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The Effectiveness of Music Therapy with Children Who Have Experienced Trauma Using the Neurosequential Model of Therapeutics (NMT): A Literature Review

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Abstract

This paper initiates filling the gap in the literature by utilizing NMT, which addresses trauma through understanding and assessing how it has impacted a child neurodevelopmentally with music therapy. Children in intensive residential care are referred to treatment with a unique range of challenges resulting from their traumatic experiences. Of these challenges, included are a wide range of traumatic experiences such as physical/emotional abuse, neglect, sexual abuse, homelessness, witnessing violence or domestic abuse, adjustment issues, attachment issues, or trauma while in utero. The Neurosequential Model of Therapeutics (NMT) is a newer framework for working with developmental trauma. Current research around the effectiveness of music therapy with children with trauma diagnoses tends to focus on the DSM definition, which encompasses witnessing a traumatic event such as a natural disaster, an accident, terrorism, war, or sexual violence (American Psychiatric Association, 2020), rather than the clinically accepted, but still unofficial diagnosis of developmental trauma (Malchiodi, Crenshaw, & Robarts 2015). This paper focuses on the practical application of music therapy within a framework intended specifically for children with developmental trauma. The question "What music therapy interventions are most beneficial to use in conjunction with NMT with children who have experienced trauma?" is addressed by presenting music therapy methods that correspond to a child's state on the arousal continuum.

Keywords: developmental trauma, music therapy, emotional regulation, self-regulation, resilience, NMT, trauma, abuse, neglect

*Author Identity Statement***:** *This author identifies as a straight-passing, queer, Black woman from New England with mixed European and African ancestry.*

The Effectiveness of Music Therapy with Children Who Have Experienced Trauma Using the Neurosequential Model of Therapeutics (NMT): A Literature Review

Introduction

Music therapy offers a unique therapeutic modality to children who have experienced trauma. Whereas traditional psychotherapy may be perceived as intimidating, threatening, or stressful, music is a distinct medium that offers a safe and enjoyable experience (Kim 2015; Wiess and Bensimon, 2020). Trauma can occur in many different forms in people's lives. In the context of studies discussed in this paper, childhood trauma includes physical abuse, emotional abuse, sexual abuse, "uprooting" experiences, and witnessing terrorist activities (Wiess and Bensimon, 2020). The primary objective of this paper is to examine the use of music therapy interventions with children who have experienced a wide range of trauma, and to investigate the methodological similarities, differences, and effectiveness between treatment approaches and music therapy within NMT.

I have personally felt drawn to this subject area as a result of working with children who have experienced trauma and are in a residential treatment facility. During the intake and assessment process, I noticed that clients who were being admitted had various diagnoses. I further observed that these children had a tendency to display the same types of behaviors – such as perceived disobedience, struggles with attending to tasks, completing tasks, hypervigilance, and "zoning out" in an academic setting. These behaviors stem from an inability to emotionally regulate and could include assaultive or verbally aggressive behaviors and difficulties with transitions. Diagnoses could include adjustment disorder, reactive attachment disorder (RAD), posttraumatic stress disorder (PTSD), and attention deficit hyperactivity disorder (ADHD).

Upon learning more about NMT as utilized by this particular treatment facility, it seemed as though defiant behaviors and struggles with emotional regulation are predictable and can be explained through this model. The most crucial contribution of this model is an arousal continuum, which is used a reference point for staff and clinicians to better understand their client's area of functioning from moment to moment. The arousal continuum corresponds to different areas of the brain, which will be described in a later section (see Appendices).

In beginning this work, I noticed that the music therapy department at this treatment facility lacked structure in terms of how this model is implemented through music therapy interventions. While sessions are client-directed, sometimes if a child appears to be beyond triggered or starting to escalate, they may not have the capacity to engage in a self-directed session, especially if they are not operating from the complex regions of the brain that at are responsible for relationships and cognition. With this, I have felt as though it may be incredibly helpful and beneficial to our clients if we were able to create interventions that were tailored to the client when they are in a particular area of the arousal continuum.

Similarly, in the existing literature on working with children who have experienced trauma, many interventions have been utilized such as different forms of songwriting, listening and receptive music therapy methods, improvisation, drumming, instrument play, performance, therapeutic singing, music and imagery, lyric analysis and discussion as well as music and movement (McFerran et. al, 2020). With so many options, how is a therapist working in acute care or intensive residential treatment supposed to know when to utilize which intervention?

In this paper, I explore the integration of Music Therapy and NMT with children who have experienced trauma, with particular focus on the following: examining how trauma manifests in children and the current definition of trauma along with current diagnoses, current

music therapy work with this population, an introduction and overview of NMT, how NMT and music therapy can be used in the most effective way with this population and finally, possible music therapy interventions that incorporate NMT.

Integrating music therapy with NMT is crucial when working with children with trauma diagnoses in residential facilities as these children present more acutely and their ability to self-regulate varies from moment to moment, unlike clients who work with music therapists or clinicians on an outpatient level.

