

**Vibroacoustic Therapy and its Effects on the Attention of Children with Autism
Spectrum Disorder**

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ABSTRACT

Attention challenges are common among children with autism spectrum disorder (ASD), as evidenced by observable behaviours and brain structure (Janzen & Thaut, 2018). Attention challenges seen in ASD are linked to poor socio-communication and emotion regulation skills (Beckwe et al., 2014; Janzen & Thaut, 2018; Leitch, 2017; Lutz et al., 2008; McRae et al., 2012). This mixed methods study investigates Vibroacoustic Therapy (VAT) as a potential intervention for children with ASD, focusing specifically on its effects on attention and its link to emotion regulation. The study also aims to understand the experiences of children with ASD undergoing VAT to determine its feasibility as a therapeutic intervention.

The pilot study involved 18 children (n=18), with nine in the treatment group and nine in the control group and three in the pilot group. It also involved the teachers of the children in the treatment and control groups. The study commenced with a pilot phase involving the pilot group, after which the treatment and control groups underwent 10 20-minute VAT sessions over six weeks. The study used a concurrent design, collecting independent quantitative and qualitative data throughout and integrating them in the interpretation phase. Quantitative components included attention assessments (NEPSY-II and JTAT) and teacher questionnaires which assessed sustained, selective, alternating, and joint attention, common challenges in children with ASD (Allen & Courchesne, 2001; Warreyn et al., 2014). Tests were administered before, halfway through, immediately after, and one week after the intervention to measure effects over time. Qualitative components included observations and creative semi-structured interviews, exploring the children's experiences of VAT.

Findings indicated significant improvements in joint attention and positive experiences in emotion regulation, positioning VAT as a valuable intervention. The study confirms the acceptability and feasibility of VAT, emphasising its potential for integration into therapeutic programs, therapy practices, and school sensory rooms. However, one may need to adapt the intervention to meet diverse needs and sensory profiles of children with ASD. The study provides insight into VAT as a holistic therapy approach for children with ASD, highlighting specific recommendations for future research and implementations for practice.

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Table of Contents

1. Introduction	8
1.1 Background and context	8
1.2 Reflection on terminology	8
1.3 Aim	9
1.4 Research questions	9
2. Literature review	10
2.1 Introduction	10
2.2 Autism and attention	10
2.3 Attention and emotion regulation	11
2.4 Music and autism	12
2.5 Vibroacoustic therapy	13
2.5.1 Vibroacoustic therapy mechanism	14
2.6 Vibroacoustic therapy and autism	15
2.7 Conclusion	17
3. Methodology	19
3.1 Introduction	19
3.2 Research approach	19
3.3 Research design	20
3.4 Sampling	21
3.4.1 Inclusion and exclusion criteria	22
3.5 Pilot phase	23
3.6 Data collection	24
3.6.1 Attention measures	24
3.6.1.1 NEPSY-II Attention subtest	25
3.6.1.2 Joint Attention Test (JTAT)	26
3.6.2 Attention questionnaires	26
3.6.3 Observation notes	27
3.6.4 Creative semi-structured interviews	27
3.7 Procedure	28

3.8 Data preparation	29
3.8.1 Preparation of quantitative data	29
3.8.2 Preparation of qualitative data	30
3.9 Data analysis	30
3.9.1 Quantitative data analysis	31
3.9.2 Qualitative data analysis	31
3.9.3 Integration of qualitative and quantitative findings	31
3.10 Ethical considerations	32
3.11 Research quality	33
4. Analysis and findings	35
4.1 Introduction	35
4.2 Quantitative data analysis	35
4.2.1 NEPSY-II auditory attention scores	36
4.2.2 NEPSY-II response set scores	38
4.2.3 JTAT scores	40
4.2.4 Questionnaire data analysis	42
4.2.4.1 Overall attention	43
4.2.4.2 Sustained attention	44
4.2.4.3 Selective attention	45
4.2.4.4 Alternating attention	47
4.2.4.5 Joint attention	48
4.3 Qualitative data analysis	49
4.3.1 Creating codes	49
4.3.1.1 Observations	49
4.3.1.2 Creative interviews	50
4.3.2 Creating categories	51
4.3.3 Creating themes	53
4.3.3.1 Theme one: Physical sensations	54
4.3.3.2 Theme two: Positive emotional state	54
4.3.3.3 Theme three: Low-intensity experience	55
4.3.4 Engagement with creative interviews	55
4.4 Summary of results	56

5. Discussion	58
5.1 Introduction	58
5.2 The effects of VAT on attention	58
5.2.1 Effect on joint attention	58
5.2.1.1 Dose, sustained and immediate effects	59
5.2.1.2 Neurophysiological regulation	59
5.2.1.3 Emotion regulation	60
5.2.2 Effect on other attentional domains	65
5.2.2.1 Neurophysiological perspective	65
5.3 Participants' experiences of VAT	66
5.3.1 Positive emotional state	67
5.3.2 Falling asleep	68
5.3.3 Feelings of warmth	68
5.3.4 Experience of VAT as gentle	69
5.3.5 Understimulation during VAT	70
5.3.6 VAT and improved speech	70
5.4 Feasibility of VAT	71
5.5 Implications for practice	73
5.6 Value of creative interview method	74
5.7 Limitations	76
6. Conclusion	79
6.1 Summary of findings	79
6.2 Recommendations for future research	79
6.3 Conclusion	81
7. References	82
Appendices	95
Appendix A: Principal of School Letter of Information	95
Appendix B: Consent from school	98
Appendix C: Guardian Letter of Information for Treatment Group	99

Appendix D: Guardian Letter of Information for Control Group	101
Appendix E Guardian Letter of Information for Pilot Group	103
Appendix F: Guardian Consent Form for Treatment Group	105
Appendix G: Guardian Consent Form for Control Group	107
Appendix H: Guardian Consent Form for Pilot Group	108
Appendix I: Teacher Letter of Information	109
Appendix J: Teacher Consent Form	111
Appendix K: Child Information Form	112
Appendix L: Child Assent Form	113
Appendix M: Brief Feedback Schedule	114
Appendix N: Creative Interview Schedule	115
Appendix O: Brief Interview Data Collection Sheet	116
Appendix P: Parent Questionnaire	117
Appendix Q: Teacher Questionnaire	118
Appendix R: Joint Attention Test	119
Appendix S: Procedure for Treatment Group	121
Appendix T: Timers	122
Appendix U: Transcriptions of Creative Interviews	123
Appendix V: Coding of Engagement in Creative Interviews	180

Chapter 1: Introduction

1.1 Background and context

Attention deficit stands out as a key characteristic of autism spectrum disorder (ASD), as highlighted by Allen and Courchesne (2001). Research indicates that compromised attention negatively impacts socio-communication skills, a common observation in individuals with ASD (Janzen & Thaut, 2018). Furthermore, a reciprocal relationship exists between attention and emotion regulation, both crucial for optimal well-being. This relationship is particularly relevant as both emotion dysregulation and attention challenges are prevalent among children with ASD (Beckwe et al., 2014; Leitch, 2017; Lutz et al., 2008; McRae et al., 2012).

My interest in addressing the challenges of attention in children with ASD stems from personal experiences working closely with this population. I often observed attention challenges and was intrigued by their links with social interaction. Additionally, I frequently noticed the calming role that music played, which appeared to translate into improved present-moment attention and social engagement, aligning with Berger's (2002) findings. This evoked further interest in exploring how emotion regulation may play a role in improving attention. Porges (2017) notes that emotion dysregulation, often influenced by sensory sensitivities such as hyper- or hyposensitivity to auditory and tactile stimuli (Dellapiazza et al., 2021), can hinder present-moment attention and social engagement.

Building on the significance of music, the historical use of music and sound vibrations across cultures for healing purposes has paved the way for less-known yet effective interventions like Vibroacoustic Therapy (VAT). VAT is a non-invasive, receptive form of music therapy, involving experiencing music and sound vibrations through specialised chairs or beds, coupled with a therapeutic presence. Demonstrating efficacy in treating various health conditions, VAT has shown links to improved attention, emotion regulation and overall well-being (Lundqvist et al., 2008; Punkanen et al., 2017; Shirazi, 2023). However, there is a gap in research specifically exploring its effects on attention in children with ASD.

As interest in holistic interventions for children with ASD continues to grow, VAT may stand out as a comprehensive and promising practice. The holistic approach involving music and sound vibrations, and a therapeutic presence may also have implications for targeting tactile and auditory sensitivity, as well as for promoting safety, relaxation, and overall well-being.

This study focused on exploring the potential of VAT as a non-invasive, portable, and user-friendly intervention for children with ASD.

1.2 Reflection on terminology

In considering the terminology used to refer to individuals with ASD, I acknowledge the ongoing debate within professional circles regarding the appropriate and respectful language (Taboas et al., 2023). It is recognised that preferences for person-first or identity-first language vary among members of the autism community (Taboas et al., 2023). Ultimately, I believe the primary consideration should be the individual's own preference. Given that the school where I conducted my research identifies itself as a “school for children with ASD,” I made a conscious decision to honour their chosen terminology, which may closely reflect the preferences of the children and their parents. Moving forward, I am committed to conducting my work and research in a manner that respects the unique preferences of each individual.

1.3 Research questions

The research questions that directed this study are as follows:

- *Quantitative question:* Can VAT improve the attention of children with ASD?
- *Qualitative question:* How do children with ASD experience VAT?
- *Mixed methods question:* Is VAT an effective and practically feasible intervention for improving attention capacity of children with ASD?

1.4 Outline of the study

Nine participants in the treatment group received 10 VAT sessions over the course of five weeks, while nine participants who matched them in the control group did not receive the VAT sessions. All participants underwent attention assessments throughout the five week intervention as part of the quantitative aspect. Regarding the qualitative aspect, only the participants in the treatment group provided brief feedback after VAT sessions and observation notes were taken of them undergoing VAT. They then took part in creative interviews at the end of the five week intervention, providing more feedback. Results were analysed and integrated to determine the feasibility of VAT.

Chapter 2: Literature review

2.1 Introduction

This review begins by exploring the literature related to attention challenges experienced by children with autism spectrum disorder (ASD). It subsequently focuses on vibroacoustic therapy (VAT) and its potential impact on attention, emphasising its role in emotion regulation. Despite existing literature on the benefits of music therapy for children with ASD, a noticeable research gap exists regarding the specific effects of VAT on the attention of children with ASD.

2.2 Attention and autism spectrum disorder

ASD is characterised by a range of symptoms affecting social communication, repetitive behaviours, sensory sensitivities, and emotion regulation (Cai et al., 2018; Lord et al., 2020; Welsh & Estes, 2018). One frequently overlooked symptom is attention difficulties (Janzen & Thaut, 2018).

Attention is a fundamental cognitive function that enables individuals to prioritise specific thoughts while filtering out less relevant stimuli (Deco & Thiele, 2009). As emphasised by Deco and Thiele (2009), attention is crucial for preparing individuals to respond appropriately in various situations. It functions by prioritising specific thought processes in a hierarchical manner, allowing preferred thoughts to be at the forefront of the mind while suppressing less-favoured thoughts or stimuli (Deco & Thiele, 2009). Janzen and Thaut (2018) observe structural differences in the brains of individuals with ASD, highlighting challenges in attention. They also underscore the strong link between attention challenges and poor socio-communication and interaction skills. Socio-communication skills are vital for establishing connections with others and contributing to an overall sense of well-being (Danker et al., 2019).

Sohlberg and Mateer (2001) categorise attention into five main types: focused attention, sustained attention, selective attention, alternating attention, and divided attention. Refer to Table 1 for the definition of each attention domain. Joint attention, defined as the shared focus on a specific subject with others, plays a crucial role in social development and relationship-building (Bruinsma et al., 2004). However, children with ASD often face challenges, particularly in sustained, selective, alternating, and joint attention (Allen & Courchesne, 2001; Warreyn et al., 2014).

Table 1

Sohlberg and Mateer Attentional Model (Sohlberg & Mateer, 2001)

Attention domain	Description
Focused attention	Response to distinct auditory, visual or tactile stimuli
Sustained attention	Maintenance of focus during extended periods
Selective attention	Maintenance of focus in the presence of distracting stimuli
Alternating attention	Ability to switch focus between tasks
Divided attention	Ability to attend on multiple stimuli or tasks

2.3 Attention and Emotion Regulation

A crucial connection exists between attention and emotion regulation, where emotion regulation refers to the process responsible for the management and control of one's moods and emotions (Gross, 2015; Koole, 2009; Webb et al., 2012). Effective emotion regulation empowers individuals to control their emotions and significantly contributes to emotional well-being (Cai et al., 2018). This link gains particular significance in the context of ASD, as children with ASD often encounter challenges related to emotion regulation (Porges, 2017).

Expanding on this concept, Beckwé et al. (2014) and McRae et al. (2012) suggest that attentional issues may underlie the emotion regulation difficulties observed in ASD (Cai et al., 2018). Leitch (2017) agrees and suggests that improving attention can lead to enhanced neuroplasticity relating to improved emotion regulation skills and thus well-being. Additionally, Lutz et al. (2008), Tang et al. (2007), and Tang et al. (2014) have identified attention monitoring and training as significant contributors to neural connectivity involved in emotion regulation, promoting neuroplasticity, and enhancing resilience.

Attentional deployment is an attention-based emotion regulation strategy that involves shifting attentional focus within an emotional scene to modulate emotional experience (Ferri & Hajcak, 2015). Cognitive reappraisal is another attention-based technique that assists individuals in regulating their emotions and involves reframing the interpretation of emotional stimuli to effectively alter emotional responses (Buhle et al., 2014; Logue & Gould, 2014). Both emotion regulation strategies rely on strong attentional capacity, offering further insight into the role of attention in emotion regulation (Cai et al., 2018). Individuals with ASD often exhibit atypical

patterns of activation in attention-related brain regions during various executive function tasks, contributing to their observed deficits in cognitive reappraisal and attentional deployment (Logue & Gould, 2014). Consequently, this decreases their ability to regulate their emotions.

Conversely, Leitch (2017) and Lutz et al. (2008) argue that improved emotion regulation is crucial for accessing attention effectively. Berger (2002) and Porges (2017) agree, offering a neurophysiological perspective, suggesting that individuals must establish a state of calm to regulate their emotions effectively before engaging in attentional functions (Berger, 2002). A state of emotion dysregulation may lead to disengaged higher functions, such as attention (Rodriguez & Kross, 2023). In contrast, a state of calm enables higher-level functioning, including attention (Berger, 2002; Porges, 2017). Leitch (2017) underscores the brain's neuroplasticity and its ability to deepen emotion regulation skills through exposure to safe and grounding situations. Continuous exposure to situations that help regulate emotions may result in an improved ability to regulate one's emotions (Porges, 2017). Improved attention appears to be a strong mediator in this process, enabling individuals to pay greater attention to their situation, thoughts, and feelings, thus assisting in emotion regulation and overall emotional well-being.

These studies underscore the reciprocal relationship between attention and emotion regulation, highlighting their mutual dependence. Interestingly, research shows similar links between joint attention and emotion regulation in that when one is in a state of emotion regulation, social engagement is more possible, and thus joint attention is more possible (Porges, 2017).

2.4 Music and Autism

As highlighted earlier, attaining a state of calm is crucial for children with ASD to regulate their emotions effectively. Research indicates that certain types of music can have calming effects, fostering a sense of safety, and facilitating emotion regulation (Berger, 2002). Berger (2002) emphasises music as one of the most effective tools for inducing relaxation and promoting bodily comfort. Soft, gentle, slow, and low-pitched music is considered calming (Grocke & Wigram, 2006). Music characterised by consistency, predictability, gentle timbres, and unchanging melodic lines has proven effective in inducing relaxation while reducing overstimulation (Wigram, 2004). This emotion regulating capacity may then further allow for improved attention (Rodriguez & Kross, 2023).

Janzen and Thaut (2018) discovered that music can effectively engage brain networks related to the cerebellum, thereby improving attention. Music therapy, in particular, has demonstrated effectiveness in enhancing attention and emotional well-being. Additionally, Neurologic Music Therapy Interventions such as the Music Attention Control Training (MACT) aim to improve attentional processes, including sustained, selective, and alternating attention (Sa, 2020). Regarding receptive forms of music therapy, such as music listening, promising research indicates enhanced neural connections related to attention (Alluri et al., 2017). Mahraun (2004) found that children with ASD performed significantly better on sustained attention tasks while listening to background music or rhythmic patterns than without the music stimuli.

Despite this growing body of research, a notable gap exists in research on the role of receptive music therapy techniques specifically targeting attention deficits among children with ASD. Given the connection between attention and emotion regulation, addressing attention challenges could potentially contribute to improved emotional well-being in this population.

2.5 Vibroacoustic Therapy

For countless years and across diverse cultures globally, sound vibrations have been used for healing purposes across physical, mental, and spiritual dimensions (Pulido, 2021). VAT is a non-invasive and receptive form of music therapy that employs music or sound vibrations for therapeutic purposes (Punikanen & Ala-Ruona, 2012). It involves the use of low-frequency sinusoidal sound vibrations and music delivered through specialised equipment such as mats, beds, or chairs, intending to achieve therapeutic outcomes. Trained music therapists administer VAT sessions, employing therapeutic techniques and music in a receptive setting, allowing clients to benefit without active music-making participation. VAT demonstrates its effectiveness in treating a wide range of conditions, including fibromyalgia, Parkinson's disease, neuro-musculoskeletal disorders, spasticity, dementia, insomnia, depression, and pain disorders (Bartel et al., 2017; Clements-Cortes, 2017; Grocke & Wigram, 2006; Mosabbir, 2020; Punikanen & Ala-Ruona, 2012; Skille, 1992; Wigram, 1996).

While the use of sound vibration for therapeutic purposes has a long history, VAT emerged as a distinct practice in the 1980s, pioneered by Olav Skille, a Norwegian scientist, therapist, and musician (Grocke & Wigram, 2006). Skille attributes the inception of VAT to a conversation between himself and Juliet Alvin, a pioneer Music Therapist (Skille, 2017). During their discussion, they explored fundamental aspects of music, including its universal elements, as

well as the role of relaxation as a primary outcome in Music Therapy (Skille, 2017). This inspired Skille to further explore the relaxation effect, ultimately leading to his pioneering work in VAT (Skille, 2017). Skille initiated his studies by working with children affected by high muscle tone and spasticity resulting from brain injuries. Positive outcomes, including muscle relaxation, prompted Skille to explore VAT's application in conditions such as depression, pain disorders, strokes, asthma, and ASD. These pioneering efforts significantly contributed to the development and understanding of VAT as a therapeutic approach.

During VAT sessions, a trained therapist operates the equipment, adjusting the music or sound vibrations to vibrate at low frequencies typically ranging from 25 to 75 Hz, depending on the specific condition being treated (Bartel et al., 2017). This frequency range has proven most beneficial in treating the aforementioned conditions. VAT's therapeutic approach integrates the effects of sound vibrations, music listening, and the therapeutic relationship between the client and therapist, making it a holistic form of music therapy. Skille (1989) recommended VAT sessions lasting between 15 and 40 minutes, with the most common duration being around 23 minutes. This is to accommodate the intensity of low tone frequencies and prevent overstimulation, while ensuring sufficient time for individuals to experience VAT's relaxation effects (Palmer et al., 2017).

