

# Music therapy for children going through haematopoietic stem cell transplantation

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## Introduction

Paediatric haematopoietic stem cell transplantation (HSCT) is a well-known treatment for aggressive leukemias, advanced haematopoietic and metabolic diseases (Miano et al., 2007). Medical developments in HSCT procedures have led to increased use of HSCT, and overall survival has improved in the paediatric population (Remberger et al., 2011). During the initial three to six months the HSCT procedure is very intense, including a period of isolation for 4–6 weeks, mainly due to the risk of infection. The child is monitored frequently after the initial hospitalisation in order to early detect infections etc. but also graft-versus-host disease (GVHD) or relapse of the disease.

The treatment affects the whole body and has a major impact on the child's and the parents' psychological wellbeing as well as their health-related quality of life (HRQoL) (Packman, Weber, Wallace & Bugescu, 2010). The lowest ratings of the child's HRQoL are noted one and three months after the HSCT (Rodgers, Wills-Bagnato, Sloane & Hockenberry, 2015). It takes approximately one to three years to return to the same level of HRQoL as before HSCT (Tanzi, 2011; Tremolada, Bonichini, Pillon, Messina & Carli, 2009).

Going through HSCT can be life-threatening. In terms of psychological reactions, post-traumatic stress disorder (PTSD) and traumatic stress symptoms as well as neurocognitive dysfunctions have been reported in HSCT survivors (Buchbinder et al., 2018; Stuber, Nader, Yasuda, Pynoos & Cohen, 1991). Earlier research has also reported high levels of stress and depressive symptoms in families of children going through HSCT (Phipps, Dunavant, Lensing & Rai, 2005).

## Why music and music therapy?

Music affects the whole brain and the neurochemical systems of reward, motivation and pleasure, and can reduce stress levels and strengthen social attachments (Chanda & Levitin, 2013). Music evokes and affects emotions. The use of music in emotional regulation is supported by behavioural and neural evidence due to music's function in early infant-parent bonding and its developmental fitness (Sena Moore & Hanson-Abromeit, 2015). Musical activations also have an effect on different biomarkers, e.g. the stress hormone cortisol and reducing increases in blood glucose. Familiar music, singing, creating and improvising are other factors that seem to have an impact on emotional regulation and reduce activity in the amygdala (Fancourt, Ockelford & Belai, 2014; Finn & Fancourt, 2018; Moore, 2013).

Music therapy is used in paediatric healthcare with the goal of helping children through serious experiences and supporting health (Bradt, 2012). Music therapy is a relational therapy, and one main objective is to increase the patient's experiences and intersubjective knowledge by being involved and relating through music (Trondalen, 2016).

Previous research reported increased well-being and decreased procedural pain after music interventions for children with cancer (Barrera, Rykov & Doyle, 2002; Nguyen, Nilsson, Hellstrom & Bengtson, 2010). Music therapy in the HSCT context for children showed reduced levels of anxiety and, in the young adult population, improved coping and social integration were reported (Robb et al., 2014; Robb & Ebberts, 2003).

## Study design and music therapy protocol

From February 2013 to November 2017 a randomised study was conducted at the Karolinska University Hospital, Sweden. Thirty-eight patients from 2 months to 17 years of age were included in the study. Music therapy was performed twice a week for 4–6 weeks in the music therapy group. The patients were hospitalised until donor engraftment. After engraftment the children were monitored in an outpatient paediatric ward at the hospital. The children in the control group were offered music therapy after discharge in the outpatient ward, twice a week for 4–6 weeks.

The music therapy intervention included both expressive and receptive methods (MacDonald, Kreutz & Mitchell, 2012). The session took place in the child's hospital room, and the child was invited to play different musical instruments, sing and listen to music with the music therapist.

The parents and siblings could also participate. The music therapy intervention was designed to build a trusting relationship between the child and the music therapist. The session had the goal of being flexible and varied in order to provide a holding structure to benefit both children and parents so that they could stay emotionally regulated (Fosha, Siegel & Solomon, 2009).

The aims of our study were:

- To evaluate physiological endpoints such as heart rate, blood pressure and saturation as well as evaluation of pain and mood between treatment groups during HSCT. The music therapy group received music therapy twice a week, and the control group received supportive conventional treatment.
- To compare HRQoL questionnaires at admission, discharge and after 6 months between music therapy group and control group.
- To explore the subjective experiences and memories of interactions between children, parents and music therapist during music therapy interventions.

## Results

We have published three articles based on our research project. In our first article, which included 21 patients, 0–16 years of age, we reported on the children's heart rates, blood pressure and saturation in connection with music therapy (Uggla et al., 2016). The children's physiological parameters in the morning were noted in both the music therapy group and the control group and were then compared with corresponding parameters that were recorded in the evening. The children's heart rates in the music therapy group were significantly lower ( $p < 0.001$ ) in the evening 4–8 hours after the music therapy intervention in comparison to the control group.

In our second article, which included 29 patients, 0–17 years of age, we reported that the children's self-reported health-related quality of life (HRQoL) improved after the music therapy intervention. In the music therapy group, the physical functioning improved at the time of discharge (adjusted  $p = 0.04$ ), and the control group showed improved results after the music therapy interventions in all domains. ( $p = 0.015$ ) (Uggla, Bonde, Hammar, Wrangsjö & Gustafsson, 2018).

Our third article was a qualitative study using the collaborative interview format as a data collection method, examining the families' experiences and memories of the interaction in the music therapy session. One of the questions was: what was it like to experience music therapy? Six families were included, and child, parents and music therapist were interviewed at

the same time by an independent psychologist who also performed the analysis. The analysis emerged in three themes: experiences of competence and recognition of the self; experiences of interactive affect regulation as potential for change; experiences of the importance of the therapeutic relationship (Uggla, Mårtensson Blom, Bonde, Gustafsson & Wrangsjö, 2019).

## **Discussion**

The aim of the doctoral study was to evaluate and explore music therapy in the particular HSCT context. Heightened heart rate was reported to be related to increased levels of distress, and elevated heart rate after an accident may predict symptoms of PTSD 6 months later for children and adolescents (De Young, Kenardy & Spence, 2007; Morris, Hellman, Abelson & Rao, 2016). Previous research has reported symptoms of stress in children, parents and siblings after HSCT. The significantly decreased heart rate levels in the evening in the music therapy group may indicate decreased levels of stress due to decreased activation in the amygdala through emotional regulation.

The increasing physical functioning reported by the children at discharge in the music therapy group and the overall increased HRQoL in the control group after music therapy at 6 months follow-up indicate the importance of the music therapy intervention. The musical elements – melody, rhythm, movement and dynamic shifts in intensity – have the potential to facilitate an intersubjective regulation experience. Shared affects and intentions in music therapy are cross-modal and do not need to be explained in words. Affect attunement through musical experiences in music therapy gives the participants an opportunity to interact and thereby influence the interplay. This could be seen as important to these children and parents, whose current life circumstances greatly reduce their opportunity to influence their situation and the challenging medical treatment.

## **Conclusions**

Music therapy developed into a significant and helpful experience for the participants, an important factor in coping and managing the treatment period at the hospital. The combination of reduced heart rate values four to eight hours after the intervention in the music therapy group and the improved HRQoL reported by both groups suggests that music therapy can be an effective, complementary intervention during and after HSCT.

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