With this population, a therapist needs to be able to conceptualize and understand how a child presents and where they are developmentally at any given moment. For example, a child of 10 years may regulate similarly to an infant or a toddler (Malchiodi, Crenshaw, & Robarts, 2015, p. 70). Music is a powerful modality to utilize with this population as it activates more regions of the brain than any other modality. Engaging with music can start at the brainstem and develop to more complex regions of the brain. Further, engaging with music can help traumatized children activate areas with little to no previous functioning (Foran, 2009, p. 56).

I selected a literature review for my thesis as a result of low census and no guarantee that the census would increase at this facility. I also didn't feel as though it would be appropriate to implement this method in group environments, which is the direction that the administration was leaning towards in terms of adjunct therapies (i.e., music therapy, dance/movement therapy, and art therapy) at this facility. My concern with implementing this modality in this setting is around this population's capacity to self-regulate, engage with group activities, and meet their needs. A literature review also seemed to be the most needed as there are clear gaps in the research. Music in general has been referenced within NMT (R. Paoni, personal communication, September

2021) however, there isn't a clear method that has been created when working with this population and within the model.

Keywords have been the primary guidance in my search for literature. The keywords I have used to find research has shifted from trauma in general to terms that are a more accurate representation of the client population that I work with. This includes abuse, neglect, day-treatment, inpatient, sexual abuse, foster care, and attachment issues. I have also discussed my thesis subject area at length with my on-site supervisor, my thesis consultant, who used to work at my site and is very familiar with the population, and a clinician on-site who conducts all the trainings on NMT, all of whom have been very helpful.

The need for the development of a method is clear in that it is incredibly difficult to plan interventions randomly based on how one interprets a child's state on the arousal continuum (Malchiodi, 2015). That being said, I explored various music therapy interventions with different forms of trauma and developed a model that I potentially could implement in the future with this population.

Literature Review

Trauma – Current Definitions and Diagnoses

Within the category of trauma diagnoses, posttraumatic stress disorder (PTSD) is the most common, impacting approximately 15 million *adults* per year (U.S. Department of Veterans Affairs, 2018). The DSM definition of PTSD requires the witnessing a traumatic event such as a natural disaster, an accident, terrorism, war, or sexual violence (American Psychiatric Association, 2020). This results in the presentation of a multitude of symptoms, such as intrusive thoughts and memories, avoidance of people, places, activities, or situations that may trigger distressing memories, changes in cognition and mood (i.e., blaming oneself or others, ongoing

guilt or demonstrating less interest in activities), and hypervigilance (American Psychiatric Association, 2020).

Recent developments in literature have suggested the expansion of the diagnostic criteria for PTSD to include complex trauma experiences. Research on complex trauma has been revolutionary in the past two decades, with researchers formulating the diagnostic classification necessary to create a formal diagnosis. Complex posttraumatic stress disorder's (cPTSD) symptomology extends beyond PTSD, including symptoms around emotional processing, self-organization and body integration, and relational functioning (Ford, 2015).

Another diagnosis that has been proposed by clinicians and researchers in recent years is developmental trauma disorder (DTD). Similar to cPTSD, it encompasses a child's ability to emotionally regulate in the symptomology, as well as a complex and persistent trauma history in early childhood "where there have been overwhelming threats to basic safety and survival" (van der Kolk, 2005; Malchiodi 2015, p.67).

As a result of the variance in behavioral manifestations and variety of experiences that children with trauma have, they may be admitted to a residential treatment facility with a range of diagnoses. Hambrick et. al. capture this breadth well in their research with children in residential and day treatment programs:

The range of specific problems was considerable and included hypervigilance, sleep problems, profound impulsivity, dissociation, aggression, delinquency (including property destruction and harm to animals), relational and social skill issues, sexual acting out, attachment issues, and threats of self- or other harm. Developmental delays in multiple domains (social, cognitive, and emotional) were common. Specific psychiatric diagnoses included ADHD, PTSD, anxiety disorders, depression, substance abuse issues, fetal alcohol spectrum disorder,

oppositional defiant disorder, conduct disorder, bipolar disorder, psychotic disorder, and autism spectrum disorder (2018, p.5).

Although their past diagnoses may capture for behavioral symptoms, they may not address the trauma at the root of the problem. The conceptualization of the root of these behaviors in children in residential and day treatment facilities may be more accurately addressed through NMT, which examines not only what trauma occurred in a child's life, but also when, as well as what brain areas were impacted by that trauma.

How Trauma Manifests in Children

Trauma manifests in a multitude of ways – neurodevelopmentally, relationally, emotionally, and behaviorally just to name a few. Traumatized children may seem hard to reach, closed down, or out of touch (Malchiodi 2015). Behaviorally, they may have temper tantrums, demonstrate oversexualized play, be disorganized, easily agitated or have exaggerated responses to seemingly small stimuli (Malchiodi 2015; Foran, 2009). Relationally, they may struggle with physical boundaries, be avoidant to developing relationships, appear to have a lack of empathy or be numb to others, or seem intrusive in how they connect (Malchiodi 2015). In the classroom, traumatized children may have difficulty paying attention (Kim 2015), struggle with concentration, tuning out and may experience difficulty verbal memory recall (Foran, 2009).

