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Wellbeing and hospitalized children: Can music help?

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Abstract

Live music in hospital has been suggested to be effective in helping paediatric patients to relax, and reduce their pain and anxiety. In this study we explored whether it is music per se or the adult attention linked to it that might be beneficial to the children. Thirty-seven paediatric patients with cardiac and/or respiratory problems between the ages of 7 days and 4 years were recruited at Great Ormond Street Hospital for Children, London. Each child participated in three 10-minute sessions: 1) Music; 2) Reading; 3) No interaction. Their physiological responses, i.e., oxygen saturation level and heart rate, and pain assessment were taken before and after each session. A significant decrease in heart rate and pain level were found at the end of the music session. Oxygen saturation level increased significantly only in the younger paediatric patients group, mostly at the end of the no interaction session, and less so at the end of the music session. The music survey showed that parents and hospital staff rated the use of music in hospital positively. We conclude that it is music per se, and not the social component associated with it, that helps to improve paediatric patients' wellbeing.

Keywords

live music, paediatric patients, pain, physiological responses, wellbeing

Being in hospital is a stressful experience for everybody, and particularly for young children (Beherman & Kliegman, 2002). Illness, painful procedures, the unfamiliar environment, and feeling isolated and far from their families may cause young children to feel fear and anxiety, and may make their pain and discomfort even more severe (Brewer & Lucas, 2012). This might affect their responses to hospitalization and medical treatments, and might also have more

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serious long-term negative effects (Lidow, 2002; Porter, Grunau, & Anand, 1999; Wright, 1995; Young, 2005). Even at 6 months, infants show some memory of pain experienced previously, and by 3 years of age they have accurate memories of painful procedures and events (Young, 2005). It is therefore vital to provide children with a positive environment, with appropriate support to help them manage and control pain, to reduce anxiety and to improve their quality of life while in hospital, so as to maximize the beneficial effects of treatment (Cook, 1981).

One way of doing this is to provide them with distractions that can help to break the hospital routine (Preti & Welch, 2004). Music has been suggested as a means of attracting and engaging paediatric patients and of alleviating their stress and discomfort in a non-pharmacological, cost-effective way (Arnon et al., 2006; Kennelly, 2000): it also helps to reduce pain and anxiety through distraction (Klassen, Liang, Tjosvold, Klassen, & Hartling, 2006).

Although several studies have looked at the effects of music on paediatric patients (e.g., Barrera, Rykov, & Doyle, 2002; Hilliard, 2006; Klassen et al., 2008; Standley, 2002), little is known about the effect of music on young paediatric patients with cardiac and respiratory problems. Since they are at more risk of developing emotional and behavioural problems (Porges, Doussard-Roosevelt, Portales, & Greenspan, 1996), their need for a better quality of life while in hospital is extremely important. Music has been found to be effective with patients in coronary care units (see for example, Guzzetta, 1989; Marconato, Munholt, Minim, & Albach, 2001; Updike, 1990), and also to soothe paediatric patients undergoing cardiac catherisation (Micci, 1984).

Music affects listeners not only psychologically and emotionally, but also promotes changes in their cardiovascular activity, and modification of their breathing (e.g., Bernardi, Porta, & Sleight, 2006; Orem & Trotter, 1994; Shea, 1996). Although recorded music is often used with paediatric patients (see, for example, Hatem, Lira, & Mattos, 2006), live music might be more effective, especially when young infants are involved. In fact, live music can be used more flexibly than recorded music, as it can be modified according to the immediate state of the infant, and be made relevant to their experiences (Stecher, McElheny, & Grennwood, 1972). Music also serves a social function (Hargreaves & North, 1997), creating positive experiences and moods, and supporting bonding and a sense of belonging for everybody involved.

