

# Active Music Engagement and Cortisol as an Acute Stress Biomarker in Young Hematopoietic Stem Cell Transplant Patients and Caregivers: Results of a Single Case Design Pilot Study

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# Introducing HCST & AME

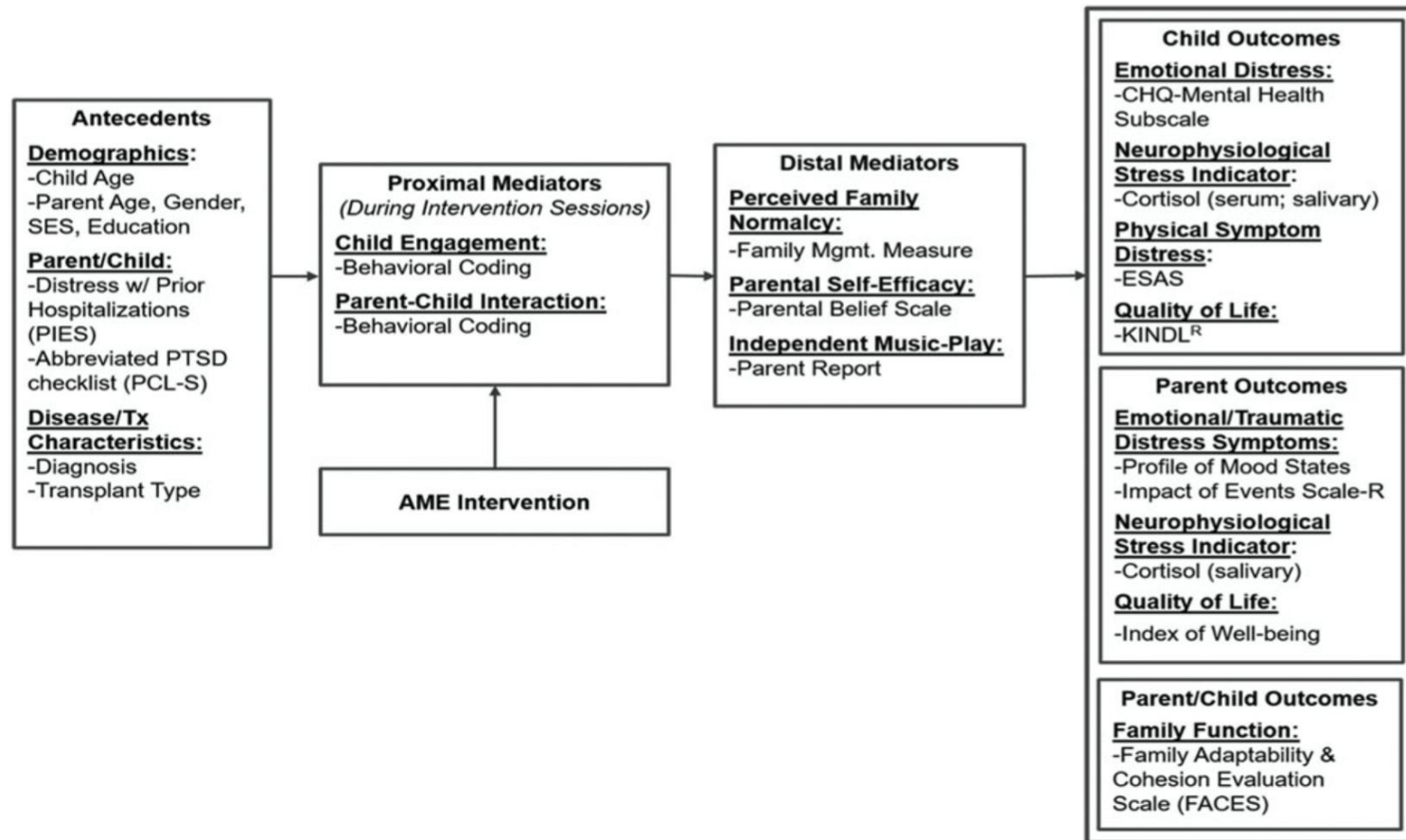
- Hematopoietic Stem Cell Transplantation (HSCT)
  - Heightened emotional and physical distress<sup>1</sup>
  - Traumatic stress symptoms following treatment<sup>2</sup>
- Active Music Engagement (AME)<sup>3</sup>

<sup>1</sup> Kazak et al., 1997, 2005; Best et al., 2001; Santacroce, 2002; Kazak and Baxt, 2007; Ingerski et al., 2010; Graf et al., 2013; Virtue et al., 2014