Tony Wigram, another notable contributor to the field of VAT, emphasised the importance of the VAT administrator being a qualified music therapist (Wigram, 1996). This emphasis stems from VAT's primary focus on sound and music stimulation and its therapeutic application to achieve specific therapeutic goals.

2.5.1 Vibroacoustic Therapy Mechanism

To comprehend the mechanism of VAT, it is essential to understand how sounds function at specific frequencies. When sounds encounter certain objects, including the human body, they can induce a phenomenon known as sympathetic resonance (Grocke & Wigram, 2006). In VAT, this phenomenon plays a pivotal role. When sympathetic resonance occurs, different parts of the body, each vibrating at distinct frequencies, respond to incoming vibrations. These resonant responses extend deep into the body's tissues and muscles, leading to autonomic reactions influencing muscle tone, blood pressure, and heart rate. The net effect is an overall sense of relaxation (Skille, 1992). This mechanism is evident in Skille's research, particularly

in children with neurologic disorders and in individuals with conditions characterised by muscle spasticity, such as cerebral palsy (Skille, 1986, 1989).

The positive impact of VAT can be attributed to the fact that sound travels through water faster than through air. Considering that the human body and brain consist of approximately 66% and 80% water, respectively, the vibrations involved in VAT can significantly affect the body and its various components (Wigram, 1996). Furthermore, the choice of calm music in VAT sessions is instrumental in facilitating relaxation (Groccke & Wigram, 2006). When combined with the sound vibrations inherent to VAT, soothing music creates a comprehensive relaxation experience for individuals undergoing the therapy.

VAT also shows promising research in terms of the impact of sound frequencies on neural responses. Neural oscillations, representing spontaneous electrical activity in the brain, are crucial for neuroplasticity and information consolidation (Buzsáki & Draghun, 2004). Different brain oscillatory rhythms function at specific frequencies. For instance, gamma oscillations, with a frequency range of 30 to 50 Hz, play a vital role in cognitive functions such as attention. Many health conditions exhibit dysrhythmic neural oscillations, and in individuals with ASD, this can be seen in brain areas related to attention and emotion regulation (Fauzan & Amran, 2015). Research indicates that sounds of particularly 40Hz gamma frequency are effective in inducing steady brain oscillations (Bartel et al., 2017). This positions VAT as a promising intervention capable of augmenting neural functioning and addressing attention and emotion regulation deficits.

Subjective reports of VAT's relaxation effect, with some referring to it as a mindfulness-based practice (Ahonen et al., 2012), align with research showing improvements in mood and an overall sense of well-being (Bartel et al., 2017; Ellis, 2004). Pulkanen and Ala-Ruona's (2012) research also characterises VAT as a non-invasive, relaxing, and enjoyable intervention.

2.6 Vibroacoustic Therapy and Autism

While research on VAT's impact specifically on attention in children with ASD is limited, a few studies have shown the use of VAT with individuals with ASD. Skille (1989) conducted a study on children with ASD and tactile defensive behaviour, and results showed that these children were more able to engage in physical contact after undergoing VAT. A more recent study conducted by Shirazi et al. (2023) used VAT as part of an integrated programme of

sensory rehabilitation, showing improvement in the emotional profile of children with ASD. Lundqvist et al. (2009) looked at the effects of VAT on adults with ASD and found that they presented with increased relaxation and decreased aggression. They also found an increase in attention, however, this study focused specifically on adults with ASD, highlighting a gap in the research regarding VAT's effects on the attention of specifically children with ASD. Regarding more research on specifically VAT and attention, Punkanen et al. (2017) present a case study on a child experiencing regular states of emotion dysregulation similar to that seen in ASD. VAT helped improve his concentration, although it is essential to note that this is a single case study lacking statistical significance.

Understanding the neurophysiological aspects provides a foundation for comprehending VAT's impact on attention, including joint attention. Research indicates that brain areas related to attention, including joint attention, function optimally at 40Hz gamma frequency (Bartel et al., 2017; Chandrasekaran & Ghazanfar, 2009; Jensen et al., 2007; Kahlbrock et al., 2012; Peiker et al., 2015). VAT, incorporating 40Hz sound stimulation, may regulate irregular brain oscillations associated with attention, often observed in individuals with ASD (Bartel et al., 2017; Hessel et al., 2021). However, this simplified explanation may necessitate further research for a comprehensive understanding.

VAT's potential to enhance attention may also be linked to its emotion-regulating capabilities (Punkanen et al., 2017; Shirazi et al., 2023). Shirazi et al. (2023) found increased emotion regulation in children with ASD resulting from VAT. The case study by Punkanen et al. (2017) of a child experiencing regular states of severe emotion dysregulation also demonstrates VAT as being an emotion-regulating intervention that offered safety and comfort, in addition to improved concentration. As previously mentioned, emotion regulation may lead to improved attention, including joint attention (Harder, 2022; Porges, 2017; Punkanen et al., 2017). According to Porges (2017), emotion regulation can also be indicated through relaxation and a sense of calm, which VAT offers (Bartel et al., 2017; Ellis, 2004; Punkanen et al., 2017; Skille, 1989). Ahonen et al. (2012) even suggest VAT as being a mindfulness-based practice in that participants reported more attention to the present moment, increased focus on bodily sensations, and increased relaxation during and after undergoing VAT, indicating emotion regulation and thus potentially improved attention.

Improvement in attention may also be attributed to sensory integration facilitated by VAT. Sensory integration involves the effective processing of external stimuli crucial for emotion regulation (Rodriguez & Kross, 2023; Simhon et al., 2019), and is a common challenge among children with ASD (Kilroy et al., 2019). A particularly common challenge involving sensory integration seen among individuals with ASD is the integration of tactile sensory input (Dellapiazza et al., 2021). Pulkanen et al. (2017) highlight the significance of the tactile system in indicating safety and comfort and suggest VAT's effectiveness in regulating emotions through its tactile aspect. As previously mentioned, Skille (1989) found that children with ASD and tactile defensive behaviour who underwent VAT enjoyed VAT's physical sensations and showed less tactile defensive behaviour and more openness to physical contact after undergoing VAT. This may show VAT's potential role in regulating sensitive tactile systems in children with ASD, leading to greater emotion regulation and thus more potential for increased attention and joint attention.

VAT's effectiveness in improving emotion regulation and thus attention may also be seen from the perspective of integrating auditory stimuli. Hypersensitivity and hyposensitivity to auditory input are also common sensory integration challenges among children with ASD (Dellapiazza et al., 2021). Calm music, a key component of VAT, may, however, assist in integrating auditory information and thus assist emotion regulation in children with ASD (Pulkanen et al., 2017; Wigram, 2004), subsequently contributing to improved attention (Dellapiazza et al., 2021; Porges, 2017; Rodriguez & Kross, 2023).

Porges (2017), Pulkanen and Ala-Ruona (2012), and Pulkanen et al. (2017) emphasise the significance of therapeutic presence, a key component often needed with VAT. Therapists can establish a sense of safety and comfort through warmth and empathy, cultivating trust and effective co-regulation (Porges, 2017). Nonverbal cues, such as facial expressions and prosody of speech, play a crucial role in conveying understanding and safety (Porges, 2017). Pulkanen et al. (2017) highlight the important role that the therapeutic presence in VAT plays in assisting emotion regulation. This is particularly relevant in working with children with ASD who regularly experience emotion dysregulation. Once again, an improved sense of safety may indicate emotion regulation and thus potentially improved attention and joint attention (Harder, 2022; Porges, 2017).

2.7 Conclusion

In summary, this literature review highlights the intricate relationship between attention, emotion regulation, and the potential impact of VAT on children with ASD. The existing literature underscores the mutual dependence of attention and emotion regulation, emphasising their significance in the context of ASD. While music therapy, particularly in the form of VAT, shows promise in addressing attention deficits and promoting emotion regulation, a notable gap remains in research specific to VAT's effects on the attention of children with ASD. The subsequent sections will further explore this gap, drawing connections between attention, emotion regulation, and the potential therapeutic benefits of VAT for children with ASD.

Chapter 3: Methodology

3.1 Introduction

This chapter outlines the methodology used in the study. It includes the chosen paradigm, design, sampling strategy, data collection methods, and procedures. It then covers data preparation and analysis and ends with a discussion of the ethical considerations and research quality employed.

This study aimed to answer the questions:

- *Quantitative question:* Can VAT improve the attention of children with ASD?
- *Qualitative question:* How do children with ASD experience VAT?
- *Mixed methods question:* Is VAT an effective and practically feasible intervention for improving attention capacity of children with ASD?

3.2 Research approach

This study employed a mixed methods approach, integrating both qualitative and quantitative methodologies (Creswell & Clark, 2018). Mixed methods research derives strength from triangulation, wherein the results of one method inform and guide the analysis and results of the other, thereby enhancing overall rigor (Bryman, 2012). It allows the researcher to rely on multiple data sources and diverse perspectives, adding richness to the findings. However, it is important to note that mixed methods research may be time-consuming and challenging, requiring the researcher to learn and understand how to integrate the findings. However, if given careful attention, the benefits of this approach may outweigh the challenges (Migiro & Magangi, 2011).

In the current study, the quantitative aspect assesses the effectiveness of VAT, while the inclusion of a qualitative component aims to enhance data richness by capturing participants' subjective experiences. This dual-method approach ensures a comprehensive exploration of the intervention's feasibility.

The study was grounded in a pragmatic paradigm, emphasising the importance of finding realistic answers by considering multiple perspectives (Creswell & Clark, 2018). By utilising both quantitative and qualitative data, this study aimed to provide comprehensive insights and

effectively address the research questions. Pragmatism values research that is relevant, useful, and applicable in real-world contexts, considering specific circumstances rather than relying solely on generalisability (Creswell & Clark, 2018). Collaborative engagement with children through interviews and feedback played a vital role in understanding the feasibility and practicality of the intervention. This approach aligns with the ontological stance of pragmatism which acknowledges the significance of participants' subjective experiences. Pragmatism recognises that while there may be an objective reality, individuals have their own subjective truths (Morgan, 2007). In terms of epistemology, pragmatism emphasises the value of both subjective and objective forms of knowledge (Johnson & Christensen, 2012).

3.3 Research design

The design employed in this study was a concurrent design in which the quantitative and qualitative data were collected separately, and concurrently. The quantitative and qualitative data were largely independent and were integrated in the discussion phase (Creswell & Clark, 2018) (Figure 1). In choosing this design, I aimed to determine the effectiveness of VAT in improving attention. However, felt it equally important to consider the participants' subjective experiences in that if the intervention was not accepted by the participants, it may not be a feasible intervention. Together, these two aspects aimed to assess whether VAT may in fact be feasible for children with ASD.

The study included a treatment group, a control group, and a pilot group. The treatment and control groups consisted of nine participants each, with the pilot group containing three participants. The control group did not receive any treatment. The pilot group underwent one VAT session and round of quantitative assessments before the commencement of the study. Both treatment and control groups underwent quantitative tests during the same periods, while only the treatment group underwent VAT sessions. This allowed me to assess the potential effect of the intervention on attention over time, while comparing the treatment to the control group.

The quantitative tests were conducted in four phases to provide insight into the different time effects of VAT on attention. The four phases included the pre-test, which acts as a baseline test, the mid-test which offers insight into possible immediate and dose effects, post-test 1 which tests for treatment effects and immediate effects, and post-test 2 which looks at possible sustained effects.

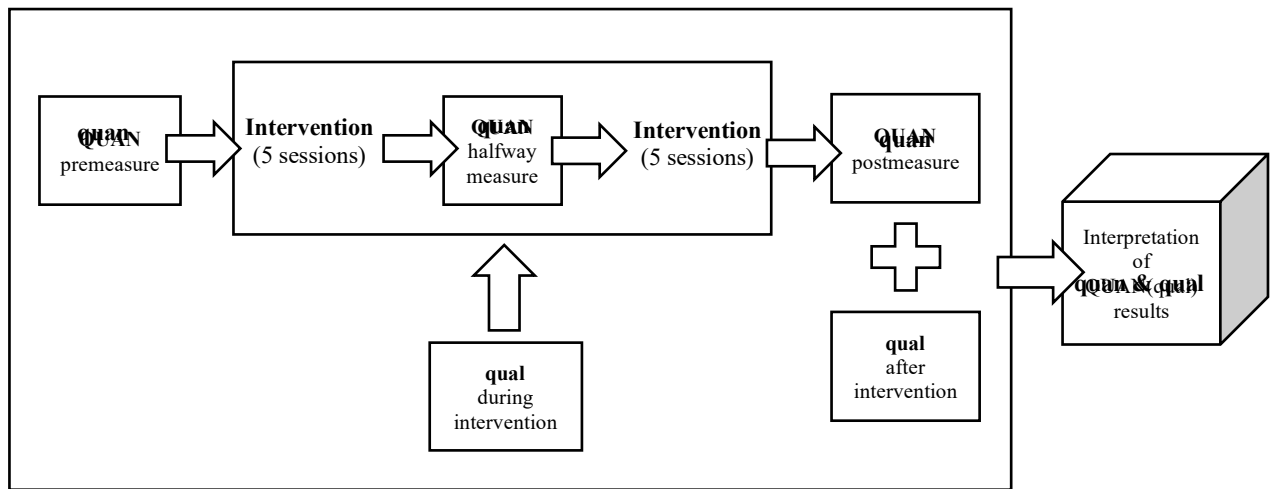


Figure 1: Concurrent design

3.4 Sampling

I conducted this study at a primary school for children with autism spectrum disorder (ASD) based in Pretoria. The school is classified as a quintile 3 school, meaning it receives government funding based on the assumption that the children come from relatively low socio-economic backgrounds and therefore do not pay fees (Ogbonnaya & Awuah, 2019). The study included children between the ages of 9 and 12 who had a diagnosis of ASD and experienced attentional challenges. These challenges encompassed difficulties in sustained attention, selective attention, and alternating attention, as determined by the school psychologist. In selecting suitable participants for the study, the school psychologist compiled a list of children who met the study's criteria. From this list, he selected 10 children for the treatment group and attempted to match them with 10 children for the control group. In the matching process, he considered verbal ability, cognitive functioning, and the level of attentional challenges. He assigned three participants from the list who were not part of either the control or treatment groups to the pilot group. During the early phase of data collection, one participant from the treatment group left the school. Despite efforts to find a replacement meeting the study criteria, another suitable child could not be identified. Consequently, the final participant count was nine in both the treatment and control groups. The sample size was limited due to the pilot nature of the study, as well as time and resource constraints. A small sample size may be seen as a limitation in mixed methods studies, however, it may also offer a more in-depth analysis of the qualitative data, offering richness to the study (Migiro & Magangi, 2011). Additionally, the study invited the participation of a guardian and teacher for each child, who were asked to complete questionnaires. All guardians submitted the initial questionnaires, yet only three

returned the follow-up questionnaires, despite reminders from teachers. Consequently, guardians were excluded as participants due to the insufficient response rate which may have stemmed from the limited time allocated for returning the follow-up questionnaires. This measure aimed at preserving the validity of the study post-VAT sessions. All teacher questionnaires were returned.

The school psychologist then sent information and consent forms (Appendix C to H) to the guardians. They were given the choice to consent to their child's participation as well as their own, despite later being excluded as participants. Once informed consent was obtained from each participant's guardian, I received their information. This process ensured confidentiality and anonymity. I then communicated the study details to the children in a manner that was easily understandable, seeking their assent (Appendix K & L). To confirm their understanding, I asked them the questions outlined in Appendix L and asked each one to sign their name at the bottom of the form (Appendix L). Ethical considerations outlined in section 3.2.2 were strictly followed.

Due to one participant withdrawing after two sessions, I excluded their quantitative data from the mid-test analysis. However, I still utilised their qualitative data, comprising observational notes and brief feedback, in the qualitative data analysis.

3.4.1 Inclusion and exclusion criteria

Inclusion criteria for the study were that each participant had a diagnosis of ASD and was between the ages of 9 and 12 years old. Each participant also had a level of verbal communication that allowed them to ask questions they may have had, answer brief feedback and attention assessment questions, and say if, at any point in the intervention, they wanted to stop or take a break. Criteria for the study also included participants who could speak English, as I am only fluent in English.

Initially, the study aimed to exclude children with a comorbid diagnosis of attention deficit hyperactivity disorder (ADHD) from the study to minimise potential data confounding by medications like methylphenidate. Notably, the school psychologist indicated a common comorbidity between ADHD combined type and ASD in the children at the school, in line with research by Gargaro et al. (2011), posing a challenge in strictly adhering to this criterion.

Consequently, controlling for this medication usage variability was deemed unfeasible, and this limitation is addressed in Section 5.7.

Ensuring comparable cognitive functioning levels among participants was crucial for a consistent understanding of the assessment. However, due to the limited number of eligible children, two participants presented with intellectual disability. To address this effectively and maintain internal validity, the school psychologist assigned one participant with intellectual disability to the treatment group, and the second participant, also with a similar level of intellectual disability, to the control group. This strategic approach aimed to control for the impact of intellectual disability on attention profiles. Importantly, both participants could fully provide verbal and written assent and had the agency to discontinue their participation at any point in the study.

Lastly, Wigram (1996) suggests that individuals with acute inflammatory conditions, pacemakers, psychosis, acute physical conditions, or hypertonia seek medical advice before undergoing VAT. To prevent any possible adverse effects, I made sure to add this to the exclusion criteria. The school had access to each child's medical information, so the school psychologist kept this in mind during the selection process.

3.5 Pilot phase

In preparation for the intervention, I conducted a pilot session with the three participants constituting the pilot group. The primary objectives of this session were to evaluate the participants' willingness to engage in the intervention and their ability to sustain focus for a 20-minute duration. The pilot session indicated that the 20-minute timeframe was manageable for the children to comfortably lie on the VAT mat. To assist one participant in time awareness and reduce restlessness, I introduced a video featuring a car racing across the screen for the 20-minute duration as a visual cue, proving effective in maintaining his participation. While additional stimulation tools such as playdough, Lego, and stress balls were available, none of the pilot group participants required them. Consultation with Dr. Lee Bartel affirmed that incorporating these tools would not compromise data integrity (L. Bartel, personal communication, June 27, 2022). In fact, Punkanen et al. (2017) encourage the use of additional activities to enhance the VAT user's engagement with VAT, acknowledging VAT as an adaptable and person-centred therapy.

In addition to piloting VAT with the pilot group, I administered the NEPSY-II and JTAT assessments, attention tests further explained in section 3.5. This enabled me to become familiar with their usage, ensuring proper administration under the supervision of the school psychologist.