It is not only the paediatric patients themselves who have to cope with the discomfort and stress of being in hospital, but also their parents who need support. Parents' high levels of stress and anxiety during medical procedures, and their feeling of powerlessness and inability to relieve their infants from distress can affect the infants' perception of the situation and thereby create an even more intense negative experience (e.g., Fenwick, Barclay, & Schmied, 2001; Hurst, 2001; Oggenfuss, 2001; Scheve, 2002). It is therefore also important to support parents and hospital staff in their caregiving role, and to help them to feel less anxious. This in turn should also help the paediatric patients to feel calmer, to perceive the hospital as more familiar and friendly, and to be more responsive to the medical procedures (Chetta, 1981; Oggenfuss, 2001; Preti & Welch, 2011).

The aim of the current study is to understand the effects of music on preschool children with cardiac and/or respiratory problems. In particular, we want to investigate the social component of the music sessions: to ascertain whether it is the music per se, or the adult attention associated with it that might help to improve their state. Their physiological responses, and perceived levels of pain, will be assessed at the beginning and end of three sessions: 1) Music; 2) Reading; 3) No interaction. It is expected that if music helps to improve their wellbeing, this will be reflected in better physiological responses than in the other (non-music) conditions. In

particular, their heart rate and pain level should decrease, and their oxygen saturation level should increase at the end of the music session. Parents and hospital staff will also be asked to express their views about the music sessions, and in particular to say whether or not they think they are beneficial to the children and to themselves.

Method

Participants

A total of 42 paediatric patients were recruited at Great Ormond Street Hospital for Children, London (GOS). Of these, 37 (26 female, 11 male) completed the cycle of three sessions, and the remaining 5 were discharged from hospital before the end of the cycle. As the children were between the ages of 7 days and 4 years, three groups were formed: 1) < 6 months of age (range: 7–181 days, M = 90.28 days); 2) 6–14 months of age (range: 192–362 days, M = 266.34 days); and 3) > 15 months of age (range: 471–1622 days, M = 959.08 days). All the children had heart and/or lung problems and were constantly monitored with the Pulse Oximeter. Nurses helped to identified the potential participants, and written parental consent was obtained.

Content of intervention sessions

Music session. The songs performed during the music session were mostly those identified in Longhi and Pickett's (2008) study. However, because some of the participants involved in the present study were younger, some more age-appropriate songs were also used. Thus the song repertoire included: "Hush Little Baby," "See Saw Marjorie Daw," "Hush a Bye Baby," "Donkey Riding," "Twinkle Twinkle Little Star," "Five Little Ducks" and "The Little Fish." The playsongs and lullabies were sung and accompanied on the guitar by the researcher who used more lively or quiet songs according to the state of the child.

Reading session. With the help of the play therapist at the hospital, "Oh Dear" by Rod Campbell, and "Where's Spot?" by Eric Hill were identified as the most popular stories for the children.

Equipment

The paediatric patients' physiological measures, i.e., their level of oxygen saturation and heart rate, were measured with a Pulse Oximeter. This is a non-invasive method often used in health settings to monitor the state of patients. The level of oxygen saturation is expressed as a percentage of haemoglobin saturated with oxygen. The patients' heart rate is also displayed and is expressed in beats per minute (bpm).

Paediatric patients' pain level was assessed by means of the Children's Hospital of Eastern Ontario Pain Scale (CHEOPS). This is a well-known and validated behavioural scale used to assess and monitor pain, especially postoperative pain, in young paediatric patients (McGrath et al., 1985). It involves six categories: cry, facial, child verbal, torso, touch and legs, and the scores range between 4 (no pain) and 13 (the worst pain). Nurses assessed the children in the study on each of these six scales.

In order to understand the views of parents and hospital staff about the music session, a music survey was developed. This was inspired by and adapted from the Satisfaction Questionnaires

developed by Barrera and colleagues (2002). It consists of five questions which parents and hospital staff were asked to rate on a 1–5 Likert scale (where 1 = "not at all" and 5 = "very much so"). The first two questions addressed how helpful the music is in providing comfort to the child (Q1), and in reducing their anxiety (Q2). The third and fourth questions address the effects of the music on the parents in reducing their anxiety and/or stress (Q3), and in providing comfort (Q4). The final question asked whether music is helpful for parents and hospital staff as caregivers (Q5).

