 'I think I should continue music therapy.' 'I like having choices of things to do with music.' 'I'd like to do this again.'	'More music for teenagers' 'She should be here everyday.' 'I hope that she comes again.' 'I would like to play more and different instruments while in the hospital.' 'It keeps you busy so you don't get bored.'

*The numbers given in parenthesis () indicates no. of children saying it.

parents expressed improvement in their own feelings during music therapy ('we love music, it's good to have something we love here in the hospital'). Only two parents indicated either no effect or that the duration of the music therapy was too short to assess.

Fourteen of the 20 SSQ forms sent were returned. The returned forms were not properly completed by the staff and only a few included written comments. Thirty six percent of the respondents stated that music therapy was very helpful in comforting children during hospitaliza-

tion; 14% stated that music therapy was very helpful in reducing children's anxiety while in hospital; 30% stated that music therapy was very helpful in reducing parents' anxiety; and 25% stated that music therapy was 'very helpful' in either providing comfort to parents or to themselves as caregivers. Staff comments ranged from very positive ('Children and parents look forward to her visit'. 'There is a change in their mood. This is great and we need a full time person across the program not just on this unit'; 'The sessions were excellent. She has such a therapeutic effect on the

Table 3. Parents' comments*

Themes	Children 0–5 years	Children 6–10 years	Children 11–18 years
Enjoyment of music	'Had fun singing, sang for 5 minutes after she left' 'Enjoyed music and songs very much' (2) 'We love music—it's good to have something we love here in the hospital' (2)	'Was nice to be able to listen to music' 'Gave her time to enjoy the things a seven year old should'	'He loves music' (2) 'Appeared to enjoy it quite a bit' (2)
Change in mood and comfort	'She becomes more playful' 'Helped me to see her joy' (2) 'It takes their mind off their disease/treatments' (7) 'Got out some frustrations which is normally expressed by biting' 'Helps child use imagination and vent Feelings' 'Helps our son trust others' 'Distracts from regular routine, more relaxed' (3) 'Relieves stress and fears (2) 'Takes his mind off the pain to some extent' (4) 'Cheerful for the rest of the day' 'Lots of smiles and giggles' 'Child was upset everytime someone came into the room but was happy to sing with therapist' 'After music therapy, my daughter felt happier' (5) 'Music was soothing and settles her down a lot' (4) 'We felt involved in the music—it felt good'	'The soft tones of the music put me to sleep' 'Comforting and distracting—seemed to rest easier both during and after' (5) 'My child could express his anger and frustration through the session' (4) 'Relaxed my son' 'Gives kids a sense of control' 'Son was quite shy and the music/singing helped him not be so shy' 'Parent felt emotional spiritual and hopeful' 'It made my child happy (4) and put him in a very good mood' 'Songs touched parent, relaxed and comforted child'	'Takes his mind off chemo' 'Helps children and parents feel less anxious' (3) 'Music put my child to sleep for a short time' 'Music was soothing to listen to, could express his feelings, helped us parents too' 'Gave him something to do and take interest in' (2) 'More lively during and after sessions' 'Son perked up was smiling, more engaged in conversation' 'Was something we both could participate in and interact with together' 'For the first time since in hospital my son laughed and really seemed to enjoy himself, and took part in the session' (2) 'It was quiet and comfortable in an otherwise noisy and stressful environment'
Comments	'No effect on my child or me' 'Too little time to properly evaluate' 'Please come again' 'I really hope this form of therapy becomes a permanent feature'	'Music is important in everyone's life. Life is normal for a while' 'This has a positive effect on parents and children' 'Gave more attention to music than she would games'	

Table 3. (continued)

Themes	Children 0–5 years	Children 6–10 years	Children 11–18 years
	'Would be more effective with greater continuity in her work' 'Each visit she was more receptive to the music' 'Shows that not everyone in hospital will hurt her' 'Nice to have someone to talk to' 'Felt safe around this person—no pokes'		

*The numbers given in parenthesis () indicates no. of children saying it.

children and families'), to neutral ('I don't understand what she does'), to very negative ('I can't believe that music that I heard, so inappropriate in my opinion'.)