3.6 Data collection

The data collection period lasted five weeks, during which participants in the treatment group underwent a total of 10 VAT sessions, each lasting 20 minutes, a duration commonly used in previous VAT research (Skille, 1992). Throughout this period, attention tests were conducted before, during, and after the intervention. Questionnaires were distributed to the participants' teachers and guardians. However, as previously mentioned, the guardian questionnaires were discarded due to insufficient returns. The control group, while not exposed to VAT sessions, underwent the same attention tests at corresponding time phases as the treatment group. As previously mentioned, only three out of the 18 follow-up guardian questionnaires were returned, leading to the exclusion of guardian questionnaires as a viable data source. These components formed the basis of the quantitative data collection. In addition to that, qualitative data were gathered through observation notes and creative semi-structured interviews. With consent from the guardians, I video-recorded the brief feedback at the end of the sessions, and creative interviews to observe responses and gestures that I may miss in the moment. Regrettably, unforeseen circumstances led to the loss of the recordings for the brief interviews. Nevertheless, I wrote observation notes during each session and recorded participants' feedback statements, using keywords that they said, during and after each VAT session. Subsequently, these notes were recognised as a data source.

3.6.1 Attention measures

The standardised assessments used in this study were quantitative measures and consisted of two attention tests. The first test was the NEPSY-II: A Developmental Neuropsychological Assessment, a standardised assessment designed to evaluate the neuropsychological development of children aged 3 to 12 (Korkman et al., 2007). The second test was the Joint-attention Test (JTAT) (Bean & Eigsti, 2012), a standardised assessment utilised to assess joint attention in children between the ages of 7 and 16, specifically those with ASD. Both tests were administered as the pre-test, mid-test, post-test 1, and post-test 2 (as shown in Table 2). The pre-test aimed to establish a baseline against which the other three time points could be compared. I conducted it before the first VAT session for both the treatment and control groups.

The mid-test provided a measure at the halfway point to assess any changes that had occurred after five sessions, which allowed for dose effects to be examined. I administered it immediately after the fifth VAT session for each participant in the treatment group and on the next day for the control group. The mid-test therefore also alluded to potential immediate effects on attention. Post-test 1, conducted straight after session 10, assessed the impact of the ten sessions on the treatment group's attention, as well as potential immediate effects. The control group underwent the same post-test a day after the treatment group. Subsequently, I administered post-test 2 to both the control and treatment groups one week after the final session, aiming to evaluate any sustained effects of the intervention.

Table 2

Standardised attention tests

Pre-test	Mid-test	Post-test 1	Post-test 2
NEPSY-II (Attention subtest)	NEPSY-II (Attention subtest)	NEPSY-II (Attention subtest)	NEPSY-II (Attention subtest)
JTAT	JTAT	JTAT	JTAT

3.6.1.1 NEPSY-II Attention subtests

The NEPSY-II is an updated version of the original NEPSY, initially developed in 1980 by Marit Korkman (Korkman et al., 1999). The NEPSY was later revised to create the NEPSY-II, published in 2007 (Korkman et al., 2007). The NEPSY-II consists of six sections, each dedicated to testing different cognitive domains. In this study, the attention and executive functioning domain were of primary interest. Within this domain, six subtests address more specific aspects. I specifically utilised the 'Auditory Attention' and 'Response Set' subtests, which assess sustained, selective, and alternating attention. In the auditory attention section, participants were tasked with touching a red circle upon hearing the word 'red' in a list of words, evaluating sustained and selective attention. The response set subtest then required the participant to touch a red circle when 'yellow' is mentioned, and vice versa, examining sustained and alternating attention (Brooks et al., 2009).

According to the Pearson Assessments guidelines, the NEPSY-II should only be administered by a registered psychologist, a research assistant, or a trained technician under the supervision of a psychologist (Korkman et al., 2007). The school psychologist, therefore, trained and

supervised me in the administration of the subtests by watching video recordings of me administering the test to each participant in the pilot group and then providing input. This was to ensure that I conducted the assessment in the accepted and standardised manner for participants in the treatment and control groups. It can be noted that the administered attention tests have a high level of validity and reliability (Brooks et al., 2009; Davis & Matthews, 2010). The subtest used for this study took an average of 10 minutes to administer.

3.6.1.2 Joint-attention Test (JTAT)

I administered the Joint Attention Task (JTAT), a standardised assessment created by Bean and Eigsti (2012), to the participants in this study. This test, designed for easy administration without requiring professional training, comprised interactive tasks involving participant engagement, such as handshakes, assistance in finding objects, and responses to comments about their clothing. It is designed to be a natural interaction, ensuring participants are unaware of being assessed. The participants' responses to each task were evaluated and scored according to the system outlined in Appendix R. I made two adaptations to the test procedure. One involved replacing the initial handshake with a high-five, administered after participants completed the NEPSY-II tests, as it was perceived as a more natural form of interaction. Another one was regarding how the participant reacted to meeting the second examiner. Because I was the only researcher in this study, I replaced this one with observing how they greeted their teacher when leaving the classroom. I therefore asked, "Did you say goodbye to your teacher?" instead of the original. "Did you meet...?".

3.6.2 Attention questionnaires

To capture observed changes in attention, questionnaires were administered to teachers both before and after the final VAT session. The questionnaire consisted of seven Likert scale questions, which utilised a continuum or rating scale format (Joshi et al., 2015). Questions one to three were formulated based on the definitions of attentional domains provided by Sohlberg and Mateer (2001), addressing distinct types of attention challenges commonly observed in children with ASD: sustained attention, selective attention, and alternating attention. Questions four to six were based on the definitions of joint attention according to and Bean and Eigsti (2012), and Bruinsma et al. (2004) aiming to assess whether the teachers observed any changes in the child's attention throughout the intervention. These Likert scale questions contributed to the quantitative data.

Additionally, the questionnaire included open-ended questions aimed at exploring any other behavioural changes observed in the child during the intervention. Unfortunately, many of the open-ended responses appeared to be unrelated to the question of whether changes were observed in the participants' attention and were more focused on the child's general behaviour in class. They were therefore discarded from the qualitative data. The questionnaire itself can be found in Appendix P and Q.

3.6.3 Observation notes

During the 5-week intervention period, notes were taken regarding the participants' physical and verbal responses during the VAT sessions. Additionally, after each odd-numbered session, participants were asked for brief feedback by answering questions regarding their experience of VAT (Appendix M). Their responses were documented as part of the observation notes.

3.6.4 Creative semi-structured interviews

After the 10th and final session, participants in the treatment group underwent longer semi-structured interviews, using creative elicitation tools, as recommended by Dos Santos and Wagner (2018). I considered the choice of semi-structured interviews appropriate for this study as it provided a structured framework while allowing participants the flexibility to freely express themselves (Bryman, 2008). During these interviews, I asked participants about their experience with VAT and encouraged them to express themselves through various creative mediums such as drawing, movement, music-making, and clay sculpting.

To create a comfortable and welcoming atmosphere, I started the interviews by engaging in drumming or singing the participant's favourite song with them. This helped establish rapport and put participants at ease. Additionally, participants were invited to collaborate in creating a song, using the melody of their favourite song while adapting the lyrics to reflect how VAT made them feel. Drawing or sculpting with playdough was another creative activity I offered during the interviews. I played the VAT song in the background to inspire participants to express their thoughts and feelings related to VAT through their artwork.

The duration of the interviews varied from 10 to 20 minutes, depending on each participant's level of interest and engagement. Some children were able to remain focused and participate for longer periods, while others had shorter attention spans. The primary objective of these interviews was to provide participants with the opportunity to convey their experiences of the intervention using a medium of their choice, which might be more accessible than verbal

expression alone (Dos Santos & Wagner, 2018). The qualitative data gathered from these interviews aimed to contribute insights into the participants' experiences of VAT and thus the feasibility of the intervention.

I strategically scheduled the interviews after post-test 1 to mitigate any potential influence on the results of the post-test 1 assessments, thereby safeguarding the integrity of the data collection process.

3.7 Procedure

Before each session, I gave careful consideration to arranging the room to minimise distractions and maintain consistency in the treatment protocol. The VAT equipment I used in this study was the Oasis VTS-1000, designed by Dr. Lee Bartel, a prominent researcher in the field of VAT (Bartel et al., 2017) (Figure 2). I sought guidance from Dr. Bartel for the proper utilisation of the equipment. I positioned the VAT mat on a large beanbag to prioritise participant comfort.

During the VAT sessions, participants listened to a song titled 'A Fresh Start,' produced by Dr. Bartel, through headphones. This song featured a dominant 40Hz frequency, using the recognised benefits of 40Hz gamma frequency in addressing various health conditions, including attention deficits (Bartel et al., 2017). Simultaneously, a different track played through the VAT speakers, creating pure 40Hz sound vibrations that participants could feel but not hear. This less engaging auditory component was transmitted through the mat, complementing the more enjoyable 40Hz music playing through the headphones. The combination aimed to create a pleasant and immersive auditory experience for the participants.

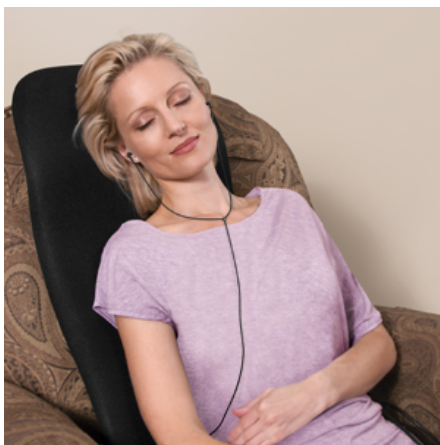


Figure 2: Oasis VTS-1000

The procedure involved individually administering VAT to each participant in the treatment group, aiming to complete 10 sessions over five weeks with two 20-minute sessions per week. Deviations in participation occurred, with one participant withdrawing after two weeks due to leaving the school, and another completing nine sessions due to being ill and thus absent from school.

Before the study commenced, I explained the intervention process and then obtained assent from each participant (Appendix K & L). Once assent was given, I conducted a pre-test for each participant in both the treatment and control groups. Following the pre-test, the first round of VAT intervention sessions began with the treatment group. The initial session included an introduction in a relaxed manner to create a calm atmosphere. I clarified that I would be in the corner, working on a laptop, and participants could signal if they needed anything. This approach aimed to shift attention away from my presence, fostering a relaxed environment.

Participants were asked to sit on the VAT mat on a bean bag, while the music and sound vibrations played through the built-in speakers. Before taking a seat, I checked if participants felt the vibrations and if the music volume was comfortable. Proactive measures were taken for participants showing restlessness, including a timer video for visual reference or materials such as play dough for engagement. All participants comfortably participated for the entire 20 minutes, with two participants using the timer video and two engaging with play dough in most sessions. No child displayed distress or expressed a desire to discontinue the session. Throughout the study, I remained attentive to signs of discomfort or indications of wanting to stop, respecting participants' autonomy and prioritising their comfort in line with ethical considerations outlined in Section 3.9. I turned the VAT device off after the 20-minute session.

3.8 Data preparation

After the data collection phase, the next crucial step involved preparing the gathered data for analysis. This section explores the process of data preparation, examining how both the quantitative and qualitative datasets were carefully organised and refined.

3.8.1 Preparation of quantitative data

After completing all NEPSY-II attention tests, the raw scores were documented on a score sheet and subsequently transformed into two age-scaled scores: one for the auditory attention section and one for the response set section, following the method outlined by Brooks et al. (2009). It is important to note that these scores are based on age norms from the United

Kingdom (UK), which may not directly apply to a South African quintile 3 school with a significant representation of children from low socio-economic backgrounds. Initially, I considered using South African norms, developed by Truter and Shuttleworth-Edwards (2023) to address this concern. However, upon further investigation, I discovered that the South African scoring system does not provide an overall attention score that encompasses all the raw scores, unlike the UK scoring system. Additionally, the use of South African norms is contingent upon the participants being from quintile 3 schools with low-income backgrounds. Upon speaking to the psychologist, it became evident that less than half of the participants were from low-income backgrounds. As a result, I deemed it more appropriate to utilise the UK norms to calculate single attention scores. Furthermore, it is crucial to understand that the interpretation of these attention scores does not solely rely on the specific norms employed. In the study, scores were compared between each time point of testing to gauge changes over time and differences between groups, as opposed to interpreting individual scores. Therefore, the focus should shift from the choice of norms to the way they are applied and interpreted.

The scores for the Auditory Attention subset, which reflects sustained and selective attention, as well as the scores for the Response Set subset, which indicates sustained and alternating attention, were recorded in an Excel spreadsheet. These scores were accompanied by the Joint Attention Task (JTAT) scores and the scores obtained from the teacher questionnaires. This ensured that all relevant data points were accurately captured and organised for further analysis and interpretation.

3.8.2 Preparation of qualitative data

This component entailed transcribing each video recording from the nine creative interviews, capturing everything exactly as it was said. The transcriptions remained true to the original form, capturing every utterance and non-verbal sound. In addition, I included observable behaviours within these transcriptions, providing a comprehensive understanding of each participant's unique experience of VAT. I originally recorded the brief feedback, but regrettably, due to technical difficulties, the recordings were lost. I therefore typed out the hand-written observation notes gathered during the VAT sessions, which also included brief feedback received after each odd-numbered session. This preparation laid the foundation for further analysis and exploration of the collected material.

3.9 Data analysis

The data analysis process consisted of analysing the various quantitative and qualitative data sources. This involved analysing the attention assessments with the assistance of a statistician, as well as conducting a thematic analysis on the qualitative observations and creative interviews. The data sources were analysed separately and then integrated in the discussion chapter.

3.9.1 Quantitative data analysis

I analysed the quantitative data with the assistance of a statistician. The results from the pre-test, mid-test, post-test 1, and post-test 2, including the NEPSY-II and JTAT scores, were recorded in an Excel spreadsheet. The scores from the Likert scale questions in the teacher questionnaires were also added to the spreadsheet. The statistical analysis used a Generalized Linear Mixed Model (GLMM) in analysing the quantitative data analysis (Bolker et al., 2009). A GLMM is a versatile statistical tool that combines two types of models to find relationships in various situations (Stroup, 2012). In simple terms, it is a flexible approach to understanding diverse data patterns.

Due to Participant 10 leaving the school and thus withdrawing from the study, I excluded their quantitative data from the analysis. Additionally, Participant 2 missed a week of school and was only able to complete nine sessions of VAT. To account for this variation in session attendance, the statistician conducted two separate quantitative analyses: one that included all participants and one that excluded Participant 2. This was done to determine whether the deviation from the intervention schedule had any impact on the outcome of the data. However, both rounds of analysis revealed the same results, deeming the second analysis redundant and so it was discarded in the analysis phase.

3.9.2 Qualitative data analysis

I conducted a thematic analysis to analyse the qualitative data. After transcribing the video recordings of participants during the semi-structured interviews, I analysed them for patterns and then coded them. I analysed the observation notes, which included feedback from the participants in the treatment group, in the same manner, using coding. I then placed these codes into categories and derived themes to create a comprehensive narrative (Braun & Clarke, 2006). Despite excluding Participant 10's quantitative data, I analysed their qualitative data from the first two sessions.

3.9.3 Integration of qualitative and quantitative findings

The integration of qualitative and quantitative data in this mixed methods study was essential for achieving a comprehensive understanding of the effectiveness and practical feasibility of VAT as an intervention for improving attention in children with ASD. The two sets of data were analysed separately and integrated during the discussion chapter, where the findings from both methods were examined for convergence, divergence, or any form of relationship (Bradt et al., 2013). This approach, following a concurrent design, allowed for a holistic exploration of how the qualitative and quantitative data interacted, providing insights into the nuanced aspects of the intervention's effectiveness and practicality (Bradt et al., 2013). By triangulating the findings, this study aimed to shed light on the relationship between the qualitative and quantitative findings, yielding a comprehensive answer to the research question.

3.10 Ethical considerations

Informed consent is important in that it respects the participants' right to choose to take part in a study, as well as gives them knowledge of their freedom to withdraw from the study at any point in time (Nijhawan et al., 2013). The study obtained ethical approval from the Ethics Committee of the Faculty of Humanities at the University of Pretoria prior to commencement. Subsequently, the school principal granted consent upon receiving detailed information about the study (see Appendix B). Before I received any information about the participants, the school psychologist compiled a list of eligible children, and sent letters of information along with consent forms (see Appendix C to H) to their guardians. Upon obtaining parental consent, the psychologist assigned children to the treatment, control, and pilot groups. Only at this stage did I gain access to information concerning the children, ensuring strict anonymity and confidentiality. I used easily understandable language (see Appendix K) in communicating the study details to the children and assessing their comprehension of the study requirements. I also emphasised the voluntary nature of participation and the option to withdraw without consequences before obtaining assent. Participants gave their assent both verbally and in writing their names at the bottom of the assent form (see Appendix L). Throughout the sessions, I remained vigilant to signs of discomfort, providing a visible stop sign for participants to point at if they wished to stop the intervention. On occasion, participants exhibited restless behaviour, seemingly indicating a desire for more stimulation. Upon my inquiry, these children reported no discomfort or inclination to stop the session, but rather a desire for more stimulation upon which I would provide additional activities such as playdough and timer videos. The addition of these activities did not introduce confounding variables but rather seemed to contribute to further engagement in the intervention, deeming VAT as an adaptable

intervention depending on the different needs of those undergoing it. I also invited teachers and parents of the participants to participate in the study by completing questionnaires, and obtained their consent before commencing the study (Appendix C, D, F, G, I & J). I provided them with information regarding their expected involvement and informed them about their right to withdraw if desired.

Although there were no identified risks associated with undergoing VAT or participating in the study, I considered the possibility of participants experiencing distress due to the unfamiliarity of the intervention. The on-site school psychologist was available to provide emotional support, if need be, though no child indicated a need for this additional assistance. Given the hypersensitivity of many individuals with ASD to certain sound and vibrotactile stimuli, the volume of music and intensity of sound vibrations from the VAT were carefully monitored to prevent discomfort. Once again, I observed no discomfort in any of the participants. I ensured the volume of the music never exceeded 70 dB(A).

I maintained confidentiality throughout the study by assigning each participant a numerical label in the write-up. Research data will be stored electronically at the University of Pretoria, protected by password, for a minimum of 10 years. The school principal, teacher and guardians were also informed that they could request access to the study results by contacting me after the study concluded.

Due to the study design excluding participants in the control and pilot groups from experiencing VAT treatment, I informed them that upon request they may have up to 10 VAT sessions at no charge once the study ended. This provided them with an equal opportunity to experience the intervention and the potential benefits it may offer. However, after the study, no participants requested this.

3.11 Research quality

According to Bradt (2015), there is no consensus on how to ensure research quality in mixed methods research. However, the incorporation of multiple data sources and triangulation, inherent in mixed methods, are some agreed-upon contributors to reliability (Bryman, 2012). In this study, the integration of qualitative and quantitative aspects, while addressing distinct questions, yielded a comprehensive understanding of VAT's feasibility as an intervention for children with ASD. I prioritised reliability, defined as the consistency of results (Heale & Twycross, 2015), in that triangulation was applied in the use of multiple attention tests

throughout the study (Heale & Twycross, 2015). My incorporation of the NEPSY-II and the JTAT assessment, both acknowledged for their high validity and reliability (Brooks et al., 2009; Ziadat, 2022), further reinforced the study's robustness. Additionally, including a control group helped mitigate the practice effect, described as performance improvement through repeated engagement in a task (Calamia et al., 2012).