While a child's ability to healthily regulate emotionally is associated with higher academic achievement, higher levels of empathy, and social competence, a child's inability to emotionally regulate can lead to reactive behaviors and an oversensitive stress response system (Foran, 2009). In regard to their neurological development, children who have experienced trauma exhibit these non-age-appropriate behaviors such as hyper vigilance and temper tantrums

as a result of chemical changes brought on by abuse and neglect which has led to an underdeveloped cortex (Foran, 2009).

Music Therapy with Trauma

History

Historically, music has been used to heal since biblical times. It gained a more formal emergence in the United States in the early 1900s (Wheeler, 2014, p.6) with its most recognized beginnings in the 1950s as a treatment for Veterans returning from World War II with traumatic brain injuries and battle fatigue, later becoming known as posttraumatic stress disorder (McFerran et. al, 2020; Foran 2009).

Current Approaches

Music therapy work with trauma has evolved since the 1950s, with music therapists working with trauma from a range of theoretical orientations and therapeutic interventions. To get a better idea of current therapist approaches when working with trauma, Bensimon (2021) interviewed 41 music therapists working with people who have experienced trauma. The therapists' experience in the field ranged vastly, with some music therapists working in the field for upwards of 35 years. Their clientele was of all ages. The researcher used a phenomenological framework for this study for data analysis and to determine its trustworthiness (Guba & Lincoln 1981, Lincoln & Guba 1985, as cited in Bensimon, 2021).

The study sought to integrate music therapy techniques utilized by the 41 participants who worked with trauma survivors. Guiding questions in interviews with participants focused on how the therapist addresses their clients' needs, therapeutic goals that are specific to treating trauma survivors as well as what they consider to be successful outcomes in treatment. Bensimon also asked participants about their therapeutic approach, principles and techniques (Bensimon,

2021, p.4). Results from these interviews identified three areas of reintegration: body integration, event integration, and life-story integration (Bensimon, 2021).

Body integration focuses on the physical manifestations of trauma as traumatic experiences can cause survivors to feel a detachment from their bodies and numbness to bodily sensations. This is addressed by music therapists through music with spontaneous movements such as walking and clapping, stress reduction through relaxing music, rhythmic entrainment and body percussion (Bensimon, 2021, p.7).

The second area of integration, event integration, focuses on how the memory of an event can be impacted by traumatic experiences and how a client's conceptualization of trauma can become nonlinear after an experience. Improvisational play that is associated with or focuses on a traumatic memory or feelings around a traumatic memory can be utilized to address this type of integration (Bensimon, 2021, p.7).

The third and final area of integration is whole life story integration, which involves the conceptualization of a client's life experiences before, during and following a traumatic event. The goal of addressing this area of concern is to create a new perspective around the event. Zanders (2015, as cited in Bensimon, 2021) specifically focuses on this area of integration through the selection of songs that represented past traumatic experiences. Other interventions presented include songwriting and lyric analysis (Bensimon, 2021, p.7). These areas of integration address a range of traumatic experiences, this categorization of goal areas in music therapy treatment aid in the formulation of interventions for this paper.

McFerran et. al (2020) also examined the current theoretical orientations of music therapists who specialize in trauma work in their critical interpretive synthesis of current research. Within their work, they discovered numerous theoretical orientations such as music

therapy specific theorists, theorists from other Creative Art Therapies (CAT), as well integrative approaches with other theorists in psychology and psychiatry (McFerran et al, 2020, p. 6). Theoretical orientations mentioned outside of the creative arts included psychoanalytic and psychodynamic theorists, cognitive behavioral therapy, attachment theory, Gestalt theory as well as some scholars from music psychology and creative art therapies more broadly. While there is much variance between theoretical orientations of music therapists who work with children who experienced trauma, a commonality between them is an emphasis on empowerment and the development of resilience.

Having an understanding of the current theoretical orientations of music therapists who work with traumatized children and trauma in general, aids with the integration of the Neurosequential Model of Therapeutics in order for the model and current theoretical orientations to align. These two studies exemplify a wide range of theoretical orientations of therapists who work with trauma. Of the orientations mentioned, empowerment and the development of resilience are most noteworthy.

A Shift in the Paradigm

The current understanding of trauma and trauma- focused therapy requires a safe environment for the client, which is often assumed to be automatically created by the therapist (Scrine, 2021). In their writings, Scrine (2021) calls for a more systemic approach to trauma informed care. They criticize the current manner of trauma informed care and music therapy as it focuses on "fixing" what is wrong with a person rather than examining the systems within which the person has been disempowered and traumatized by. Further, this form of treatment may continue to disempower the client throughout their journey (Scrine, 2021).

To begin to address this gap in treatment or lack of examination, Scrine (2021) urged for a resource-oriented approach that allows for collaboration with clients and takes into consideration clients' families, social networks, systems and communities that they exist in. It encourages empowerment and the development of resilience. Through utilizing NMT, resiliency and empowerment can be developed by setting realistic expectations and attainable goals for clients and implementing neurodevelopmentally informed interventions, as will be addressed in a later section.