Procedure

Each child participated in three 10-minute sessions: 1) Music; 2) Reading; 3) No interaction (i.e., a control condition in which the children were not engaged in any social activity). All the sessions took place in the wards, in the patients' bedrooms. They were administered by the same researcher, and the order of the sessions was counterbalanced. Parents were invited to attend the sessions, and, if interested, members of the hospital staff were also invited to attend the music session in particular. The sessions occurred on different days at about the same time as the first appointment.

At the beginning and end of each session the children's pain was assessed with the CHEOPS (Children's Hospital of Eastern Ontario Pain Scale), and their oxygen saturation level (i.e., the amount of oxygen in the arterial blood) and heart rate were read from a Pulse Oximeter. This was a double-blind study in which the measures and the pain assessment were recorded by nurses who did not know the nature of each session, nor whether the physiological measures were taken at the beginning or after the session. At the end of the study, parents and members of the hospital staff who attended one of the music sessions were asked to complete the music survey.

Results

Physiological measures: Oxygen saturation level

A three-way mixed ANOVA was applied to examine the effects of the different sessions on the infants' oxygen saturation (Sp02) levels in relation to two within-subjects factors: *condition* (×3 levels, i.e., music, reading and control session); *before/after* (×2 levels, i.e., measures taken before and after each session); and one between-subject factor: *age* (×3 levels, i.e., < 6 months of age, between 6 and 14 months, and > 15 months of age). There were no significant main effects for any of these three factors. However, there was a significant interaction between condition and age: $F(4, 68) = 3.282$, $p = 0.016$, $\eta_p^2 = .162$, as well as a significant interaction between condition and before/after: $F(2, 68) = 7.285$, $p = .024$, $\eta_p^2 = .104$. No other interactions reached significance. Mean Sp02 levels for age group 1 (youngest) showed an increase of Sp02 level at the end of the session ($M = 95.38$ before, $M = 96.92$ after), but this was not the case for age group 2 ($M = 98.07$ before, $M = 97.6$ after), or for age group 3 ($M = 97.64$ before, and $M = 98$ after). Mean Sp02 level during the Reading condition suggests that infants did not show any significant change in oxygen saturation level at the end of the session across all age groups; group 1 ($M = 97.23$ before, and $M = 97.31$ after), group 2 ($M = 96.29$ before, and $M = 95.64$ after) and group 3 ($M = 97.69$ before, and $M = 97.85$ after). Finally, during the Control condition, i.e., no interaction session, paediatric patients' mean level of Sp02 appeared to change at the end of the 10-minute session. In particular, age group 1 ($M = 96.54$ before, and $M = 97.62$ after) showed an increase in Sp02 level, but group

Table 1. Paediatric patients' physiological and pain level responses before and after each session.

Measures	Session	Before session mean (*SD*)	After session mean (*SD*)
Oxygen saturation (Sp02)			
	Music		
	Group 1	95.38 (5.26)	96.92 (4.16)
	Group 2	98.07 (1.65)	97.60 (2.50)
	Group 3	97.64 (2.27)	98.00 (1.54)
	Reading		
	Group 1	97.23(3.94)	97.31 (4.10)
	Group 2	96.29 (4.13)	95.64 (5.55)
	Group 3	97.69 (3.29)	97.85 (1.96)
	No interaction		
	Group 1	96.54 (5.41)	97.62 (4.95)
	Group 2	97.20 (2.59)	97.87 (2.28)
	Group 3	96.85 (2.63)	96.85 (1.96)
Heart rate			
	Music	134.10 (23.65)	128.67 (23.51)
	Reading	128.12 (23.87)	128.42 (23.71)
	No interaction	125.85 (23.32)	128.02 (23.53)
CHEOPS			
	Music	6.21 (0.98)	5.64 (0.71)
	Reading	6.07 (0.89)	6.10 (1.32)
	No interaction	5.98 (0.99)	5.76 (0.80)