Validity, referring to the accuracy in measuring the intended concept, remained a critical consideration throughout the research process (Borsboom et al., 2004). An initial pilot session with three participants, although not part of the intervention, aimed to familiarise me as the researcher with equipment, refine procedures, and instil confidence in administering the attention tests, enhancing the study's validity (Heale & Twycross, 2015).

The small sample size, while limiting generalisability and statistical power, offers unique advantages. A smaller sample permits more in-depth investigation and qualitative exploration, enriching the dataset with individual perspectives. It is also crucial to acknowledge that a pilot study primarily serves to inform and justify future, larger-scale research rather than provide generalisability.

The complex nature of ASD, characterised by unique presentations and sensory profiles in each child, underscores the necessity for a person-specific approach to VAT. In response to observed restless behaviour in three participants, I introduced additional activities such as playdough and a timer video to enhance their engagement with VAT, thereby maximising its effects. While this may be interpreted as inconsistency, personal communication with Bartel (2022) clarified that such adaptations should not confound the data. In fact, Punkanen et al. (2017) recommend adapting VAT to accommodate the diverse needs of individuals, promoting optimal engagement. Such modifications aim to provide a more comparable experience of VAT for different individuals. While these adaptations were accepted as non-confounds, certain confounding variables, such as the time of day assessments were conducted, remained uncontrollable. Chapter 5 further explores the adaptability of this intervention and potential confounding variables in quantitative data collection, recognising the inherent complexities associated with studying ASD.

Chapter 4: Analysis and Findings

4.1 Introduction

As mentioned in Chapter 1, the primary objective of this research study was to assess the effect of Vibroacoustic Therapy (VAT) on the attention of children with autism spectrum disorder (ASD). This chapter aims to present the results in a way that aligns with the aims set for this study:

- To quantitatively evaluate what effect VAT had on the attention levels of children with autism.
- To qualitatively explore the subjective experiences of the children with ASD who underwent VAT.

Chapter 4 aims to offer a comprehensive overview of the data analysis process. It begins by presenting the quantitative findings from the descriptive and inferential statistical analyses followed by a detailed exploration of the qualitative data which I analysed using thematic analysis. In line with the protocol for a concurrent mixed methods design, the quantitative and qualitative data strands are analysed separately and then integrated in Chapter 5 to determine the feasibility of this intervention (Creswell & Clark, 2018).

4.2 Quantitative data analysis

The quantitative data analysis had two primary objectives: first, to assess changes in attention scores over time, and second, to make a comparative assessment of test scores between the treatment group (those receiving VAT) and the control group (those not receiving VAT) to identify any significant differences. The analysis aimed to determine the effects of VAT on attention.

The design of the NEPSY-II tests posed challenges in isolating and analysing distinct attentional domains. The Auditory Attention (AA) subtest, for instance, combined assessments of sustained and selective attention, while the Response Set (RS) subtest assessed sustained and alternating attention concurrently. This combined nature made it difficult to separate these attentional domains in the analysis. Although teacher questionnaires provided isolated attention scores for each domain, they were limited by having only one question per domain, affecting

the internal validity of the analysis when examining each domain individually. Given these challenges, the results deserving the most attention are those obtained from the NEPSY-II and JTAT tests and the overall attention scores derived from the questionnaires. As previously mentioned, the statistical analysis employed a Generalized Linear Mixed Model (GLMM) for each analysis (Bolker et al., 2009).

The scores of the Auditory Attention (AA) and Response Set (RS) subtests ranged from 1 to 15, with 1 representing the lowest possible auditory attention score and 15 indicating the highest. For both subtests, the analysis aimed to determine changes in scores across different time points during the intervention period. This investigation involved various comparisons: comparing pre-test scores to mid-test scores to investigate dose effects and immediate effects, analysing post-test 1 scores to assess treatment effects and immediate effects, and testing post-test 2 scores to explore sustained effects. In this investigation, I considered two primary factors. Firstly, the categorical 'treatment' variable was utilised to assess disparities in scores between the treatment and control groups. Secondly, I employed the categorical 'time' variable to investigate whether scores exhibited changes over the course of the intervention.

4.2.1 NEPSY-II Auditory Attention Scores

The NEPSY-II Auditory Attention (AA) subtest focused on assessing sustained attention and selective attention. The AA scores ranged from 1 to 15, with 1 indicating the lowest possible score, and 15 representing the highest.

The findings seen in figure 4.1 suggest no evidence for a statistically significant interaction term between treatment and time ($X_2 = 0.69$, $df = 3$, $P = 0.875$). This means that the rate at which the auditory attention scores changed over time was not significantly different between the treatment and control groups. In fact, there was no evidence for a statistically significant treatment effect ($X_2 = 0.025$, $df = 1$, $P = 0.874$). Averaged across all four time intervals, the auditory attention scores were 0.69 units lower in the control group (5.22 ± 1.41) versus the treatment group (5.92 ± 1.41). Similarly, the mean difference in auditory attention scores between the treatment and control groups when compared within each time point ranged between a minimum of 0.33 (pre-test) and a maximum of 0.89 (mid-test and post-test 1).

In contrast, there was support for a statistically significant difference in auditory attention scores over time ($X_2 = 28.16$, $df = 3$, $P < 0.001$). This may indicate the presence of the practice

effect. Although there was no statistical support for a treatment effect, the time-based comparisons seen in figure 4.1 are provided for both the treatment and control groups separately. There was no significant difference between the pre-test and mid-test scores in either the control ($\beta = -0.44$, $t = -0.98$, $P = 0.323$) or treatment groups ($\beta = -1.00$, $t = -1.62$, $P = 0.109$) (Figure 4.1). In contrast, the auditory attention scores were 1.44 units higher in the control group ($t = -2.84$, $P = 0.006$) and 2.00 units higher in the treatment group ($t = -2.85$, $P = 0.005$) when comparing post-test 1 and the pre-test time periods (Figure 4.1). Similarly, the auditory attention scores were 1.67 units higher in the control group ($t = -3.58$, $P < 0.001$) and 2.00 units higher in the treatment group ($t = -3.17$, $P < 0.001$) when comparing post-test 2 and the pre-test time periods. Essentially, there was no evidence for immediate effects, a dose effect, or sustained effects. There was however evidence of a treatment effect in the treatment group, although this was similarly seen in the control group, indicating no significant changes in auditory attention over time in comparison to the control group.

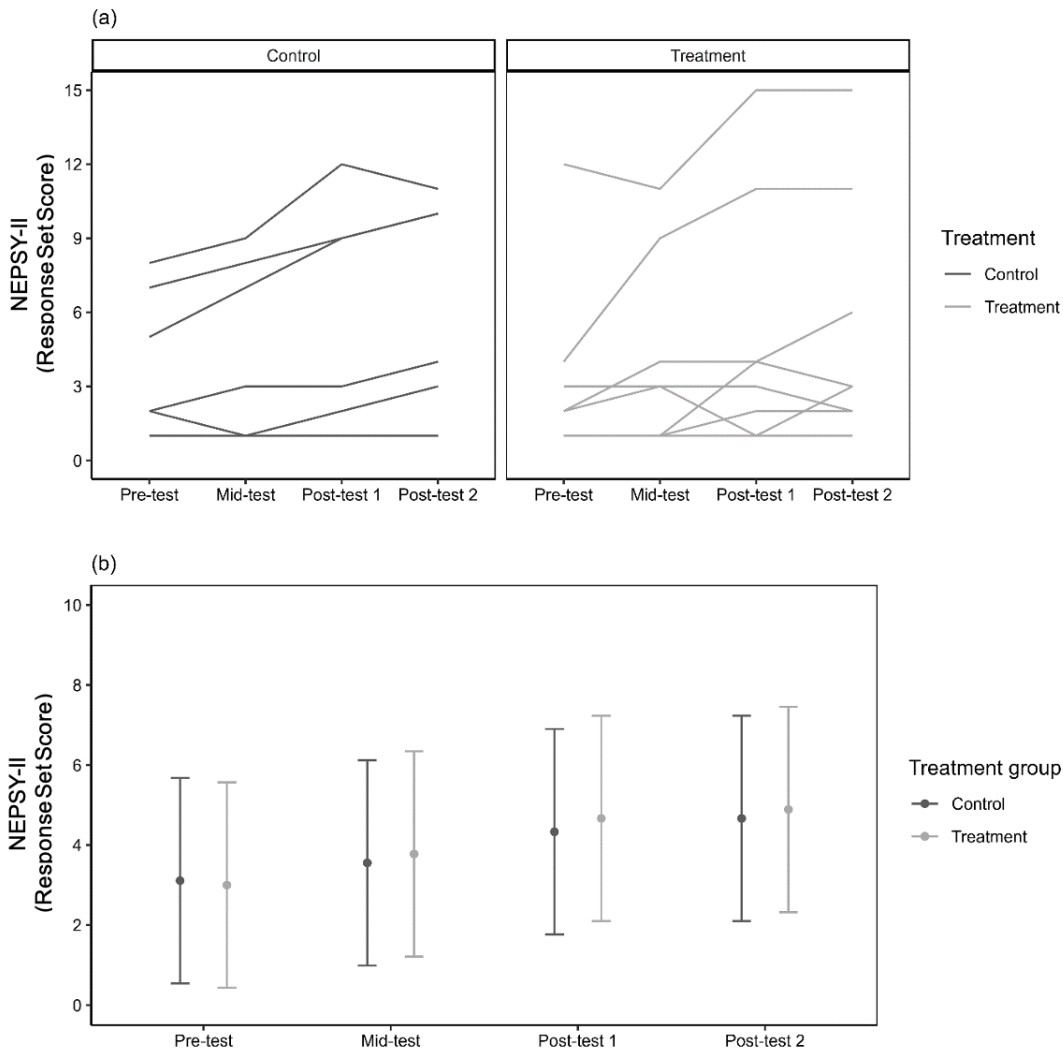


Figure 4.1: NEPSY-II auditory attention scores. Panel (a) represents the raw scores for nine individual subjects per treatment and control groups at four different time intervals, while panel (b) indicates the marginal predicted means (+/- 95% confidence interval of the mean) across the four different time intervals.

4.2.2 NEPSY-II Response Subset Scores

The NEPSY-II Response Set (RS) subtest focused on assessing sustained attention and alternating attention. Like the AA subtest, RS scores ranged from 1 to 15, with 1 indicating the lowest possible score, and 15 representing the highest.

The results mirrored those of the Auditory Attention scores analysis. There was no evidence for a statistically significant interaction term between treatment and time ($X_2 = 0.384$, $df = 3$, P

= 0.943) (Figure 4.2). This means that the rate at which the response subset scores changed over time was not significantly different between the treatment and control groups. In fact, there was no evidence for a statistically significant treatment effect ($X^2 = 0.003$, $df = 1$, $P = 0.951$). Averaged across all four time intervals, the response scores were 0.16 units lower in the control group (3.92 \pm 1.14) versus the treatment group (4.08 \pm 1.16). Similarly, the mean difference in auditory scores between the treatment and control groups when compared within each time point ranged between a minimum of -0.33 (Post-test 1) and a maximum of 0.11 (Pre-test).

In contrast, there was support for a statistically significant difference in auditory scores over time ($X^2 = 17.26$, $df = 3$, $P < 0.001$). Although there was no statistical support for a treatment effect, the time-based comparisons are provided below in figure 4.2 for both the treatment and control groups separately. There was no significant difference between the pre-test and mid-test scores in either the control ($\beta = -0.44$, $t = -1.49$, $P = 0.193$) or treatment groups ($\beta = -0.78$, $t = -1.44$, $P = 0.154$). In contrast, the auditory scores were 1.22 units higher in the control group ($t = -2.81$, $P = 0.007$) and 1.67 units higher in the treatment group ($t = -2.12$, $P = 0.039$) in post-test 1 than the pre-test time period. Similarly, the response subset scores were 1.56 units higher in the control group ($t = -3.36$, $P = 0.001$) and 1.89 units higher in the treatment group ($t = -2.25$, $P = 0.028$) when comparing post-test 2 and the pre-test time periods. These results mirrored those of the Auditory Attention in that there was no evidence for immediate effects, a dose effect, or sustained effects. There was however evidence of a treatment effect in the treatment group, although this was similarly seen in the control group, indicating no significant changes in attention over time in comparison to the control group.

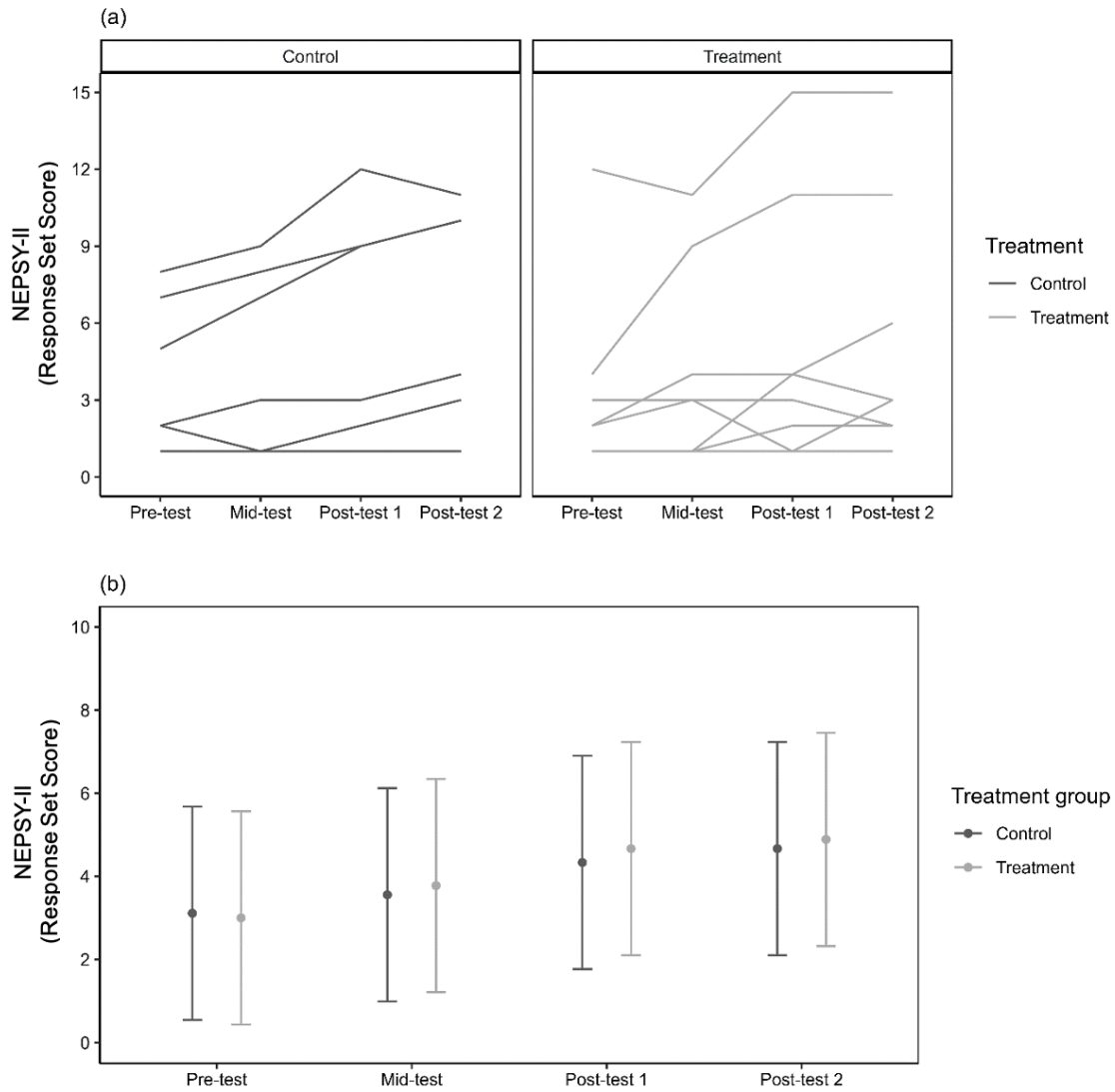


Figure 4.2: NEPSY-II response subset scores. Panel (a) represents the raw scores for nine individual subjects per treatment and control groups at four different time intervals, while panel (b) indicates the marginal predicted means (+/- 95% confidence interval of the mean) across the four different time intervals.

4.2.3 JTAT scores

The JTAT evaluation aimed to assess joint attention changes over time. Similar to the NEPSY-II assessments, it had four phases: comparing pre-test and mid-test scores to see immediate and dose effects, looking at post-test 1 scores for treatment and immediate effects, and post-test 2 scores for sustained effects. JTAT scores ranged from 1 to 25, with 1 indicating the lowest possible score, and 25 representing the highest.

There was evidence for a statistically significant interaction term between treatment and time explaining joint attention scores ($X_2 = 11.64$, $df = 3$, $P = 0.008$) (Figure 4.3). This means that the rate at which the joint attention scores changed over time was significantly different between the treatment and control groups. This result is largely driven by the 1.67 unit higher scores in the treatment group by the mid-test period ($t = -3.57$, $P < 0.001$), while the control group scores were not significantly different by the mid-test period ($\beta = -0.78$, $t = -1.74$, $P = 0.086$). Thereafter, the joint attention scores were significantly higher in the post-test 1 period for both the treatment and control groups, however, the difference in joint attention scores between pre-test and post-test 1 was 1.21 units greater, on average, in the treatment group in comparison to the control group in post-test 1, when compared to their respective pre-test scores. Similarly, the joint attention scores were significantly higher in the post-test 2 period for both the treatment and control groups, however, the difference in joint attention scores between pre-test and post-test 2 was 1.56 units greater, on average, in the treatment group in comparison to the control group.

In simple terms, there was evidence for a dose effect after five sessions, a treatment effect after 10 sessions and sustained effects one week later on joint attention. One cannot say with confidence whether an immediate effect was evident since the mid-test and post-test 1 both measure dose and treatment effect, respectively, along with immediate effect. The improvements seen at these points are likely due to the cumulative impact of sessions. To accurately assess immediate effects, assessments immediately after the first session might have been necessary. Speculating on immediate effects remains uncertain and could be a focus for future research. Additionally, pinpointing when VAT began effectively enhancing joint attention is unclear since improvements surfaced after five sessions, and tests were not conducted earlier, except for the pre-test. Future studies might benefit from more frequent assessments, a consideration explored further in Chapter 5. Last, comparing mid-test to post-test 1 may have been additionally beneficial in assessing whether there was a significant difference between five and 10 sessions and whether 5 sessions may have been sufficient in optimising joint attention.