Group Music Therapy with Trauma

Of the literature gathered for this paper, the primary format of current work with children who have experienced trauma was in group settings. Wiess and Bensimon (2020) conducted a pilot study with teenagers who were displaced from their homes in the Gaza Strip and witnessed terrorist activity. The group consisted of six adolescents, all from the same community in the Gaza Strip. All participants were interviewed prior to the start of the music therapy group for approximately 45 minutes. They also completed an emotional state survey at the start and end of each session. For additional data collection, the researcher took a diary of each session, and each session was video recorded. The music therapy group took place for 12 consecutive weeks, with each session being 90 minutes. Analysis was conducted on participant interviews, therapist notes, and video of all 12 sessions. Based on the analysis, the researchers identified three major themes throughout the therapeutic process and issues that preoccupied participants at the beginning: shattered world, expression of pain through structured musical activities, and contribution of the therapy (Wiess and Bensimon, 2020, p. 185). Results of the study indicate that the ritualistic nature of the therapy and the nonverbal accessibility of music were beneficial for the participants. Findings from this study reflect the importance of processing traumatic

experiences through music along with the benefits of predictability and structure in group music therapy.

In another study examining the effectiveness of group music therapy, Fairchild and McFerran (2018) addressed their research question of "What does music mean to you?" through a collaborative songwriting process with fifteen children who experienced homelessness and family violence. These children were divided into two groups. While both groups touched on similar themes, their songs ended up differing greatly in lyrics and melodies. The first group's focus was on music as "everything", the second centered the song they wrote around listening to music with headphones on and how it made them feel. The methodology chosen for this study achieved the goal of answering the research question.

Themes that occurred in the songwriting process included music being an escape for the children, music as something that offers hope, and music as something that empowers or makes the children feel good (Fairchild & McFerran, 2018). A strength of this study is that the answer to "What does music mean to you?" comes directly from the child's perspective rather than from a researcher's analysis of how participants may perceive or value music. The inclusion of the brainstorming documents and the final product were necessary for me, as a reader, to understand the importance of the subject area for children. This research study also brings to light the issue of children not having agency or an active role in the research process, and therefore, exemplifies how researchers can make research a collaborative process for children. I would be curious as to how this study may have turned out with younger children, as children in the study were between the ages of 8 and 14, approximately the age range of the children I work with at a residential treatment facility. This study illustrated how music can foster hope, increase empowerment, and offer an appropriate escape for children who have experienced trauma. It also reflected the power

of a collaborative research process, which can translate to a child's individual therapeutic treatment.

In their work with children in residential treatment, Flores et. al. examined the impact residential treatment may have on a child's development of a sense of self, personal boundaries, and ability to develop secure relationships. The study had fifteen participants between the ages of 7 and 12 and took place at a residential treatment facility in South Africa. Participants that were selected did not leave the facility during holidays and weekends; participants also had the highest levels of anxiety, depression, and difficulties with socialization within the facility (2016, p.258). Researchers separated participants into three groups of five, with interventions designed to increase in complexity over time.

The beginning of the group was designed in a way for participants to be successful, with interventions centered around simple rhythm activities primarily led by the group facilitator. As the group progressed, interventions became more complex and involved more participant led activities. The authors utilized a collective case study approach with the primary researcher reviewing video recordings for overarching themes, as well as changes in individual participants progress throughout study. An observational framework was utilized to guide data collection with a section on musical functioning, emotional functioning, and social functioning. Results indicated improvements in overall emotional functioning as participants demonstrated growth in the following goal areas: self-expression, self-motivation, emotional regulation, agency, confidence, mastery, playfulness, self-awareness, and sense of self (Flores et. al., 2016, p.260). Researchers also noticed a drastic reduction in anger, agitation, anxiety, and depression over the course of the groups. Researchers also noticed increases in attention, active listening, capacity

for self-expression and peer interaction which demonstrated support for participants increased self-awareness throughout the group.

Results of the drumming group and increased positive behaviors did not generalize to other settings, which the researchers attributed to the length of the study (Flores et. al., 2016, p. 265). Researchers suggested activities to encourage generalization as well as activities that focused on the goal areas of increasing social and emotional functioning. The primary limitation of the study was that the principal researcher of the study was the one who reviewed and analyzed videos for themes. Another limitation is a lack of inclusion of the observational framework for the video analysis. Providing more information on differences in individual group members functioning would also be beneficial for the reader. It would also be helpful for researchers to have included more information for each group, rather than what was included in the analysis of the study, which was progress on one of the three groups that were conducted throughout the length of research.

The findings from this study suggest that a group environment when safe and structured, allows for children to co-regulate with each other rather than with staff members or therapists. This increases confidence and the ability to self-regulate and reassurance around one's ability or capacity to regulate. In addition, drumming provided a medium that invited creativity flexibility, connection, and predictability for group participants. Structure and predictability, an uncommon occurrence for this population, is something that clearly is beneficial for them. Interviews with participants suggested continuity between researcher-identified themes and areas of growth identified by participants. Participants expressed that the drumming made them feel relaxed, happy, and excited (Flores et. al., 2016, p. 265).