<sup>2</sup> Stuber et al., 1996, 1997; Kazak et al., 1998; Hobbie et al., 2000; Kangas et al., 2002; Bruce, 2006; Ingerski et al., 2010

<sup>3</sup> Robb, 2000; Robb et al., 2008, 2017

# Conceptual Framework



**FIGURE 1** | Conceptual framework. Reprinted from Russ et al. (2020).

# Research Questions

- Primary Aims

- What proportion of eligible caregiver-child dyads consent to study participation, and what percentage of AME sessions do these dyads complete?
- What self-report and biological data can be collected during HSCT?
- What are caregivers' perspectives about the relative ease/burden of biological sample collection?

- Secondary Aims

- What are caregivers' perceptions of the benefit (or non- benefit) of AME for managing distress, and enhancing family and quality of life outcomes for self and child?
- Are there observed changes in caregiver and/or child cortisol levels associated with the AME intervention?

# Participants & Intervention Procedures

**TABLE 1** | Child demographics, diagnosis, and treatment.

Participant number	Child age	Diagnosis	Transplant type	Conditioning agent	Acute GVHD
1	4.53	Neuroblastoma	Autologous	Chemo only	No
2	3.81	Neuroblastoma	Autologous	Chemo only	No
3	3.51	Relapsed ALL	Allogeneic	Chemo only	Yes Stage 4, Grade III
4	3.51	Sickle cell disease	Allogeneic	Chemo only	No

*Age corresponds to the child's age at the beginning of their participation in the study.*

*GVHD, graft versus host disease.*

**TABLE 2** | Active music engagement (AME) intervention components and theoretical principles.

Intervention component	Theoretical principles
Component 1: music-based play activities	<p>(1) Predictable environment provides a structure that supports child competence.</p> <p>Therapist uses familiar music activities to provide structure and increase child's ability to predict what will happen in their environment.</p> <p>(2) Leveled activities help ensure success and support child competence.</p> <p>Therapist tailors physical activity requirements to meet the individual needs of each child. Enables child success and engagement during periods of high or fluctuating symptom distress.</p> <p>(3) Opportunities to make independent decisions support child autonomy.</p> <p>Children choose from a variety of music play activities, and each activity includes a wide range of materials. Activities include a wide range of materials and activity options so that the child can make choices for self and others. Therapist uses improvisational techniques to follow child-initiated changes in their music making (e.g., child changes tempo or style of playing).</p> <p>(4) Activities structured to support caregiver-child interaction. Activities structure and support reciprocal caregiver-child interactions. The therapist individualizes experiences to support increased frequency and quality of interactions.</p>
Component 2: music play resource kit	<p>Supports independent use of music play to manage distress between therapist-led sessions. Activities mirror content from therapist-led sessions. The kit includes:</p> <p>(1) Professional CD recording of music composed and/or arranged specifically for the AME intervention.</p> <p>(2) Age-appropriate musical instrument and play materials that correspond to each activity.</p> <p>(3) Activity cards designed to give children/caregivers at-a-glance information on ways they can use their kit.</p>
Component 3: session planning and tip sheets	<p>(1) Promotes caregiver competence about how children use play to cope and ways to engage their child in music play during the transplant period.</p> <p>(2) Promotes caregiver autonomy by empowering caregivers with skills/resources to support their child during treatment.</p> <p>(3) Supports caregiver-child relationships through normalizing music-based play activities.</p>

*Reprinted from Russ et al. (2020).*

# Research Procedures

		Baseline	AME 1		AME 2		AME 3	AME 4		AME 5	AME 6		AME 7	AME 8	Follow-up
		(N/A)	C	T	T	C		C	T		T	C			(N/A)
ESAS	Pre	√			√				√		√				√
	Post				√				√		√				
Salivary Cortisol	Pre		√	√	√	√		√	√		√	√			
	Post 1		√	√	√	√		√	√		√	√			
	Post 2		√	√	√	√		√	√		√	√			
Blood Cortisol	Morning		√	√	√	√		√	√		√	√			

**FIGURE 4 |** Simplified collection schedule for self- and proxy-report measures (ESAS), salivary cortisol, and blood cortisol. As shown in **Figures 2, 3**, the correspondence of AME sessions and data collection varied for children undergoing autologous and allogenic transplants; for illustrative purposes, this figure depicts days for a child undergoing an autologous transplant. Pre, Post, and Morning refer to the time of day during which samples were collected. Pre indicates that data collection occurred before the AME session, whereas Post indicates collection occurred after the session (Post 1 and Post 2) are used to indicate that data were collected twice after the session. C and T refer to control and treatment condition days within each pair of days on which data were collected for a given AME session.