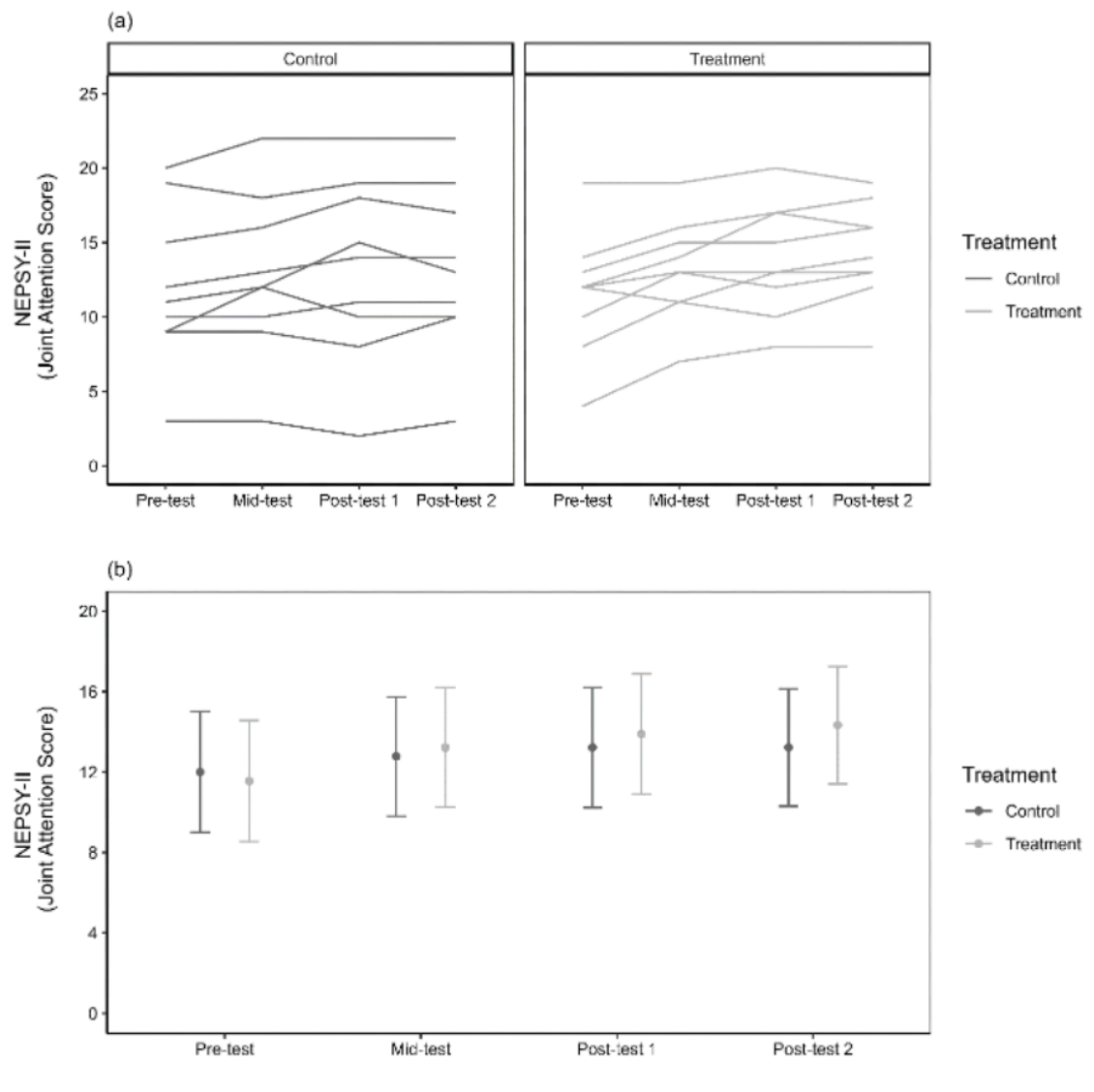


Figure 4.3: NEPSY-II joint attention scores. Panel (a) represents the raw scores for nine individual subjects per treatment and control groups at four different time intervals, while panel (b) indicates the marginal predicted means (+/- 95% confidence interval of the mean) across the four different time intervals.

4.2.4 Questionnaire Data Analysis

This analysis aimed to determine whether there were changes in attention scores after the VAT intervention compared to before. Each question focused on a different type of attention, and so the attention scores under consideration encompassed (1) overall attention, (2) sustained attention, (3) selective attention, (4) alternating attention, and (5) joint attention.

These attention scores were treated as a continuous response variable, scored on a Likert scale ranging from 1 to 5, with 5 denoting the highest achievable attention score and 1 signifying the lowest. Two phases of testing were done: One before the VAT intervention, and one after. Two essential fixed effects were incorporated into this analysis. First, a categorical 'treatment' variable was utilised to examine potential differences in attention scores between the treatment and control groups. Second, a categorical 'time' variable was included to assess any variations in attention scores before and after the initiation of the treatment.

4.2.4.1 Overall Attention

The evaluation of overall attention showed no significant interaction between treatment and time ($X^2 = 3.02$, $df = 1$, $p = 0.082$) (Figure 4.4). Moreover, no significant treatment effect ($X^2 = 0.85$, $df = 1$, $p = 0.357$) or time effect ($X^2 = 0.04$, $df = 1$, $p = 0.847$) was observed. Both groups displayed comparable overall attention scores before and after treatments. Overall attention scores were only 0.1 units higher, on average, in the control group after treatment interventions. While not statistically significant, overall attention scores were 1.78 units higher, on average, after treatment interventions began (21.1 ± 1.14), in comparison to the control group (19.3 ± 1.32).

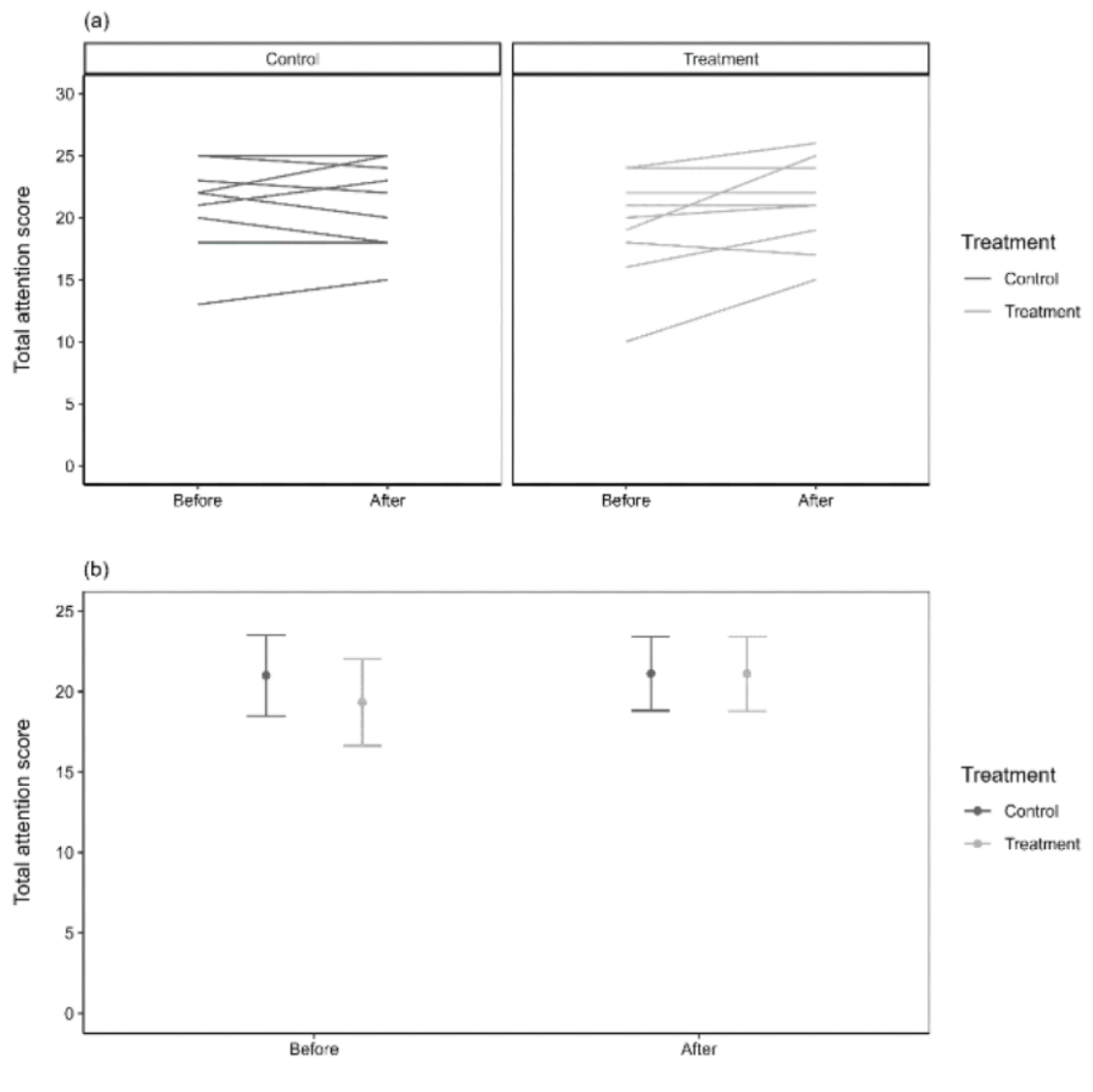


Figure 4.4: Overall attention scores. Panel (a) represents the raw scores for nine individual subjects per treatment and control groups before and after treatment interventions, while panel (b) indicates the marginal predicted means (\pm 95% confidence interval of the mean) before and after treatment interventions.

4.2.4.2 Sustained attention

The analysis found no significant interaction between 'treatment' and 'time' impacting sustained attention scores ($X^2 = 0.01$, $df = 1$, $P = 1.000$). Additionally, there was no notable impact from either 'treatment' ($X^2 = 0.41$, $df = 1$, $P = 0.521$) or 'time' ($X^2 = 2.18$, $df = 1$, $P = 0.140$) (Figure 4.5).

In summary, these results suggest that sustained attention scores were quite consistent between the treatment and control groups, both before and after the interventions. The average increase in sustained attention scores after the interventions was merely 0.33 units for both groups.

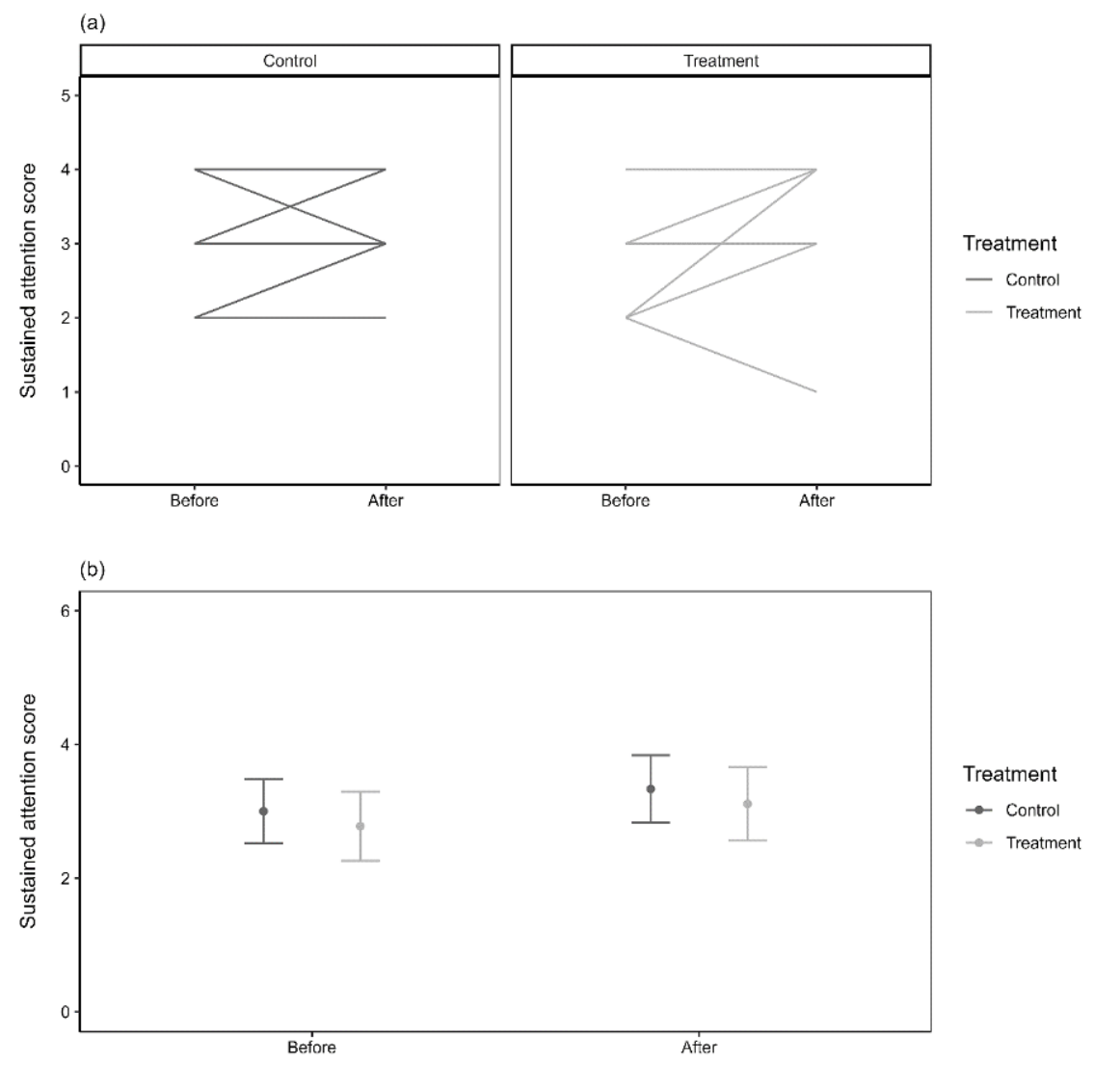


Figure 4.5: Sustained attention scores. Panel (a) represents the raw scores for nine individual subjects per treatment and control groups before and after treatment interventions, while panel (b) indicates the marginal predicted means (+/- 95% confidence interval of the mean) before and after treatment interventions.

4.2.4.3 Selective attention

There was no evidence for a statistically significant interaction term between treatment and time explaining selective attention scores ($X^2 = 1.55$, $df = 1$, $P = 0.214$) (Figure 4.6). Moreover,

there was no evidence for a treatment effect ($X^2 = 0.41$, $df = 1$, $P = 0.521$). However, there was evidence for a statistically significant time effect ($X^2 = 2.18$, $df = 1$, $P = 0.140$). Taken together, these results indicate that selective attention scores were comparable between the treatment and control groups both before and after treatments took place, however, the control and treatment group scores were 0.33 and 0.67 units higher after treatment interventions than before, respectively.

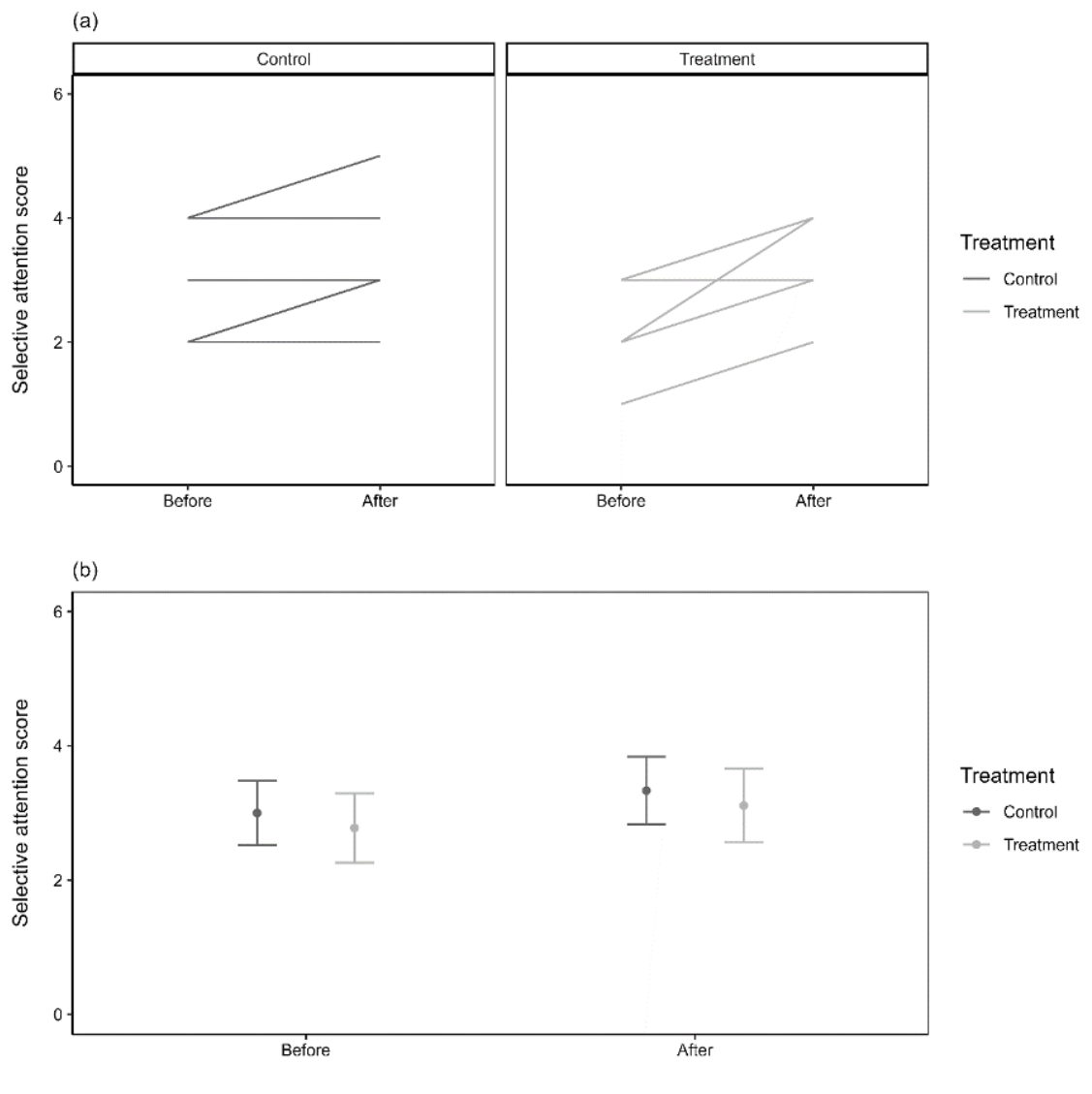


Figure 4.6: Selective attention scores. Panel (a) represents the raw scores for nine individual subjects per treatment and control groups before and after treatment interventions, while panel (b) indicates the marginal predicted means (+/- 95% confidence interval of the mean) before and after treatment interventions.

4.2.4.4 Alternating attention

There was no evidence for a statistically significant interaction term between treatment and time explaining alternating attention scores ($X_2 = 0.28$, $df = 1$, $P = 0.598$) (Figure 4.7). Moreover, there was no evidence for either a treatment ($X_2 = 0.70$, $df = 1$, $P = 0.403$) or time effect ($X_2 = 2.64$, $df = 1$, $P = 0.104$). Taken together, these results indicate that alternating attention scores were comparable between the treatment and control groups both before and after treatments took place. Sustained attention scores were only 0.22 and 0.33 units higher, on average, in the control and treatment groups respectively after treatment interventions.