While choice and agency are important for this population, it's not until a child is set up for success by the therapist by creating a safe predictable environment with attainable goals, while the child may have the capacity and self-awareness to become more self-directed in their treatment. Why might the positive results from the music therapy groups not generalize to other settings? This is the advantage of using NMT at a residential treatment facility. Unlike this study (Flores et. al., 2016), the use of NMT allows for consistency and terminology as well as continuity in care in the classroom, individual psychotherapy and adjunct therapies.

Individual Music Therapy with Trauma

The treatment approach with children who have experienced trauma differs greatly between a group setting than in individual settings. This is exemplified in Christenbury's case study (2015). While groups require extensive amounts of planning and the creation of a group curriculum, a therapist has the ability to be more flexible in their treatment approach when working with clients individually. This may make it easier to work within the arousal continuum in the moment with a child whereas groups do not permit such flexibility.

In her work with a six-year-old client who had a history of sexual and physical abuse, Christenbury (2015) examined how songwriting and visual art can be combined to encourage emotional expression. She proposed the intervention to the client as a book they would create about feelings. Each feeling would have a corresponding drawing, to which the music therapist would write a song. This process was client-driven, as there were some weeks where the client would not want to draw or listen to the song created by the music therapist for the emotion.

The presented case study examines the process of introducing emotional identification using visual art with a client who has a history of difficulty with processing emotions. Christenbury attempted to use songwriting as an alternative for verbally processing emotions by

curating songs for the client then presenting them in the following sessions. She used a range of Velcro visuals, oil pastels, and drawing paper to initiate the songwriting process with the client. For some songs, the author used their knowledge of the client's history to aid with the songwriting process. Most of the songs were intended to be from the client's perspective, with one song being written from Christenbury's perspective. She oriented herself around a person-centered therapeutic approach, with the belief that people are capable of healing themselves through self-discovery and insight (Christenbury, 2015, p. 9). The primary limitation of this study was that the client was not directly involved in the songwriting process.

This case study demonstrates the differences in treatment planning for an individual child who has experienced trauma as compared to working with traumatized children in the group setting. This study reflects the option for flexibility that is available working in this setting, as well as ways to introduce emotional identification and regulation nonverbally, utilizing music alongside other expressive mediums.

An Overview of the Neurosequential Model of Therapeutics

The Neurosequential Model of Therapeutics (NMT) was created in response to a feeling of frustration around unsuccessful clinic-based work witnessed by Bruce Perry. Perry felt as though children who were impacted by severe abuse, neglect and trauma presented "with a host of developmental challenges" which were not being addressed through the use of "ineffective treatment models" (Mitchell, 2020, p.141). NMT draws on research from multiple disciplines (i.e., the neurosciences, anthropology, sociology, developmental psychology, public health) to create a structured, practical way for clinical teams to measure elements of the client's developmental history and current functioning (Mitchell, 2020, p.138).

Important developmental considerations are created using both quantitative and qualitative assessments along with NMT assessment materials. Specific assessments utilized are dependent on the organization. NMT assessments are not meant to replace any other forms of assessment that may be implemented at an institution. Rather, NMT utilizes these assessments to create a neuroscience-based map which includes a developmental history, development risk and a brain metric which inform clinical teams of a client's current developmental functioning.

Depending on when trauma occurred in a child's life, it may have impacted their neurodevelopment differently. Earlier in life, the trauma may have a more severe impact on lower regions, while trauma that occurs later on in childhood may impact regions of the brain that are associated with higher levels of functioning. Higher levels of functioning in the brain rely on the development of lower regions, therefore making it nearly impossible for higher levels of functioning to develop if there is severe damage to lower regions (Perry, 2009, p. 242).

For example, interventions that may be designed to focus on social skills or reading may be particularly challenging if not seemingly impossible for a dysregulated child; as they are more than likely functioning from lower regions of the brain that are not involved with relationships and complex cognition (Perry, 2009). In order to improve functioning in lower neural networks, repetitive activity such as yoga, music, and movement can help to provide predictable and patterned stimuli in order to reduce anxiety and other trauma related symptoms (Perry, 2009, p. 243).

The first step of NMT's assessment is to gather developmental and relational history in order to better understand which areas of functioning were impacted by the child's history of

trauma. Next, brain mapping is done to create a representation of the child's current levels of functioning and different domains, with level of functioning being rated from undeveloped or nonfunctional to fully functional and well organized. The function map then informs in for interventions utilized by clinicians. It is only once lower regions of brain functioning are addressed when interventions can begin to increase in complexity (Perry, 2009). Figure 1 illustrates which regions of the brain are associated with each area of functioning (Lusheck, 2018).