DISCUSSION

The findings of this pilot study, consistent with the previous reports (Lane, 1994; Robb, 2000), support the hypothesis that music therapy may have a positive effect on hospitalized Hematology/Oncology pediatric patients. Children's and adolescents' ratings suggested an improvement in effect, and parent's ratings suggested a general improvement in the child's play activity after music therapy. Parental ratings also indicated a trend in age differences, with increased levels of play activity after music therapy in the younger children and in the adolescents, but not in the school-age children. Younger children have been reported to be at a greater risk of developing emotional and behavioral problems during and following hospitalization, likely due to their limited understanding of illness and medical procedures (Siegal and Conte, 2001). The suggestions that young children are receptive to music therapy and that their mood during hospitalization for cancer treatment seems to improve with this intervention provide reasons for optimism for the care of children with cancer.

The majority of parents' and children's subjective responses and comments were positive. Their responses are likely to reflect their subjective views of the meaning of music therapy and its effect on the well-being of the child. It is difficult to define the actual meaning of music therapy. Music is a rich and complex interplay of identifiable

elements (i.e. pitch, rhythm, harmony, timbre, and dynamics) and a non-verbal, ineffable, spiritual component of music and its meaning is significantly personal and profound. Music therapy interventions have the potential to tap this profundity, but we have yet to find ways to measure it. The qualitative analysis of children's and parents' responses and comments provides the closest measure of the meaning of music therapy. Specifically, the comments suggest that music therapy had a calming and enjoyable effect for many hospitalized children and even some parents. The simple response that 'the music made me happy' under such extreme and unhappy circumstances has importance for the patient and family alike that is beyond words.

Although we found positive responses from parents and children to music therapy, the findings of this pilot study, in and of themselves, do not represent an established evidence of the effectiveness of music therapy with hospitalized pediatric cancer patients. The results of this study are limited for several reasons. The pre-post design does not control empirically the effects of other variables that might have an impact on the outcome variables. The patient group was heterogeneous in terms of diagnosis, and the stage of the disease(s) and treatment(s). And the duration and number of sessions also varied across participants. Although in this study we conducted preliminary tests to control these variables statistically, and age differences were examined as a factor in the study, future studies may consider a more homogeneous sample. Another limitation was that the therapist herself collected the children's comments, which may add bias to the child's responses. Future randomized controlled studies with blind observers are needed to provide a conclusive evidence of

the effectiveness of music therapy for hospitalized pediatric oncology patients following the APA guideline for intervention programs (Chambless and Hollon, 1998).

It was encouraging to find that those children who were rated by the music therapist to actively engage in the music sessions were also perceived by parents as playing more actively after the sessions. The consistency between parents' and therapist's ratings provides concurrent validity to the finding of this study. Moreover, based on the children's own ratings of their mood it appeared that even children who were passively engaged during the music therapy (perhaps because they were too ill to engage actively) experienced an improvement in their mood related to music therapy.

Staff responses and comments were based on low return and incomplete information. The mixed views of staff may reflect the low rate of returns, but it may also reflect the limited preparation the program staff received regarding the role and function of music therapy prior to its introduction into the program. Therefore, staff might not have appreciated the range of music available and could have been caught 'off guard' when they walked into a room and 'unusual' music was being played. But perhaps the greatest difficulty was the timing of staff's completion of the survey. Since this was done at the end of the study, it did not take into consideration when they actually had contact with the children in the study.

Despite these limitations, this preliminary pilot study has several strengths. Data were obtained from several sources (i.e. children, parents, staff and the music therapist) and the findings seemed to be consistent across informants. The study involved a large sample of hospitalized children with cancer, which allowed us to examine age differences. The use of several music therapy activities depending on children's age and clinical needs (writing a song with an adolescent, engaging in music activities during painful procedures with preschool age children), may generate specific hypotheses regarding music therapy activities for different age groups to be tested in future studies. The findings are suggestive of general beneficial effects of interactive music therapy with hospitalized pediatric hematology/oncology patients. The consistency of the qualitative and quantitative findings supports the clinical significance of music therapy with hospitalized children and might encourage other pediatric centers, particularly those treating children with severe chronic and

life-threatening illness, to evaluate and include music therapy as a part of their services.

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