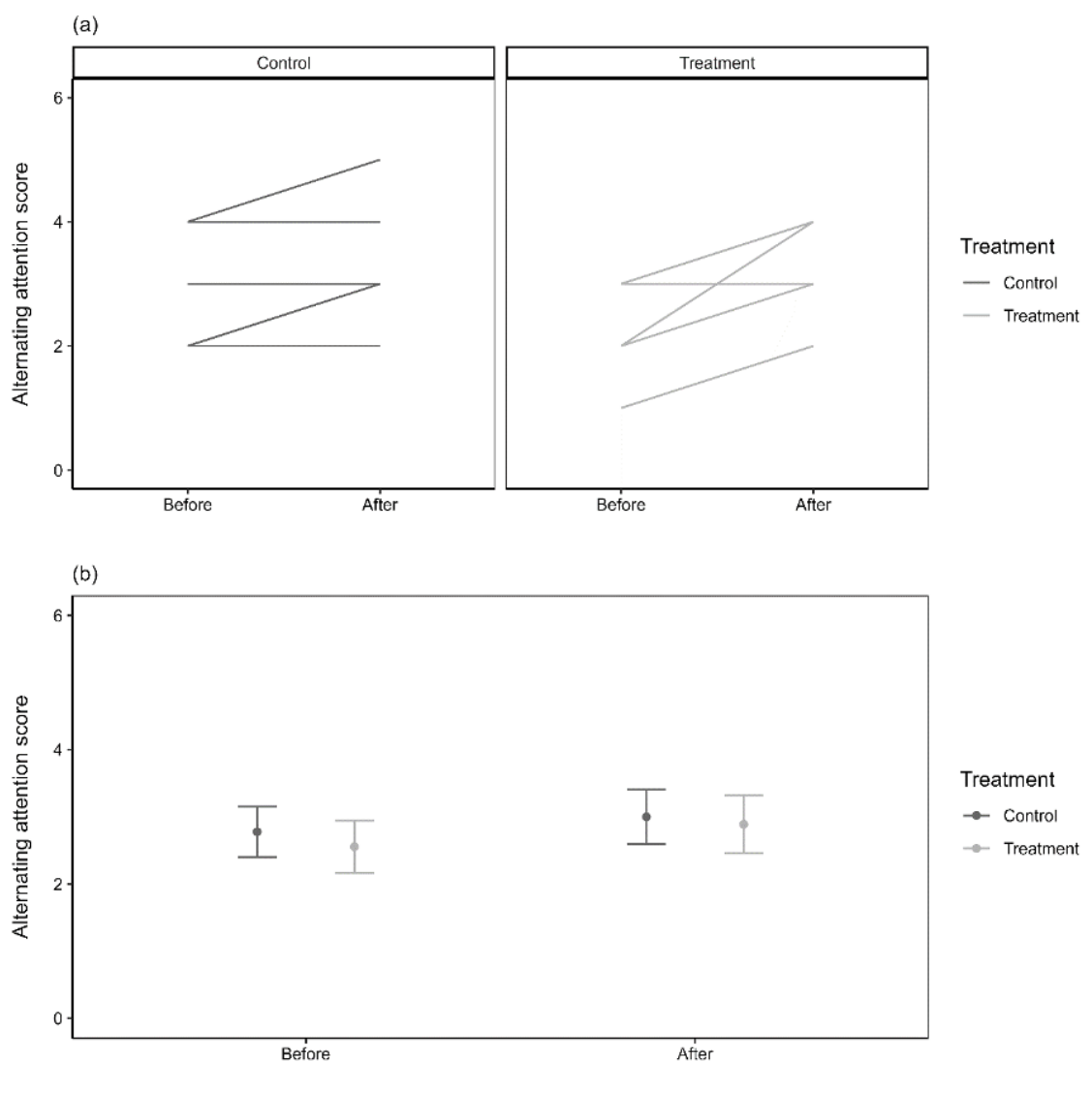


Figure 4.7: Alternating attention scores. Panel (a) represents the raw scores for nine individual subjects per treatment and control groups before and after treatment interventions, while panel

(b) indicates the marginal predicted means (\pm 95% confidence interval of the mean) before and after treatment interventions.

4.2.4.5 Joint attention

There was evidence for a statistically significant interaction term between treatment and time explaining joint attention scores ($X_2 = 0.28$, $df = 1$, $P = 0.598$) (Figure 4.8). This result is explained by the 0.78 unit lower joint attention scores, on average, after intervention in the control group, while there was a 0.44 unit increase in joint attention scores, on average, after intervention in the control group.

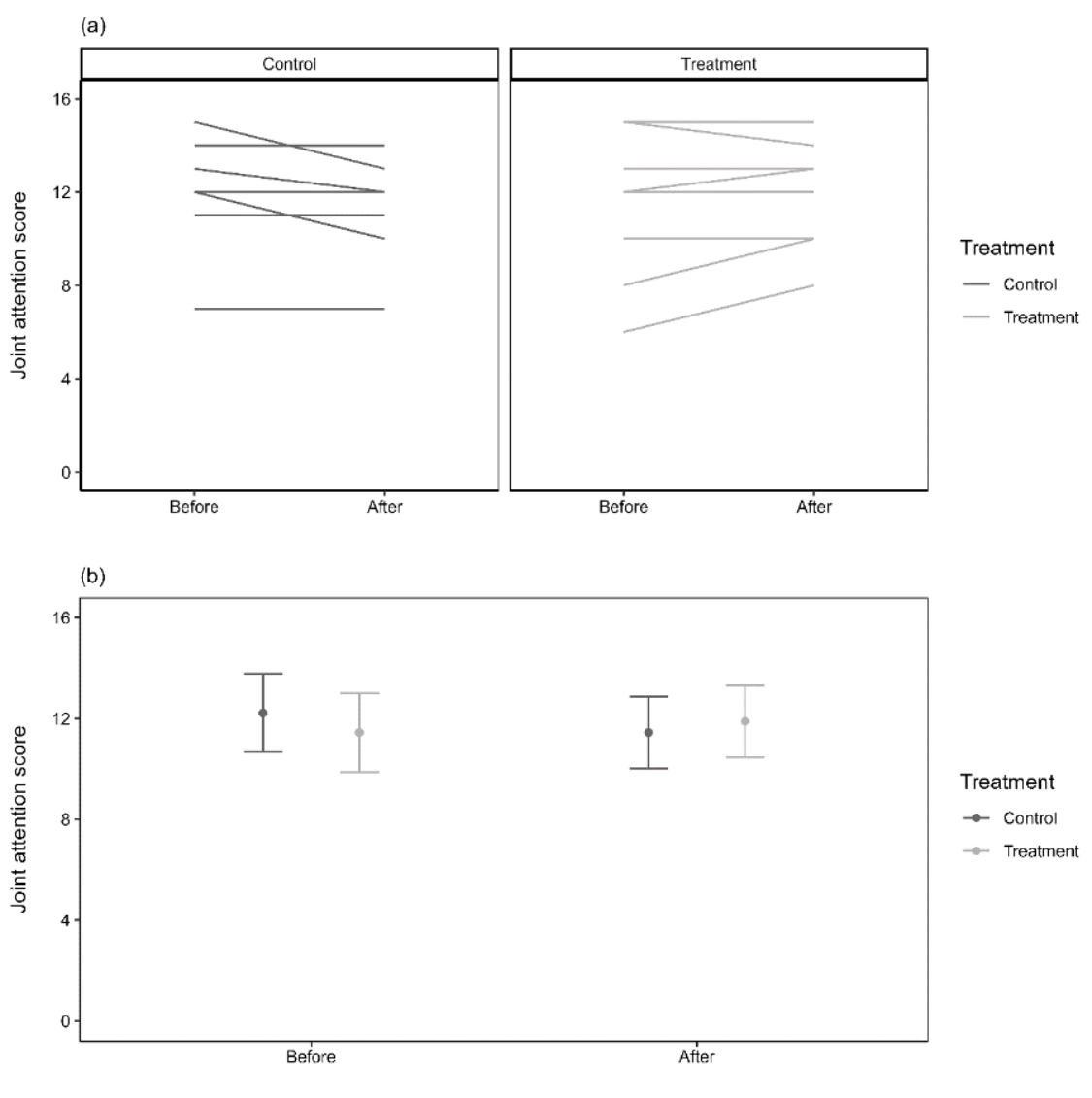


Figure 4.8: Joint attention scores. Panel (a) represents the raw scores for nine individual subjects per treatment and control groups before and after treatment interventions, while panel

(b) indicates the marginal predicted means (+- 95% confidence interval of the mean) before and after treatment interventions.

4.3 Qualitative data analysis

Two main forms of qualitative data collection were employed: observation notes, which encompassed both observation and brief feedback notes, and creative semi-structured interviews. I conducted an inductive thematic analysis on all three data sources through open coding. In this analytical approach, I coded the transcriptions from these data sources, categorised the codes, and subsequently refined them to construct themes.

4.3.1 Creating codes

Codes were created from observation notes, which included brief feedback and observation, and from transcriptions of the creative interviews.

4.3.1.1 Observations

I documented observation notes for each child during their sessions of VAT, in addition to collecting brief feedback from each child after every second session. I integrated the brief feedback notes into the observation notes. I then transcribed the observation notes and subsequently organised them within an Excel spreadsheet. I then assigned each note on each child's experience with VAT a specific code for identification and analysis. Table 4.1 provides illustrative examples of observation notes along with their corresponding codes.

Table 4.1

Examples of codes for participants' interactions

Participant	Participant's interaction	Code
2	"I liked how it shaked me"	Enjoyment of shaking sensation
2	"I got a little bored"	Experience of boredom Rhythmic sensations in body
3	"There was grooving in my body"	Enjoyment of VAT music
4	[The music was] "Perfect" (Points to ears)	Humming to VAT music

5	Lay still and hummed a bit towards the beginning. Got a bit restless about midway until I put on a car racing timer	Restlessness during VAT Required additional activity to remain engaged in VAT
3	Lay still and quietly throughout. Eyes closed. Fell asleep again	Stillness during VAT Falling asleep during VAT
9	Laughed, smiled and mumbled inaudibly to self throughout session	Laughter during VAT VAT evokes chattiness Happiness during VAT

4.3.1.2 Creative interviews

The creative interviews conducted after the ten VAT sessions were video-recorded and transcribed verbatim to maintain authenticity of the original content. These transcriptions encompassed descriptions of participants' observable behaviours and musical interactions, with the aim of providing a comprehensive representation of the original recordings, including relevant non-verbal cues pertaining to the research question. These transcripts were subsequently organised within an Excel spreadsheet, labelled, and subjected to coding using an inductive approach. The resulting codes were subsequently transferred to a new Excel spreadsheet. During this stage, it became evident that many of the codes were more closely related to the participants' engagement in the creative interview than to their experiences with VAT. While these codes were not directly aligned with the initial qualitative research question, they still held potential interest. Consequently, these codes were segregated from those included in the primary dataset and have not undergone analysis. A summary of these codes for each participant is presented at the conclusion of this chapter (Table 4.4) and will receive a brief discussion in Chapter 5. The codes that were included in the primary data set and analysis were related to the child's experience of VAT. Table 4.2 below illustrates the coding process for the creative interviews.

Table 4.2

Examples of codes for participants' interactions

Participant	Participant's comment	Code
-------------	-----------------------	------

2	“It wa- wa- It feeled relaxing like...” [moves body in relaxed and flowing manner. Makes inaudible babbling sounds to describe feeling]	Reflects relaxation through movement Reflects relaxation through vocal sounds
3	[Begins drumming and singing in gentle manner] <i>It is soft and... And it is always comfortable</i>	Experiences VAT as soft Experience of comfort
7	Let me use yellow [Continues drawing for a while] Here, he’s warm	Demonstrates warmth in drawing
6	[Drew stick figure lying on VAT mat, smiling, with music notes above head and saying “Music”]	Enjoyment of VAT music General pleasant experience Demonstrates happiness in drawing
8	[Sings] <i>Zhhhhh. Zhhhhh</i> [mimics mat & shakes body]	Mimics shaking sensation vocally Mimics shaking sensation in movement
9	Headphones with heart above and written “music” below	Demonstrates love in drawing Demonstrates love for VAT music in drawing

4.3.2 Creating categories

Before beginning the categorising stage, all the codes were transferred to a new Excel spreadsheet and any duplicate codes from the same child were removed. To create categories, the codes were then organised based on their similarities. This process involved multiple rounds of rereading and evaluating the connections between codes. Ultimately, the similar codes were grouped into distinct categories, depending on their respective focuses. Table 6 below demonstrates an example of the categorisation process.

Table 4.3

Examples of categories with respective codes

Category	Codes in category
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Physical relaxation	Release of body tension massage sensation Physical relaxation
Positive emotional state	Happiness in music Demonstrates love in drawing Feelings of improved state Happiness during VAT
Comfort	Reflects comfort through sculpture Demonstrates warmth in drawing Associates VAT with hug General feelings of comfort
Low-intensity experience	Reflects gentleness on drum Sensitively engages with playdough Reflects sculpture as non-aggressive
Energising & fun	Experience of fun Excitement in drawing Music has vibrant quality Laughter during VAT
Under-stimulating experience	Experience of boredom Conscious of time Restlessness during VAT Anticipating end of session

4.3.3 Creating themes

The next step in the analysis involved arranging the previously established categories into themes. These categories were grouped together based on the similarities they exhibited. This grouping process resulted in the formation of three distinct themes: physical sensations,

positive emotional state, and low-intensity experience. The following section presents a figure containing the themes and the categories that each encompasses. Thereafter, a description of each theme is provided:

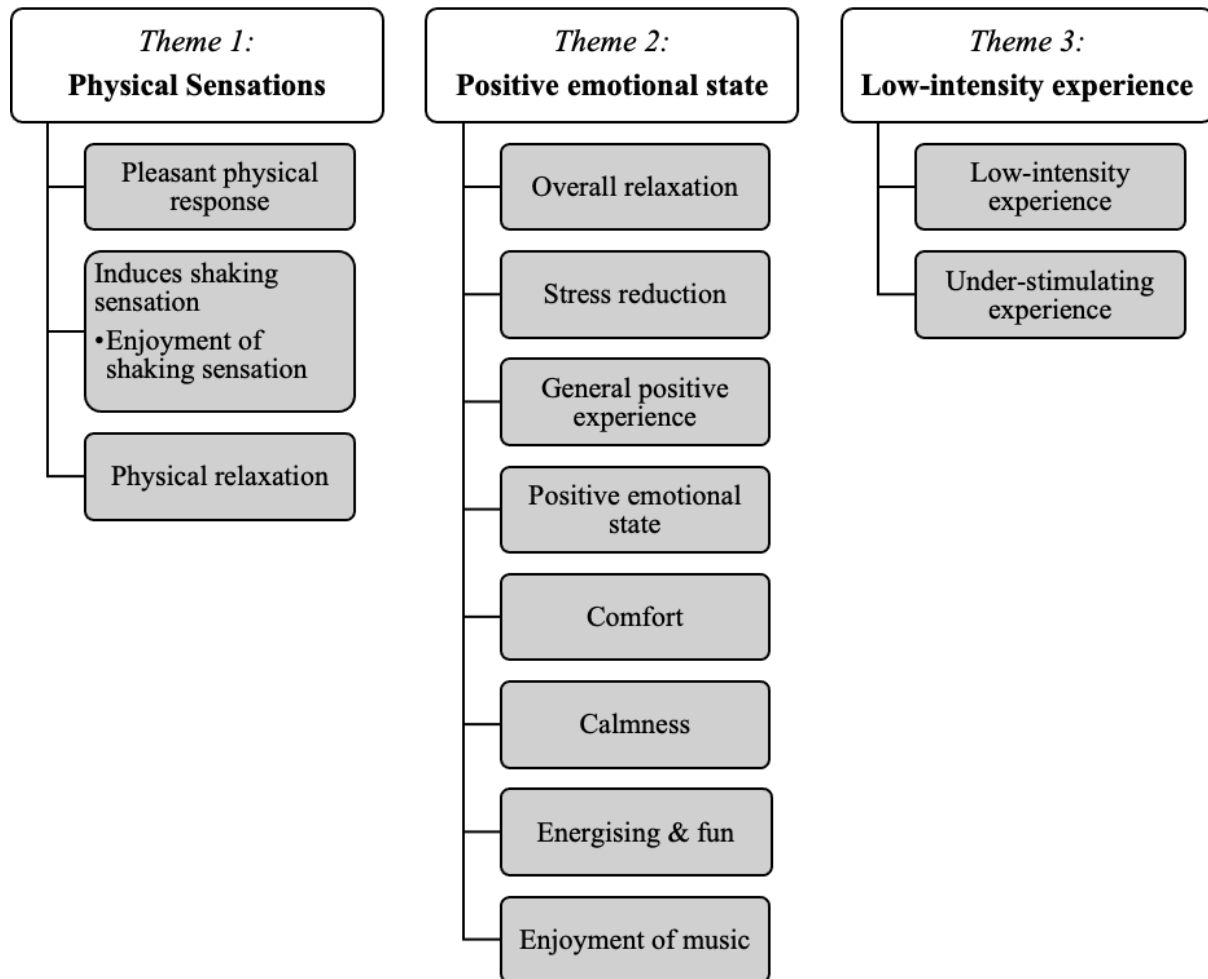


Figure 4.9: Themes and categories

4.3.3.1 Theme one: Physical sensations

In the brief feedback and creative interviews, many of the children described the physical sensations they experienced during or after VAT. Common experiences included feeling a unique shaking sensation during VAT, as well as experiencing physical relaxation. During the brief feedback session, when asked about how it felt in their bodies, Participant 2 mentioned that they enjoyed how it "shook" them and likened it to a massage. Participant 3 expressed that

it felt like their body was dancing or experiencing a form of "grooving." Several other participants reported sensations of warmth, comfort, relaxation, and described the experience as "nice" and "good". In the creative interview, many children used drumming, movement, and vocalisation to express the physical sensations they felt, often attaching specific pleasant emotions to them. Others remained more neutral when expressing these sensations. Many children portrayed fast, shaking qualities, while others used flowing and slow movements and music to convey the relaxing aspects of VAT.

4.3.3.2 Theme two: Positive emotional state

In observations and creative interviews, children frequently expressed their positive emotional states during and after VAT sessions. Participants described feelings of overall relaxation, stress reduction, and a general sense of positivity linked to the experience. They often mentioned experiencing comfort, calmness, and relaxation, as well as general statements such as "nice" and "good". Some participants even expressed a sense of being energised and joyful. During the creative interview, several children enthusiastically described their VAT experiences through movement, songwriting, drawing, and music-making. Many participants sang their favourite songs while replacing some of the lyrics with words to describe their enjoyment of VAT. Participant 2, for instance, replaced the lyrics of "Jingle Bells" with "I like relaxing, I like relaxing in the shaking bed" and also likened the sensation of VAT to feeling like he was melting. He then drew a picture of himself lying on the mat, smiling, with a red heart on his chest, as seen in Figure 5 below. Participant 7 expressed his feelings of warmth by hugging himself in a comforting manner. Some children enthusiastically indicated their enjoyment of the VAT music by drawing or miming headphones on their ears, as evidenced by Participant 9's illustration (Figure 4.10). According to the observation notes, participants 3, 5, and 6 used the word "fun" to describe their experiences, while participants 1, 9, and 10 frequently laughed and smiled during VAT sessions. A few participants fell asleep during the VAT session, which I interpreted as indicating a sense of relaxation. One noteworthy observation was that Participant 1, who was initially experiencing a meltdown, sought a VAT session, after which he reported feeling "better". These accounts collectively illustrate the prevalence of positive emotions such as enjoyment, calmness, comfort, and relaxation associated with VAT among the children involved.