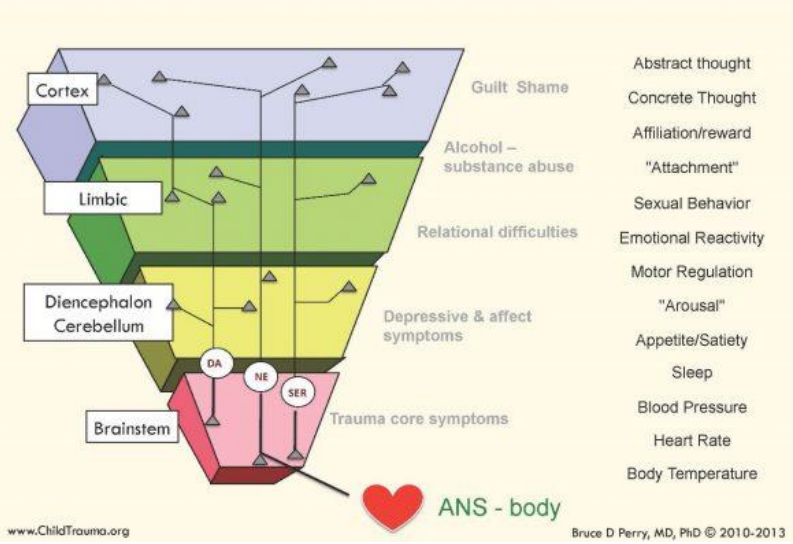

Figure 1

Current Literature – NMT with Traumatized Children

While NMT is a fairly new model, with its roots dating back to the early 1990s, the development of the model began on an interdisciplinary research team who were studying the effects of stress and trauma on neurodevelopment (Mitchell et al, 2020). This research has continued well after the development of the Neurosequential Model of Therapeutics, Neurosequential Model in Education, and NM for Caregivers, which are all subsets of the original model to be implemented in a variety of settings.

For example, Zarnegar et. al. studied the outcome of the use of early interventions utilizing the NMT with children diagnosed with fetal alcohol syndrome (FAS). All children who participated in this study were adopted and ranged from the age of 10 to 53 months of age. Measures used structured forms to conduct interviews and gather information from the children's

caregivers, the most relevant measures used are the NMT Metrics, which estimates a child's level of functioning in the following domains: sensory integration, self-regulation, relational and cognitive, and executive functioning (Zarnegar et. al., 2016, p. 7). Researchers from this study noted improved functioning in cognitive, relational, sensory integration, ability to self-regulate and in their capacity to use top-down processing skills (Zarnegar et. al., 2016, p. 11). Findings from this study suggest that early intervention methods that are rooted in a child's neuropsychological strengths can improve a child's ability to self-regulate as well as their overall functioning.

While research conducted by Zarnegar et. al. (2016) focused on working with outpatient clients, de Nooyer and Lingard (2016) centered their work using NMT with adolescents in a day treatment and inpatient setting. Participants in this study ranged from the ages of 12 to 18 years old and had the diagnosis of Posttraumatic Stress Disorder, Acute Stress Disorder, Adjustment Disorder, or a category within anxiety diagnoses (de Nooyer and Lingard, 2016, p.150). Many participants also presented with suicidal ideation and self-harm behaviors.

Researchers implemented NMT based interventions in stages and include the development of multiple groups. Interventions beginning in the brainstem were targeted for "Red" groups, interventions centered around improving functioning in the midbrain and emotional literacy were created for the "Amber" group, and interventions focused on improving functioning in the cortex were used for the "Green" group. These groups took place over the course of 10 weeks, in which time children were able to advance to higher level groups as they progressed.

The development of this curriculum demonstrates its feasibility in residential treatment and day treatment facilities. While logistics could present possible difficulties in the creation of

multiple groups, developing groups rooted in the children's level of functioning will be the most effective form of treatment to yield long term benefits.

Thus far, I have discussed varying definitions of trauma, how our understanding of trauma and trauma diagnoses is shifting, the current work in music therapy with this population in group and individual settings as well as an overview of NMT and current literature supporting this model. Next, I will evaluate gaps in the literature, how clinicians can create safety for clients who have experienced trauma and introduce possible interventions that support each level of the arousal continuum.

Discussion

Research reviewed for this paper exemplifies the gap between literature focused on group work and literature focused on individual case studies. Conducting more individual case studies, such as those by Christenbury (2015), with children who have experienced trauma who demonstrate acute behaviors, will allow future researchers and clinicians to gain better understanding of how interventions can be used depending on a child's acuity. It will also continue to exemplify differences in effectiveness of interventions utilized in the group environment versus an individual setting.

Many of the studies presented utilize the qualitative methods with participants, while only some (e.g., Wiess and Bensimon, 2020, Fairchild and McFerran 2018), include elements of these interviews in their final works. The integration of these interviews would aid in giving participants and children a voice in the research.

Developing a Safe Environment

Evidence from previously mentioned research with children who have experienced trauma suggest that safety can be created through predictability and rituals (Wiess and

Bensimon, 2020; Flores, 2016). The ability to process trauma through the nonverbal experience of music also can help to create a sense of safety, increase self-expression, and decrease the perceived threat of vulnerability clients may experience with verbal processing in psychotherapy (Wiess and Bensimon, 2020; Flores, 2016; Kim 2015).