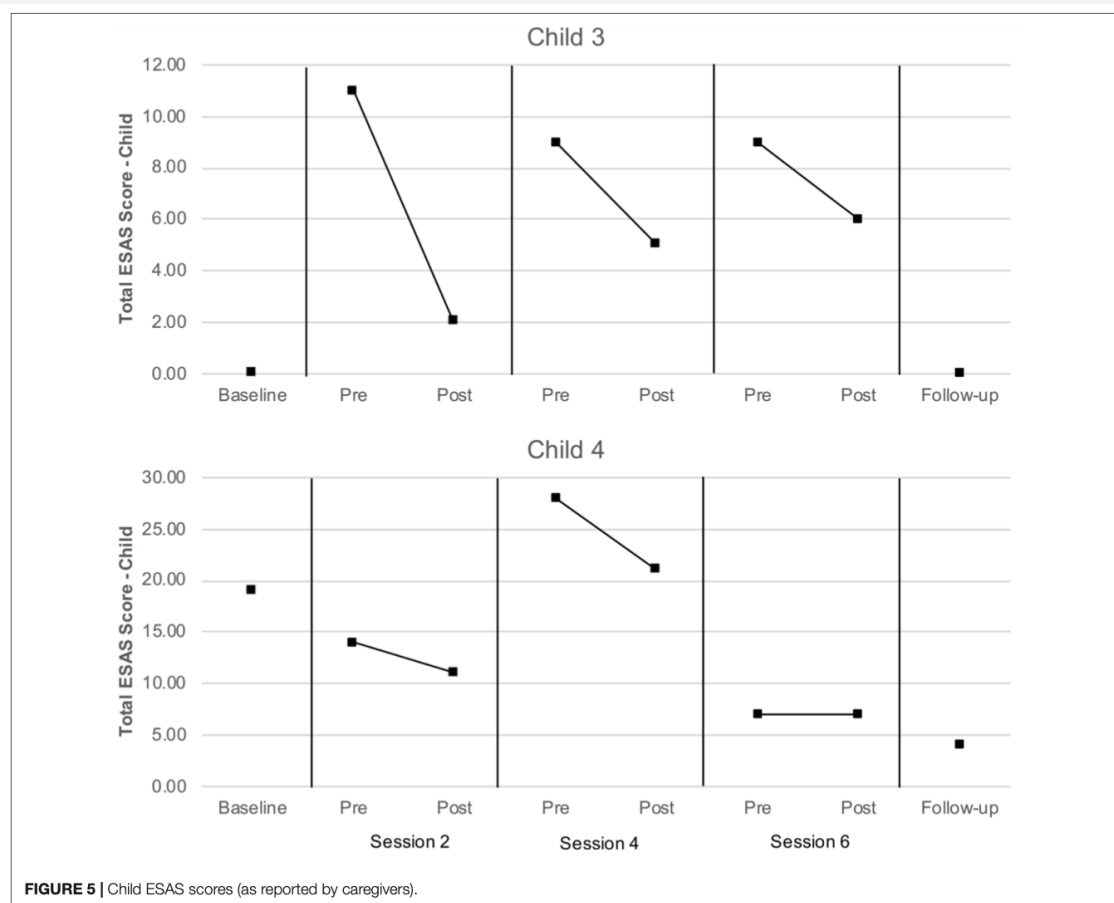
# Results: Primary Aims

- What proportion of eligible caregiver-child dyads consent to study participation, and what percentage of AME sessions do these dyads complete?
  - Consent rate: 100% (feasibility threshold = 75%)
  - Session completion rate: 84% (feasibility threshold = 75%)
- What self-report and biological data can be collected during HSCT?
  - ESAS (self-report): 63% (feasibility threshold = 75%)
  - Caregiver salivary cortisol: 72% viable samples (feasibility threshold = 75%)
  - Child salivary cortisol: 2 children refused all samples
  - Child blood cortisol: 84% viable samples (feasibility threshold = 75%)
- What are caregivers' perspectives about the relative ease/burden of biological sample collection?



# Results: Secondary Aims (1)

- What are caregivers' perceptions of the benefit (or non- benefit) of AME for managing distress, and enhancing family and quality of life outcomes for self and child?



# Results: Secondary Aims (2)

- Are there observed changes in caregiver and/or child cortisol levels associated with the AME intervention?