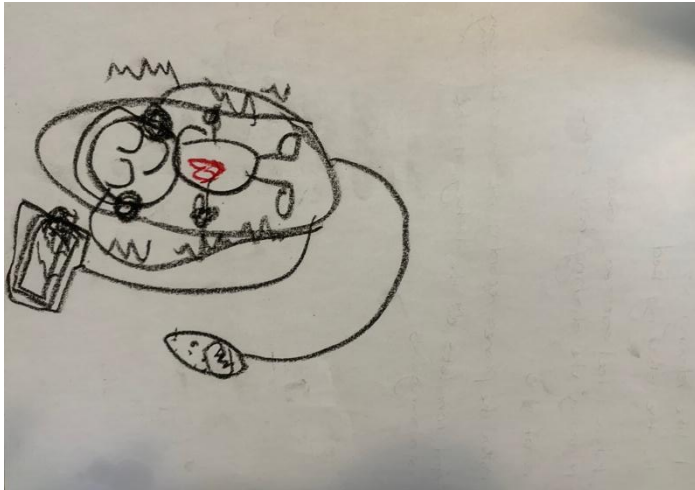


Figure 4.10: Drawing from Participant 2

4.3.3.3 Theme Three: Low-intensity experience

Within this theme, two specific categories emerged from the analysis: "Low-intensity experience" and "Under-stimulating experience." These categories depict how children engage with VAT. In the brief feedback, Participant 2 mentioned feeling bored during VAT. Observations of Participants 2 and 7 revealed restlessness, as they frequently asked for the time and occasionally wanted to leave, suggesting a need for more stimulation. When offered additional activities such as clay or a timer video to watch, these two participants happily remained on the mat. On the other hand, Participant 3 described the VAT as being "soft", while also sculpting a snail during the creative interview, likening VAT to the snail's slow, non-aggressive qualities. In creative interviews, some children used instruments, movement, or singing to convey VAT as a gentle and low-intensity experience.

4.3.4 Engagement with creative interviews

This section includes a table with summaries of each participant's engagement with the creative interview. Although this data is unrelated to the research questions, it is interesting to note for future research.

Table 4.4

Participants' engagements with creative interviews

Participant	Age	Gender	Summary of Engagement
P1	9	M	Immediately drawn to music, showing enthusiasm and laughter. He was highly engaged in drumming and confident in their musical responses. However, he faced difficulties with verbal expression, leading to limited spoken responses.

			On the other hand, he readily embraced sculpting and drawing, finding these activities fun.
P2	9	M	Immediately engaged with music, showing excitement, vocal engagement, and a vibrant quality in their responses. However, his verbal responses were limited, indicating challenges in expression. He also displayed enthusiasm for songwriting and drawing as creative activities.
P3	11	M	Limited verbal responses and hesitancy in music at first, but displayed growing confidence throughout, especially in drumming. He expressed enjoyment and excitement in both drumming and sculpting activities. Despite initial shyness in verbal expression, the participant demonstrated confidence in non-lexical vocables and singing. Additionally, he expressed enjoyment in sculpting, describing the physical qualities of their creations with enthusiasm.
P4	12	M	Faced challenges in verbal expression and lyric articulation but demonstrated an immediate and growing excitement in music. His engagement extended to dancing, and they expressed excitement during both music and dancing activities. Additionally, he immediately engaged in drawing and sustained their involvement, indicating a perception of drawing as a fun activity.
P5	11	M	Faced challenges in verbal expression and lyric articulation but displayed immediate and growing excitement in both music and dancing, music having a bouncy quality. He nonverbally requested music, expressed himself through dancing, and immediately engaged in drawing, sustaining his involvement for an extended period, indicating that drawing was perceived as a fun activity.
P6	9	F	Encountered challenges in verbal expression and lyric articulation but demonstrated an immediate and growing excitement in music. Her engagement extended to dancing, and she expressed excitement during both music and dancing activities. Additionally, the participant immediately engaged in drawing and sustained her involvement, indicating a perception of drawing as a fun activity.
P7	12	M	Limited verbal response but showed immediate and confident musical engagement with music of regular quality. They immediately engaged in drawing, shared their drawing experience, and expressed enjoyment during the creative interview.
P8	10	M	Faced challenges in verbal expression with limited responses but demonstrated growing confidence in engaging with music, which had a regular and bouncy quality. He expressed excitement and confidence in drawing, engaging with it immediately.
P9	11	M	Exhibited an immediate musical response, with limited verbal response but increased verbal engagement after singing. He showed a physical response to music and expressed excitement in both music and drawing, responding immediately to the latter.

4.4 Summary of results

In summary, the quantitative results showed no evidence for significant improvements in sustained, selective, divided and alternating attention. However, there was significant evidence for an increase in joint attention. This included treatment effects, dose effect and sustained effects.

Regarding the qualitative findings, thematic analysis of observation notes and creative interviews revealed three themes: "Physical Sensations," where participants described sensations like shaking, relaxation, and warmth; "Positive Emotional State," emphasising feelings of enjoyment, relaxation, and happiness; and "Low-Intensity Experience," revealing variations in engagement levels, from boredom to excitement.

These results provide a nuanced understanding of VAT's effects on both attentional aspects and the subjective experiences of children with ASD. The integration of quantitative and qualitative findings in Chapter 5 offers a comprehensive interpretation of these results and aims to answer the question of whether VAT is a feasible intervention for children with ASD.

Chapter 5: Discussion

5.1 Introduction

This chapter begins by addressing the study's aims: assessing the effect of Vibroacoustic Therapy (VAT) on attention and investigating the children's experiences of VAT. It systematically integrates these findings to determine whether VAT is a feasible intervention for children with autism spectrum disorder (ASD). The chapter further explores the potential practical implications of the research and the value of the creative interview method and then concludes with a discussion of the study's specific limitations. Given the study's small-scale pilot design, this discussion is speculative and exploratory, resulting in tentative conclusions. The intention is to provide a comprehensive understanding of the feasibility of VAT as an intervention for children with ASD.

5.2 The Effect of VAT on Attention

The quantitative research question in this study was, "Does VAT have an effect on the attention of children with ASD?". This section explores the findings of the attention scores to determine what effect VAT may have had on attention. This may offer valuable insights into whether VAT is an effective intervention in improving the attention of children with ASD.

5.2.1 Effect on joint attention

Analysis of the Joint Attention Test (JTAT) and teacher questionnaire scores revealed a significant increase in joint attention across all testing phases for participants in the treatment group. This suggests immediate, dose, treatment, and sustained effects of VAT on joint attention. Teacher questionnaire results supported these findings, further underscoring their significance and reliability. Thus, it appears that VAT may significantly improve joint attention in children with ASD. Joint attention can be defined as a shared focus on a specific subject with others, and it plays a large role in building social relationships and overall well-being (Bruinsma et al., 2004; Warreyn et al., 2014). Previous research has shown that children with ASD often face challenges in this area (Mundy, 2018; Presmanes et al., 2007; Stone et al., 2007; Sullivan et al., 2007). The observed increase in joint attention in the current study is consistent with the findings of Kim et al. (2008), Lagasse (2014), and Thompson et al. (2014), all of which reported improved joint attention in children with ASD after music therapy interventions. It is worth noting that these studies primarily involved active music-making, which is distinct from the receptive music therapy approach employed in the current VAT

study. Lundqvist et al. (2009) conducted a study on VAT for adults with ASD, where participants experienced improved concentration, aligning with the findings of the current study. Notably, both studies involved 10 twenty-minute VAT sessions, demonstrating similar treatment effects. The only distinction is the age group, with Lundqvist et al.'s study focusing on adults with ASD, while the current study centred on children with ASD.

5.2.1.1 Dose, sustained and immediate effects of VAT

In addition to the observed treatment effect after 10 sessions in the current study, participants also exhibited an improvement in joint attention after five VAT sessions. This is consistent with findings from Ruutel et al.'s (2017) study which indicated a dose effect of VAT, as they observed a significant decrease in pain and improved perceived health conditions after all five sessions. This suggests that VAT may be effective, even after only five sessions. These findings align with the current study's observation of improved joint attention after only five sessions of VAT.

The sustained effects observed in the current study suggest that VAT might enhance joint attention for a week after the intervention. While one week may not indicate long-term effects, evidence of sustained effects may inspire future research to investigate VAT's long-term effects on joint attention. In a longitudinal study by Clements-Cortes et al. (2017), individuals with Alzheimer's Disease exhibited improved cognition, awareness, and clarity three years after VAT sessions, indicating the potential long-term effectiveness of VAT.

As mentioned earlier, the uncertainty surrounding the immediate effects is due to their conflation with treatment and dose effects, making them challenging to isolate. Speculating on the presence of an immediate effect remains the only option, and future studies may need to explore this by conducting assessments immediately after the first session. Notably, Bieligmeyer et al. (2018) found significant immediate effects of VAT on well-being and relaxation after each session. Similarly, Ruutel et al. (2017) observed immediate benefits in individuals with spinal cord and brain injuries, including a notable decrease in spasticity, pain, and anxiety, coupled with an increase in overall well-being after each VAT session. These findings from prior studies underscore the potential for immediate effects, suggesting the importance of more thorough examination in future research.

Given the limited research on VAT in children with ASD, while the aforementioned studies show similar findings regarding time effects of VAT, it is important to emphasise that none of them specifically focused on children with ASD and joint attention. Therefore, there is a need for more research that specifically examines the treatment, immediate, dose, and sustained effects of VAT on joint attention in children with ASD.

5.2.1.2 Neurophysiological regulation

While research specifically focusing on VAT and its impact on joint attention is limited, a neurophysiological perspective may provide insight into potential mechanisms for this observed improvement. According to Bartel et al. (2017), different regions of the brain oscillate at specific frequencies when functioning optimally. An area of the superior temporal sulcus involved in perceptual integration during joint attention processes operates optimally at 40Hz gamma frequency (Chandrasekaran & Ghazanfar, 2009; Peiker et al., 2015). However, individuals with ASD often exhibit underconnectivity in this region (Peiker et al., 2015), which is associated with poor ability to make sense of social cues and thus challenges in social communication and joint attention abilities. Research suggests that 40Hz sound stimulation may entrain and regulate irregular brain oscillations (Bartel et al., 2017; Clements-Cortes et al., 2017; May et al., 1994). Notably, 40Hz sound stimulation was a fundamental component of the VAT intervention in the current study, suggesting that it may contribute to the regulation of neural oscillations in the superior temporal sulcus, possibly explaining the observed increase in joint attention in the current study. However, it is essential to recognise that this is a simplified explanation of a complex phenomenon, providing a foundational understanding of how VAT's effects on brain oscillations may be related to improved joint attention. Further research is needed to further explore the intricate details of the neurophysiological mechanisms underlying VAT's impact.

5.2.1.3 Emotion regulation

Another perspective suggests that VAT's effectiveness in improving joint attention lies in its emotion-regulating capacity (Punikanen et al., 2017). Emotion regulation can be defined as the process responsible for the management and control of one's moods and emotions (Gross, 2015). Emotion regulation has a strong positive correlation with social engagement, and research shows a further positive relationship between social engagement and joint attention (Harder, 2022; Porges, 2017; Punikanen et al., 2017). Qualitative analysis in this study suggests that participants experienced emotion regulation from VAT, potentially explaining the

improvement in joint attention. The next section explores participants' experiences related to emotion regulation and how this may be one of the explanations for the improvement in joint attention.

Relaxation

According to Porges (2017), a state of physical and emotional calmness typically indicates a degree of emotion regulation. Many participants in this study reported feelings of calmness, relaxation, and comfort resulting from VAT. For example, some children adapted their favourite songs, altering lyrics to reflect the relaxation they experienced during VAT. A few even fell asleep during their sessions, possibly indicating an elevated state of relaxation, as discussed further in Section 5.3. Skille (1989) conducted a study on VAT for children with ASD and found that the children experienced relaxation, in line with observations in this study. This observed relaxation suggests that participants experienced a level of emotion regulation through VAT. Porges (2017) posits that individuals in a regulated emotional state are better equipped to engage socially with their surroundings. This improvement in emotional regulation may, in turn, enhance their capacity for joint attention (Harder, 2022; Porges, 2017; Punkanen et al., 2017). The relaxation experienced by participants in this study offers valuable insights into their improved joint attention. This is particularly significant for children with ASD, who often display dysregulated emotional states.

Stress reduction

Although many participants experienced relaxation during VAT sessions, it was not clear if they were in a stressed state before the sessions and if they were in need of relaxation or emotion regulation. However, some participants reported feeling stressed before the intervention, with a noticeable reduction in stress during and after the VAT session. For example, in session 8, Participant 2 shared, "Every time I feel stressed, and I come here, and then I feel my stress is gone afterwards, and I'm so relaxed". The same participant reported that he could no longer feel stress in his head after a different VAT session, suggesting that he was experiencing less stress in his head than before VAT. In both scenarios, the stressors were not clearly defined, and since the study did not assess these stressors physiologically, they cannot be further validated or understood. I observed a more evident case of stress reduction in Participant 1, who arrived in distress and crying after a fight during break time. He requested to lie on the VAT mat for relaxation and expressed feeling 'better,' afterwards. This seemed to indicate an improvement in overall calmness and emotion regulation. I also observed the

participant was calmer as well as better able to articulate himself after this session, suggesting VAT's potential to improve social engagement by alleviating stress. This finding of improved articulation will be explored further in section 5.3. These observations align with Skille's (1989) research, which found that VAT alleviated stress symptoms and induced relaxation in those with elevated stress levels. A single case study by Punkanen et al. (2017) similarly found that VAT helped calm a child in a hyperaroused state and contributed to increased social engagement. However, this is an isolated case and lacks statistical power. Unfortunately, I did not immediately assess joint attention after this incident, so it is unclear whether there was an immediate and significant increase in joint attention as a result of the stress reduction. However, collectively, these findings suggest that VAT may have the potential to improve joint attention, with emotion regulation playing a mediating role.

Mindfulness

Individuals with ASD may experience improved emotion regulation through mindfulness-based interventions (Hartley et al., 2019). Mindful awareness involves focusing on present sensory input or being attentive to present-moment experiences in an accepting manner (Kabat-Zinn, 1990; Zeidan and Vago, 2016). VAT is considered a form of mindfulness-based practice by Ahonen et al. (2012) as it encourages individuals to concentrate on bodily sensations and the present moment, inducing a relaxation effect.

In Ahonen et al.'s (2012) study, participants noted that VAT heightened their self-awareness, including awareness of physical sensations and emotions, allowing for clearer thoughts and encouraging relaxation. In the current study, participants demonstrated an awareness of the sensations induced by VAT, describing these sensations as if sound vibrations were "moving all over" and "grooving" in their bodies, similar to the sensation of "having a massage" and generating feelings of physical warmth.

After the VAT sessions, the children were asked about how VAT felt in their heads, referring to their cognitive experiences. Although it was challenging to determine if the children interpreted the question as pertaining to physical sensations or cognitive experiences, their responses indicated a form of self-awareness resulting from VAT, a key component of mindfulness (Richards et al., 2010). Responses included "I cannot feel any stress in my head anymore," "It feels clear now," "relaxed," and "calm". This heightened bodily awareness may

shift their focus to the present moment, aligning with the goals of mindfulness techniques (Ahonen et al., 2012).

While the children may not intentionally practice mindfulness during VAT, the therapy appears to produce similar outcomes by fostering self-awareness and attentiveness to the present moment. This redirected attention may help individuals take their minds off distress, in line with mindfulness principles. Overall, the participants' increased sensitivity to bodily sensations after VAT underscores its potential to enhance emotion regulation by strengthening their connection to the body and the present moment.

Integration of tactile stimuli

One may further understand the improvement of joint attention from the perspective of sensory integration. Sensory integration allows one to make sense of external stimuli effectively and plays a large role in one's emotion regulation capacity (Rodriguez & Kross, 2023; Simhon et al., 2019). Children with ASD commonly experience sensory integration issues regarding tactile sensory input (Kilroy et al., 2019). Mäkelä (2005) and Punkanen et al. (2017) mention the importance of one's tactile system in indicating safety and comfort. Furthermore, the somatosensory system develops before birth and significantly influences one's sense of safety, which may explain why some users of VAT have described the experience as similar to feelings of being in the womb (Lehtonen, 2010; Punkanen et al., 2017). In the current study, many participants found the tactile input enjoyable and comforting. For example, participant 7 often reported regular feelings of physical warmth and on one occasion, he hugged himself to further depict this feeling. This seemed to show a sense of physical comfort related to his VAT experience. Notably, Participant 7 exhibited the most significant increase in overall attention and specifically joint attention. While this case is of interest, it is crucial to acknowledge that it represents only a single instance and therefore lacks statistical power.

According to Skille (1989), children with ASD and tactile defensive behaviour may also benefit from the gentle vibrations in VAT. Skille (1989) conducted a study on VAT for children with ASD and tactile defensive behaviour, revealing that these children enjoyed the tactile input from VAT and became more receptive to physical touch after the intervention. This seems to indicate the occurrence of sensory integration and possibly improved emotion regulation (Rodriguez & Kross, 2023). Therefore, the gentle vibrations in VAT may play a role in regulating the sensitive tactile systems of children with ASD, contributing to improved emotion

regulation (Dellapiazza et al., 2021; Punkanen et al., 2017; Skille, 1989). Once again, VAT's ability to improve sensory integration and emotion regulation suggests that it has potential to help children engage socially and, consequently, enhance their joint attention (Porges, 2017).

Integration of auditory stimuli

Many children with ASD also experience a poor ability to integrate auditory stimuli (Dellapiazza et al., 2021). According to Bridges' (2015), Simhon et al. (2019), Punkanen et al.'s (2017) and Wigram's (2004) research, the use of consistent, predictable, and soothing music with unchanging melodic lines during VAT sessions can promote sensory integration and emotion regulation, while also minimising the risk of overstimulation. Lundqvist et al. (2009) report that individuals with ASD experienced a sense of security during VAT, attributed to the consistent use of the same, calm music throughout the intervention. In the current study, several participants reported feelings of calmness and relaxation in response to the VAT music. While the specific sensory profiles of the children were unknown, these responses, coupled with existing research, suggest that the calming music used in VAT may have a regulating effect on children with ASD, with the integration of auditory stimuli potentially playing a mediating role. This enhanced emotion regulation may, in turn, contribute to improved social engagement and joint attention (Dellapiazza et al., 2021; Porges, 2017; Rodriguez & Kross, 2023).