Work presented from Fairchild and McFerran (2018) suggests that children should play an active role in their treatment. Caregivers and clinicians alike often underestimate the capacity that children have in knowing what their needs are and being able to express them. The way in which the research question of "What does music mean to you?" was addressed made it accessible for children to engage with through a group process. Scrine's (2021) criticism of the current assumption of safe spaces also urges clinicians to reframe how they're conceptualizing safety with their clients. In their work, they suggest for clinicians to prioritize what resources a client brings such as their community, consent, collaboration, and choice (p.8)

Early interventions are always ideal when working with this population (Hambrick 2018; Perry 2009). The Stress Model of Crisis illustrates the cycle of a child stress response, while the arousal continuum demonstrates what region of the brain a child is functioning in when they are in each state of stress. As reflected below, as a child escalates in crisis, their behaviors become more violent (see Appendix A). In these stages, a child is likely functioning from fight or flight (see Appendix B), may be screaming, or becoming assaultive, at which point in these facilities a physical restraint may be implemented. In my experience, the primary goal is to avoid putting children in restraints, as that can lead to re-traumatization. Music therapy can be used in residential and day treatment facilities as a preventative measure to provide an opportunity for children to regulate or coregulate when they are at baseline or triggered in order to avoid entering escalation.

Intervention Suggestions

NMT provides a framework for creating interventions while allowing the client and therapists creative independence. This does not mean every therapist will use the same interventions based on where the child is on the arousal continuum. Rather, it gives music therapist resources for interventions. Therapist will still use their clinical judgment as to which interventions will be regulating for the client. These interventions ideas are not a catch-all approach with children who have experienced trauma. Rather, interventions can be tailored to individual clients and depending on their personal interests and age.

Platt et al. have begun the work of creating a trauma informed handbook of interventions for creative arts therapists to utilize while working with this population. The handbook is divided into four parts: sensory integration, self-regulation, relational, and cognitive. The foreword is written by Bruce Perry himself, the founder of the Neurosequential Model of Therapeutics and the Child Trauma Academy, suggesting that the formation of this handbook was created around NMT. Each section includes interventions related to art therapy, dance/movement therapy, and music therapy.

Upon reviewing this handbook however, it appeared that most interventions in this book are targeted towards a younger clientele, possibly between the ages of five and eight. Again, the difficulty of the development of age-appropriate interventions became a relevant issue. Most of the kids that I have worked with in the residential setting are on average 10 years old. *Walk to the Beat* is a music therapy intervention mentioned within the self-regulation section of the book that focuses on a child walking to the tempo of a song introduced by the therapist. This intervention focuses on the goal area of self-regulation through co-regulation led by the therapist in music.

The book suggests for the therapist to hold the child's hand or walk side-by-side. The therapist then taps or vocalizes a beat to for them and the client to walk to. If the goal is for the child to slow down, the therapist may begin the tapping or vocalizing at a faster tempo and gradually slow down. If the goal area is to energize a client who is lethargic or in a low mood, the therapist may start with a slow beat and gradually speed up. This activity can also be done with other movements, e.g., crawl to the beat, tiptoe to the beat, slide to the beat, etc. (Platt, et. al, 2014, p.43).

While interventions such as *Walk to the Beat* may be appropriate for younger children, in my experience, interventions such as these do not have as much buy in from the older children that I work with in residential treatment. With this, a music therapist needs to consider how to modify an intervention like this to engage the client and meet the same goal areas as *Walk to the Beat.* Further*,* they need to know what capacity the client has to engage with music and how they can engage depending on where they are functioning within the arousal continuum. Though music therapy interventions can be implemented to increase self-regulation and functioning in lower regions of the brain such as the brainstem, note that in the table (see Appendix C) there are no interventions presented for clinicians when clients are functioning at a level of fear or terror.

At these points in the arousal continuum, the child will not have any capacity to engage with the therapist's interventions that require complex regions of the brain. With that, interventions that are rooted in rhythm can work towards increasing functioning in these regions (Malchiodi, Crenshaw, & Robarts 2015, p. 73). It is essential for the therapist to recognize moments of fear or terror in the child and to give space, time, and silence for the child to begin to regulate or model for the therapist to model co-regulation. If a child is demonstrating aggressive

physical behaviors that is also a clear indicator that they likely do not have the capacity to engage with these interventions.

Research reviewed for this paper has informed my creation of an intervention table that corresponds to the arousal continuum and includes music therapy methods that are appropriate with each level of functioning (See Appendix C). As clinicians and researchers continue to develop a deeper understanding for developmental and complex trauma in children and adolescents, I hope that these intervention ideas and table that corresponds with the arousal continuum will aid in the continued integration of NMT and music therapy –in residential treatment facilities and other environments.

Gaps in the Literature

As researchers have repeatedly demonstrated, the development of safety, predictability and trust are crucial when working with children who have experienced trauma (Scrine 2021, Flores 2016, Malchiodi 2015). With that said, it's imperative for clinicians to focus on the development of those aspects of the therapeutic relationship before implementing any of these interventions. There is an ever-present need for more literature in this area of research. This includes what specific interventions work best with each population, how reintegration can manifest depending on the population and the music therapist's therapeutic approach, and how the client's direct involvement with the songwriting process can affect their ability to verbally process emotions. This also is dependent upon the age of the child, and the amount of time since their traumatic experience(s). Using a collaborative model would give music therapists and clinicians a common ground in understanding goal areas addressed in session. NMT provides a touching stone for communication between clinicians, music therapists and staff who work at institutions that utilize NMT.