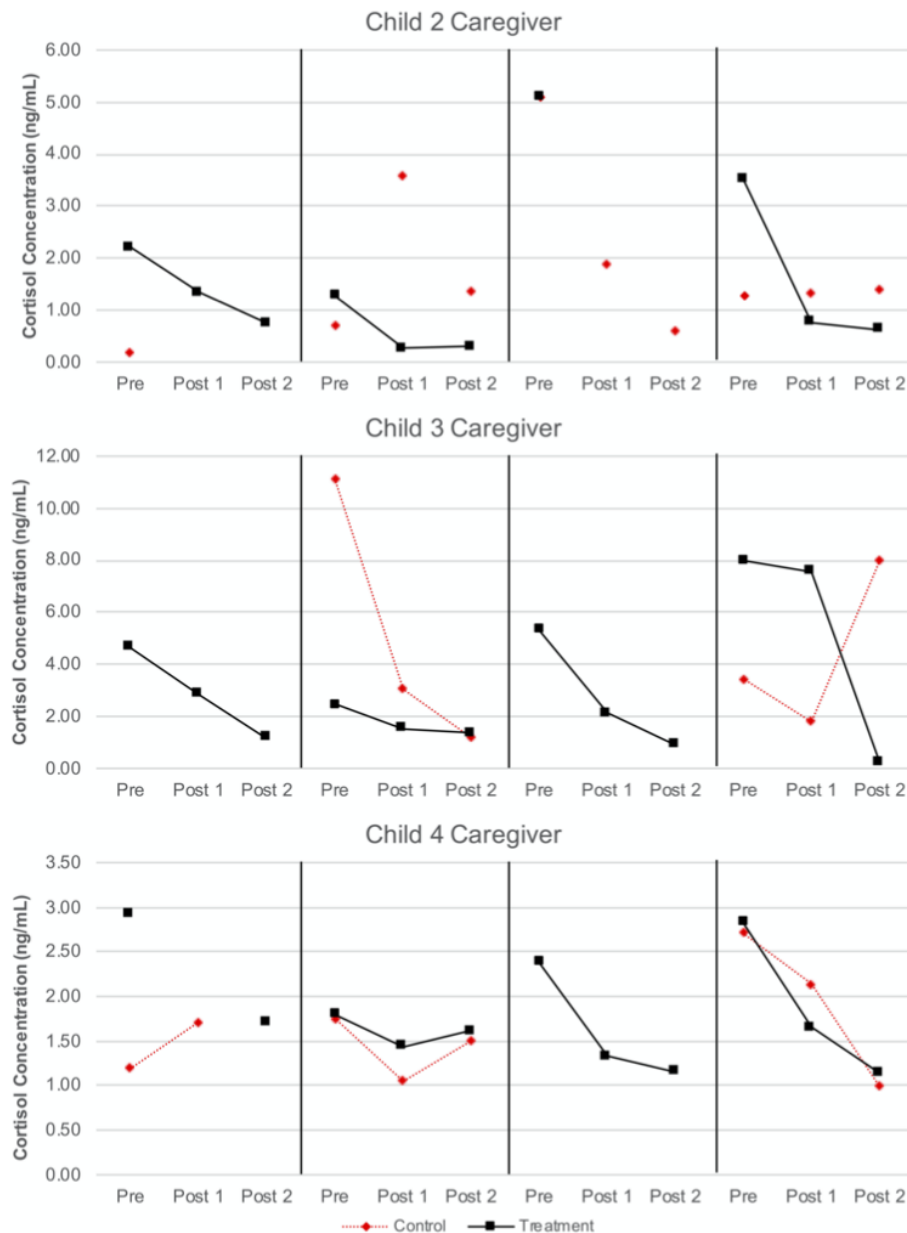


FIGURE 7 | Caregiver salivary cortisol concentrations.

# Summary & Interpretation

- Families will consent to participate and AME sessions can occur as scheduled
- Data can be collected, but...
  - Some forms of data are more amenable to collection than others.
  - Salivary cortisol collection is especially problematic.
- There is some evidence that AME is of benefit, both from:
  - Parent responses to interviews and self-report measures.
  - Salivary cortisol collected from caregivers.

# Future Directions

- RCT or SCD?
- How to modify SCD protocols?
  - Monitoring diurnal cortisol via a second blood draw.
  - Relaxing scheduling for caregiver salivary cortisol collection.
- Considering additional or alternative biomarkers

# Thank You

- Co-authors
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