2 ($M = 97.20$ before and $M = 97.87$ after), and group 3 ($M = 96.85$ before and $M = 96.85$ after) did not show any significant difference. Pair-wise comparisons (correlated t tests) were used to explore the paediatric patients' Sp02 levels in relation to condition, and before/after the session. Particular attention was paid to age group 1, as this appears to be the one with the greatest change in Sp02 level. Sp02 change before and after the Music condition revealed a significant difference, $t(12) = -2.132$, $p = .054$, as did that for the Control condition, $t(12) = -2.694$, $p = .020$. Thus the youngest group showed significant variation in Sp02 level at the end of the Music condition, and even more so at the end of the Control condition (see Table 1).

Physiological measures: Heart rate

A three-way mixed ANOVA was applied to examine the effect of the different sessions on the infants' heart rates in relation to two within-groups factors: *condition* (×3 levels, i.e., music, reading and control session); *before/after* (×2 levels, i.e., the physiological measures taken before and after each session); and one between-groups factor: *age* (×3 levels, i.e., < 6months of age, between 6 and 14 months, and > 15 months of age). There were no significant main effects for condition, for before/after, nor for age group. However, there was a significant interaction between condition and before/after: $F(2, 66) = 3.029$, $p = .055$, $\eta_p^2 = .084$. No other interaction reached significance. Mean heart rate level before and after the Music session showed a decrease ($M = 134.10$ before, and $M = 128.67$ after), but there were no significant variations for the Reading sessions ($M = 128.12$ before, and $M = 128.42$ after) or the Control sessions

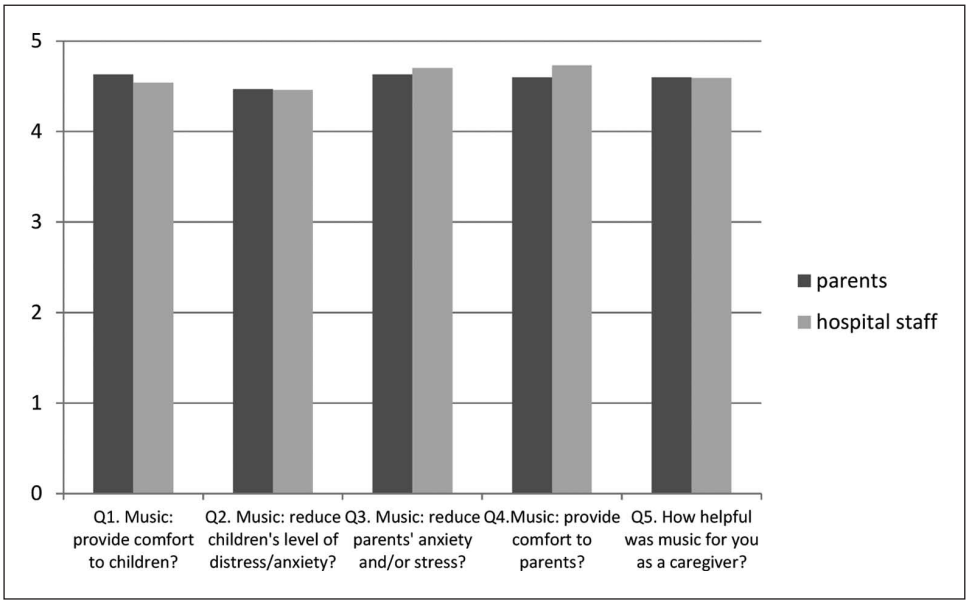

Figure 1. Music survey parents and hospital staff ratings.

($M = 125.85$ before, and $M = 128.02$ after). A *t*-test comparison between the mean heart rate before and after the Music session showed a significant decrease of heart rate in the paediatric patients: $t(38) = 2.556$, $p = .015$.