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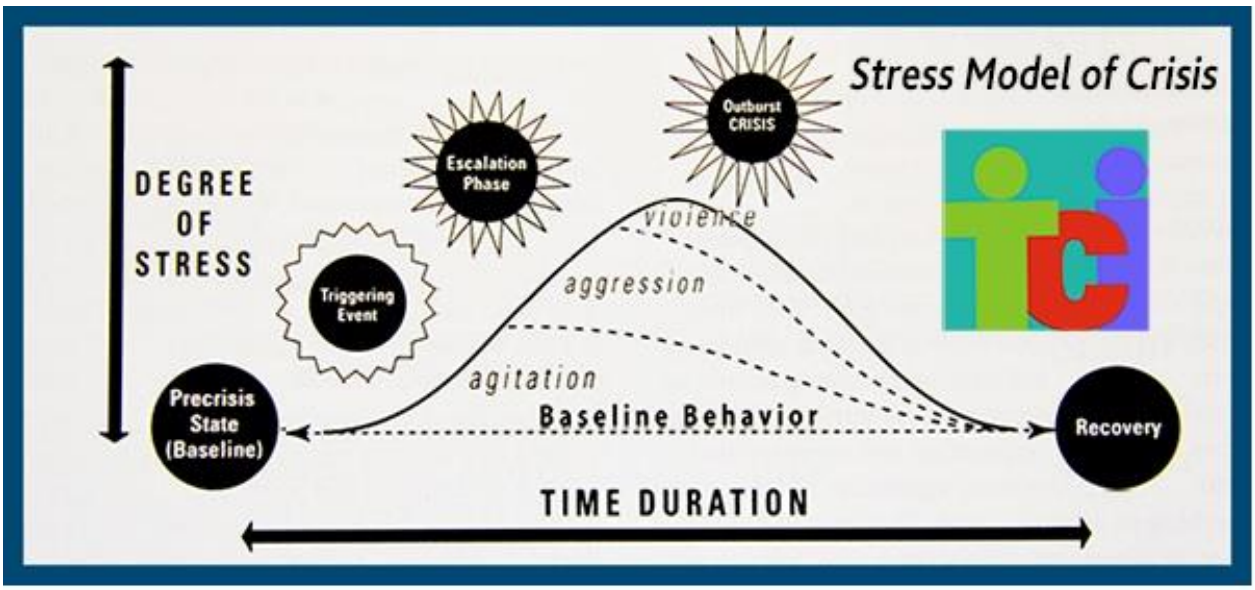
Appendix A



Appendix B

Adaptive Response	REST	VIGILANCE	FREEZE	FLIGHT	FIGHT
Predictable De-escalating Behaviors *(behaviors of the teacher or caregiver when a child is in various states of arousal)*	Presence Quiet Rocking	Quiet voice Eye contact Confidence Clear simple directives	Slow sure physical touch "Invited" touch Quiet melodic words Singing, humming music	Presence Quiet Confidence Disengage	Appropriate physical restraint Withdraw from class TIME!
Predictable Escalating Behaviors *(behaviors of the teacher or caregiver when a child is in various states of arousal)*	Talking Poking Noise Television	Frustration, anxiety Communicate from distance without eye contact Complex, compound directives Ultimatums	Raised voice Raised hand Shaking finger Tone of voice, yelling, threats Chaos in class	Increased or continued frustration More yelling Chaos Sense of fear	Inappropriate physical restraint Grabbing Shaking Screaming
Regulating Brain Region	**NEOCORTEX** Cortex	**CORTEX** Limbic	**LIMBIC** Midbrain	**MIDBRAIN** Brainstem	**BRAINSTEM** Autonomic
Cognition	ABSTRACT	CONCRETE	EMOTIONAL	REACTIVE	REFLEXIVE
STATE	CALM	ALERT	ALARM	FEAR	TERROR

Appendix C

Calm *Neocortex - Cortex*	**Alert** *Subcortex – Limbic*	**Alarm** *Limbic - Midbrain*	**Fear** *Midbrain-Brainstem*	**Terror** *Brainstem - Autonomic*
Abstract	***Concrete***	***Emotional***	***Reactive***	***Reflexive***
Instructional instrument play		Rhythm activities – Drumming (Flores 2016)		
Improvisational play – possibly with verbal processing	Improvisational play- without verbal processing	Rhythmic entrainment (Bensimon, 2021)		
Songwriting – with little to no prompts	Songwriting activities with prompts / fill in the blanks (Christenbury 2015)	Songwriting primarily conducted by therapist (Christenbury 2015)		
Lyric analysis	Relaxing music (Bensimon, 2021)	Relaxing music (Bensimon, 2021)		
Collaborative and group songwriting (Fairchild, 2018)		Music with movement (Bensimon, 2021)		

THESIS APPROVAL FORM

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Student's Name: Brianna Lambert-Jenkins

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Title: The Effectiveness of Music Therapy with Children Who Have Experienced Trauma Using the Neurosequential Model of Therapeutics (NMT): A Literature Review

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In the judgment of the following signatory this thesis meets the academic standards that have been established for the above degree.

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