Pain assessment (CHEOPS)

A three-way mixed ANOVA was applied to examine the effects of the different sessions on the infants' pain assessment ratings in relation to two within-subject factors: *condition* (×3 levels, i.e., music, reading and control session); *before/after* (×2 levels, i.e., the physiological measures taken before and after each session); and one between-subjects factor: *age* (×3 levels, i.e., < 6 months of age, between 6 and 14 months, and > 15 months of age). No significant main effects of condition or age were found. However, a significant main effect for before/after the session emerged: $F(1,34) = 5.90$, $p = .021$, $\eta_p^2 = .148$. Moreover, there was also a significant interaction between condition and before/after: $F(2,68) = 3.727$, $p = .029$, $\eta_p^2 = .099$. The mean CHEOPS ratings suggest a decrease in pain assessed over the Music session ($M = 6.21$ before, and $M = 5.64$ after), but there was no significant variation over the Reading sessions ($M = 6.07$ before, and $M = 6.10$ after), or the Control sessions ($M = 5.98$ before and $M = 5.76$ after). A *t*-test comparison between the mean assessment of children's pain with CHEOPS before and after the Music session showed a significant decrease by the end of the session, $t(38) = 3.148$, $p = .003$.

Music survey

30 parents and 37 members of staff completed the music survey. Parents rated all the questions, whereas hospital staff did not rate some of the questions, i.e., Q1 and Q2 ($N = 37$), Q3 and Q4 ($N = 30$) and Q5 ($N = 35$). It is possible that hospital staff refrained from rating Q3 and

Q4 because they were about the effect of music on the parents and they were not sure how to rate them. Overall, parents and members of staff agreed that music has a positive effect on the children's as well as on their own state (see Figure 1). The Spearman correlation between the ratings of parents and members of staff on Q1 showed that both groups agree that music gives comfort to the child: $\rho(30) = 0.396$, $p = .030$.

Conclusion

The aim of the current study was to investigate the effect of playing live music to young paediatric patients in hospital with cardiac and/or respiratory problems. Their physiological responses and pain assessments at the end of the music session suggest that the patients felt lower levels of anxiety and pain as compared to other (non-music) sessions. In particular, a significant decrease in their heart rate was found at the end of the music session but not in the other sessions: this suggests that live music can help to distract and relax children, and to reduce their anxiety.

The young paediatric patients' level of pain was also found to be significantly lower at the end of the music session. Although music is not always effective in reducing pain in young patients (Cepeda, Carr, Lau, & Alvarez, 2006), the current results demonstrate that live music can help children with cardiac and/or respiratory problems in alleviating their discomfort and reducing pain. This confirms the results of Hatem and colleagues (2006). They found that music helped to reduce pain in postoperative heart surgery patients. On the other hand, the level of oxygen saturation changed significantly at the end of the music session only in the youngest of our three groups of children, i.e., those who were less than 6 months of age, and this was also true to an even greater extent at the end of the control session. We speculate that the younger children might be in a more sensitive condition as they are exposed not only to medical procedures, but also to a novel and possibly noisy environment: some of them might enjoy the music, but most of them might prefer a quieter environment. The current findings therefore confirm only in part the results from Longhi and Pickett's study (2008), in which a significant change of oxygen saturation level was found in the paediatric patients at the end of the music session. However, in that study, paediatric patients were from a wider age range; and the live music session lasted up to 50 minutes.

The parents' and hospital staff's responses to the music survey suggest that they are generally positive about the use of music in hospital with the paediatric patients. In particular, both groups agreed that music is beneficial to the children, and that it helps to comfort them, as in the study by Barrera and colleagues (2002). Parents also reported some positive effects of music on themselves, which might support their interaction and bonding with the children.

In conclusion live music, as compared with reading and no interaction, appears to improve the wellbeing of young patients with cardiac and/or respiratory problems, and also to be beneficial for their carers. It seems to be live music per se, and not the social component of the musical interaction that attracts and distracts children, thereby helping them to feel less in pain and more relaxed, and this seems to apply to the older children in particular. Further research is needed to address the long-term effects of live music on children's behavioural states, e.g., their sleeping patterns, their interactions and communication with their parents, as well as on their recovery time in hospital.

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