Therapeutic presence

My consistent presence is another factor that may contribute to the observed improvement in joint attention. Notably, Participant 4's creative interview featured a drawing with the words "girl," "love," and "music," in which he openly referred to me (Figure 5.1). While I did not explicitly introduce additional therapeutic interventions beyond Vibroacoustic Therapy (VAT), their involvement in escorting children from their classrooms to sessions, regular check-ins, and a warm, empathetic demeanour could have fostered feelings of comfort, safety, and enjoyment during VAT sessions. Although not specific to VAT, Porges (2017) emphasises the significance of the therapeutic presence, a key component often associated with VAT. Therapists can establish a sense of safety and comfort through warmth and empathy, cultivating trust and effective co-regulation. Nonverbal cues, such as facial expressions and prosody of speech, play a crucial role in conveying understanding and safety (Porges, 2017). Emphasising the therapeutic relationship in VAT, Punkanen et al. (2017) highlight its importance in promoting emotion regulation, especially when working with emotionally dysregulated

children. Their case study demonstrates that despite experiencing dysregulated emotional states, a child found comfort, safety, and warmth through VAT combined with a strong therapeutic relationship. Given the established connection between emotion regulation and joint attention (Harder, 2022; Porges, 2017), my consistent presence may have played a positive role in influencing joint attention. This underscores the potential significance of therapeutic presence in VAT, suggesting its contribution to supporting emotion regulation and fostering improved joint attention.



Figure 5.1: Participant 4's drawing

5.2.2 Effect on other attentional domains

Although there were improvements in sustained, selective and alternating attention during the testing phases, these changes were not statistically significant, indicating that VAT did not significantly influence these attentional domains. These results contrast with other research involving music-listening interventions. For example, Mendes et al.'s (2021) systematic review suggests that music-listening interventions can enhance these attention types. The findings also contradict Mahraun (2004) who found that children with ASD performed better on sustained attention tasks when listening to background music. Similarly, they do not align with Janzen and Thaut (2018) who discovered that music-listening could improve brain connectivity related to attention. However, it is important to note that these studies only considered the music-listening aspect of VAT and not the sound vibrations. Puncanen et al.'s (2017) case study found that VAT improved the concentration levels of a 10-year-old child with severe emotion regulation capacity. However, this is only one observation and therefore lacks statistical value.

5.2.2.1 Neurophysiological perspective

Due to the design of the NEPSY-II tests, this study encountered challenges in isolating and analysing distinct attentional domains. The Auditory Attention subtest combined assessments of sustained and selective attention, while the Response Set subtest assessed sustained and alternating attention together. As a result, the analysis could not separate these attentional domains. The only isolated attention scores for each domain came from teacher questionnaires, but these questionnaires had only one question per domain, limiting the internal validity of the analysis when examining each domain individually. Consequently, this neurophysiological discussion focuses on the three attentional domains collectively to propose an explanation for the absence of statistically significant improvements. It is important to note that this discussion is speculative due to the complexity of attention neurophysiology.

Individuals with ASD often exhibit underconnectivity in brain areas related to sustained, selective, and alternating attention (Fauzan & Amran, 2015; Janzen & Thaut, 2018; Welsh & Estes, 2018). Research indicates that 40Hz gamma frequency oscillations play a significant role in attention functioning, particularly in selective attention (Bartel et al., 2017; Jensen et al., 2007; Kahlbrock et al., 2012). However, sustained attention relies more on theta frequency, while inhibiting task-irrelevant processes relies more on alpha frequency (Clayton et al., 2015). VAT's dominant gamma frequency sound stimulation may have improved participants' ability to attend to sensory inputs, but it might not have effectively targeted sustained attention or task inhibition due to their differing optimum-functioning frequencies. This could explain the minor, statistically insignificant increase in attentional scores compared to the control group.

Regarding alternating attention, both gamma and theta oscillations are crucial for optimal functioning (Voloh et al., 2015). Therefore, VAT's dominant gamma frequency may not have fully addressed alternating attention. This neurophysiological perspective provides a theory for the lack of statistical significance in sustained, selective, and alternating attention. However, it is essential to consider that the study's limitations may have also influenced these findings, as discussed in Section 5.7.

5.3 Children's Experiences of VAT

The qualitative research question in this study was, "How did the participants experience VAT?". This section explores the children's experiences without a specific focus on their links with attention. Instead, it provides valuable insights into the children's experiences of VAT,

offering a foundation to assess its potential as an implementable intervention for children with ASD.

5.3.1 Positive emotional state

Throughout the intervention, many participants displayed a positive emotional state regarding VAT. Other than experiencing the already mentioned relaxation, calmness, comfort and enjoyment of the music, some participants expressed excitement and joy regarding their sessions. The VAT intervention also seemed to provide an energising and fun element for some participants, in line with findings by Ahonen et al. (2012) in which participants reported feeling more energised and joyful after sessions. I observed this in their excitement before and after sessions as well as in the creative interview when expressing their experiences of VAT. For example, Participant 6 often excitedly exclaimed "It's relax time!" when being collected from her classroom before a session. Participant 2 also enthusiastically adapted the lyrics of "Jingle Bells" to "I like relaxing in the shaking bed" (Figure 5.2), and drew a picture depicting a contented smile and a red heart on his chest while lying on the VAT mat (Figure 5.3). The findings from these studies suggest that VAT may have the potential to effectively enhance mood. Bartel et al. (2017) and Ellis (2004) conducted studies involving VAT with elderly individuals and reported improved mood immediately after sessions and over multiple sessions. Additionally, Campbell et al. (2017) found that VAT reduced anxiety in individuals with chronic pain, while Ahonen et al. (2012) found that music students and staff reported enhanced mood and increased mindfulness following VAT sessions. Although research on children with ASD and their experiences with VAT is limited, Skille (1989) found that these children greatly enjoyed VAT.

Many participants also expressed enjoyment of the music in particular, conveying this through words such as "perfect," "lekker,"¹ and "beautiful," by giving a thumbs-up, or through drawings (Figure 5.4). Furthermore, Participants 5 and 6 engaged in enthusiastically humming along to the music during multiple sessions, underlining their positive engagement with the VAT music. Lundqvist et al. (2009) found that individuals with ASD and other developmental conditions found that playing the same music in each session created a sense of familiarity and security around VAT, enhancing their emotional state.

¹ Lekker: Afrikaans word conveying a sense of enjoyment

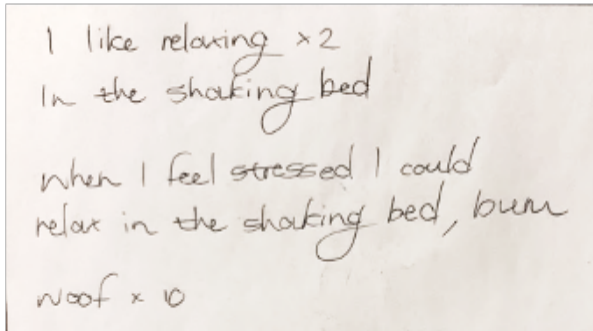


Figure 5.2: Participant 2's song in creative interview

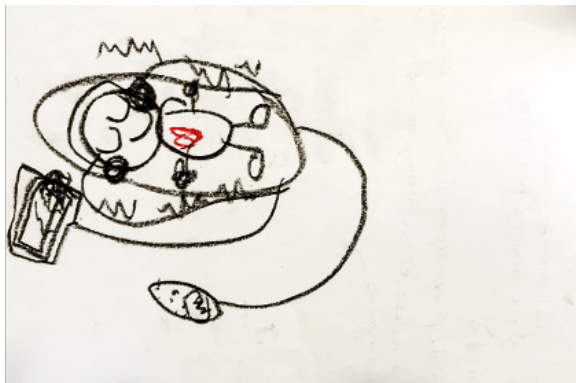


Figure 5.3: Participant 2's drawing of VAT experience

5.3.2 Falling asleep

As previously mentioned, some children fell asleep during VAT sessions underscoring its potential to induce a state of relaxation. Clements-Cortes et al. (2017) and Rützel, et al., (2004) made a similar observation of VAT users falling asleep during sessions. Additionally, Skille (1989) noted that VAT sessions helped individuals struggling with insomnia to fall asleep during sessions and lead to improved sleep quality and duration. Subsequent studies have reported notable enhancements in both sleep quality and duration (Campbell et al., 2017; Clements-Cortes et al., 2017; Naghdi et al., 2015). Although I did not have information about the children's specific sleep patterns, sleep issues are prevalent among children with ASD (Cohen et al., 2014). Therefore, future studies could explore the potential impact of VAT on the sleep patterns of children with ASD.

5.3.3 Feelings of warmth

As previously mentioned, Participant 7 reported that VAT induced feelings of warmth in his body. He hugged himself to depict this, seemingly indicating a sense of physical comfort

related to it. He then reinforced this experience by drawing a picture of himself on the mat with the sun above (see Figure 5.1). Bieligmeyer et al. (2018), Punkanen et al. (2017), Vilímek et al. (2021) and Wigram (1996) found that warmth and comfort were common responses among individuals undergoing VAT, aligning with the findings in the current study. This phenomenon may be attributed to sympathetic resonance, as described by Punkanen and Ala-Ruona (2012). Sympathetic resonance occurs when specific sound vibrations interact with the body, promoting deep relaxation, increased blood circulation, metabolism, muscle relaxation, and subsequently elevated body temperature.

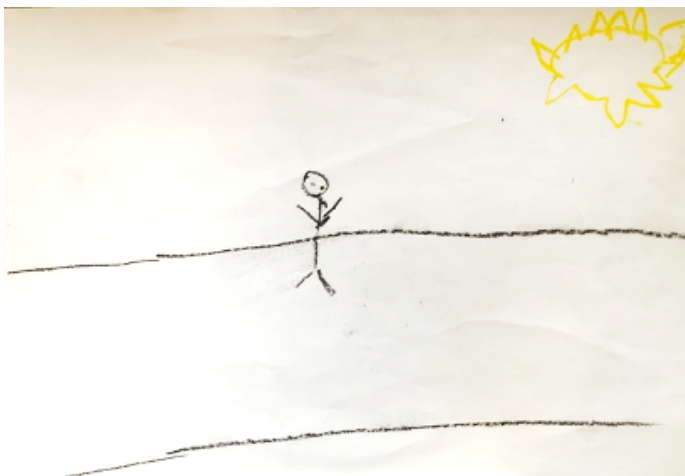


Figure 5.1: Participant 7's Drawing

5.3.4 Experience of VAT as gentle

The "Low-intensity and Understimulation" theme, that emerged in the thematic analysis, relates to the gentle and non-aggressive perception some participants had of VAT. They expressed this perception through gentle drumming and flowing movements when asked to share their VAT experiences. Participant 3 reinforced this perception by describing VAT as "soft" and "always comfortable" during the creative interview.

One participant expressed gentleness by likening the experience to gentle and non-aggressive animals, which he had sculpted out of clay. This view of VAT as being gentle corresponds with previous research describing VAT as non-invasive, relaxing, and enjoyable without negative responses (Punkanen & Ala-Ruona, 2012). Bridges (2017) also speaks about the importance of subtlety and gentleness when working with children with ASD, especially due to their often heightened susceptibility to overstimulation.

5.3.5 Understimulation during VAT

While many participants experienced relaxation effects from VAT, some exhibited restlessness on the mat, suggesting a need for additional stimulation. In response, I introduced playdough or videos of racing cars and Lego timers to enhance their engagement. This approach effectively addressed the restlessness in three participants. Puncanen et al.'s (2017) case study, focusing on a child with regular emotional dysregulation, showed that building a fort on the VAT mat increased engagement and provided a comforting effect, enhancing the regulating effects of VAT. Similarly, in the current study, the introduction of activities like playdough and timer videos seemed to encourage deeper engagement with VAT, enhancing the overall experience for the participants.

Participant 2, despite engaging in conversations with me and expressing enjoyment of VAT, showed moments of restlessness. This behaviour suggested a potential desire for social interaction. However, I limited interactions to maintain protocol consistency and avoid introducing data bias. While Participant 2 consistently enjoyed VAT, there was a brief mention of feeling 'a little bored' in one instance, possibly indicating a need for more stimulation or interaction. As discussed earlier, the therapeutic relationship plays a crucial role in the effectiveness of VAT (Porges, 2017; Puncanen et al., 2017; Puncanen & Ala-Ruona, 2012).

5.3.6 VAT and improved speech

As previously mentioned (Section 5.2), Participant 1 entered the room in a state of distress but demonstrated improved emotion regulation after his VAT session. Notably, his speech became more articulate after the session in that he was able to explain what caused his distress and report feeling better afterwards. Many children with ASD face challenges in speech production, which may in part be due to regular dysregulated emotional states (Janzen & Thaut, 2018; Michalik & Solak, 2017; Porges, 2017; White et al., 2021). This may suggest implications for VAT to improve speech production. However, this observation is based only on a single participant and does not have any statistical power. While research on VAT's effects on speech production is limited, Ellis (2004) found that elderly individuals experienced improved verbal communication after undergoing VAT sessions for several months. Further research into VAT's effect on speech production for children with ASD is an area worth exploring. It is crucial to note that I sent Participant 1 to discuss the incident with his teacher after the session

to avoid introducing potential confounding verbal therapy elements into the intervention, which could have impacted the data.

5.4 Feasibility of VAT

Given the improvements in joint attention and the overall positive feedback from each participant during the VAT intervention, VAT appears to be a promising approach for children with ASD, particularly in enhancing emotion regulation and joint attention. However, it is crucial to acknowledge that some participants experienced moments of understimulation, suggesting that VAT may not be universally suitable or may require customisation to meet each child's specific needs. This section explores the possible ways VAT could be adapted to suit the various needs of children with ASD.

Punkanen (2017) suggests that allowing the child to select their favourite song for VAT sessions can enhance their connection with VAT and contribute to a greater sense of safety, comfort, and enjoyment. In the current study, my decision to use 40Hz dominant music was based on existing evidence of its impact on neural oscillatory behaviour, particularly in relation to attention (Bartel et al., 2017). While many participants in this study expressed enjoyment of the music I selected, a few did experience restlessness and under-stimulation, which may have been related to the choice of music. Therefore, future research may benefit from considering the use of client-selected music, especially when working with children who regularly experience states of emotion dysregulation (Punkanen, 2017).

While the gentle and non-invasive nature of VAT seemed to induce relaxation in some children, as discussed earlier, it was evident that certain participants experienced understimulation and sought additional engagement (Punkanen & Ala-Ruona, 2012) The introduction of additional activities like playdough and timer videos helped some of the participants engage more in the VAT intervention. This suggests that the inclusion of additional activities might be a valuable strategy in encouraging children to engage more deeply with VAT. This is akin to how the fort-building activity facilitated greater participation by the child in Punkanen et al.'s (2017) case study, leading to increased comfort, emotion regulation and concentration (Punkanen et al., 2017).

Another factor to consider is the potential need for a stronger therapeutic relationship with the participants. It is possible that a stronger therapeutic relationship, involving more interaction

with me, could have helped Participant 2 feel less restless and experience improved emotion regulation in combination with VAT. As mentioned earlier, the therapeutic relationship may play a role in enhancing the comfort and regulation provided by VAT. This was observed in Punkanen et al.'s (2017) case study. This further underscores that VAT can encompass various elements tailored to the child's needs for engagement and emotion regulation. For Participant 2, increased interaction with me could potentially have led to greater engagement, allowing him to derive full benefits from VAT and possibly preventing feelings of boredom.

Another possible way to adapt the VAT intervention to suit the needs of different children is to extend the duration and frequency of the sessions. Previous research on VAT has shown significant improvements in various health conditions after more than 12 sessions, each lasting 25 to 40 minutes (Campbell et al., 2017; Di Rito, 2017; San Vicente et al., 2015). This exceeds the 10 sessions of 20 minutes each used in the current study. Clements-Cortes et al. (2017) used the same music track in VAT sessions as in the current study. However, they noted that because the track used a prominent 40Hz frequency and not pure 40Hz sound stimulation, one may need to extend VAT sessions to longer than 20 minutes each to achieve greater effects (Clements-Cortes et al., 2017). In this case, the current study might have needed to extend each VAT session or provide more than 10 VAT sessions for each participant. However, this was not possible due to time constraints and the pilot study nature.

Certain participants might have also experienced improvements with higher vibration intensity and increased sound volume. There is currently no established research specifying recommended sound volume and vibration intensity levels for children with ASD. This aspect tends to be highly individualised and subjective, as indicated by Hynynen et al. (2017). The only available guidance suggests maintaining the volume below 70 decibels, which is considered the maximum safe level for human ears. Additionally, it is important to be mindful of potential auditory hypersensitivity in some children with ASD, as noted by Dellapiazza et al. (2021). To ensure the safety and comfort of the participants, I initiated each session with the volume and vibration intensity set to their lowest levels. They then gradually increased these settings while closely monitoring each participant's response. However, it is worth mentioning that this process was occasionally challenging because some participants had difficulty fully understanding my inquiries, even when presented straightforwardly. Therefore, remaining cautious, I maintained the sound volume and vibration intensity at levels below the maximum recommendations. As a result, it is possible that the sound volume and vibration

intensity may not have been sufficiently high for some children to experience the maximum benefits from the VAT intervention.

These findings collectively suggest that VAT may be a feasible intervention for children with ASD. However, one may need to adapt the intervention according to the child's specific needs and sensory profile. Additionally, the multifaceted nature of the participants' responses to VAT may emphasise its potential as a holistic therapy approach which may need to include additional activities and a strong therapeutic relationship. A recommendation is to incorporate VAT as part of a comprehensive therapeutic program for children with ASD. VAT can play a role in promoting emotion regulation, potentially enhancing a child's engagement in various therapeutic modalities. Furthermore, future research could further investigate sensory profiles and the impact of VAT parameter adjustments on participant engagement. Exploring how the combination of VAT with other modalities might enhance its effectiveness warrants consideration. This study opens the door to a more comprehensive understanding of VAT's role in addressing the diverse sensory needs of children with ASD, further enriching the field of therapeutic interventions for children with ASD.

5.5 Implications for practice

This study adds to the limited literature on VAT with children with ASD. More studies are however needed to further investigate the role of VAT in attention and emotion regulation of children with ASD, especially since this is a small pilot study. Given the finding that VAT may be a practically implementable intervention for children with ASD, it is essential to consider possible future implications for practice.

One potential application of VAT is within sensory rooms in schools for children with ASD where it can offer comfort to those who are in a state of heightened arousal. In such settings, VAT can provide tactile and auditory input that may foster emotional well-being and sensory integration, making it a valuable addition to schools for children with ASD. Additionally, VAT can be incorporated into multimodal therapy plans within private care settings. Healthcare professionals and therapists working with children with frequent emotion dysregulation and joint attention challenges can integrate VAT into their practice, adopting a holistic approach that addresses each child's unique sensory needs. By doing so, not only can children benefit directly from VAT, but the regulated emotional states induced by VAT may lead to improved outcomes from other therapy modalities.

Furthermore, VAT has the potential to become a part of daily routines, similar to meditation or mindfulness practices, offering children with ASD an avenue to cultivate better emotion regulation, relaxation, sensory integration, and potentially joint attention in the home. In this context, VAT transcends being solely a therapeutic intervention administered by a health professional to become an accessible daily practice contributing to the overall well-being of children with ASD.

Future research can expand on the therapeutic potential of VAT in researching the effect of VAT on body awareness, something also intricately linked to emotion regulation. Moreover, future studies could look at ways of testing emotion regulation in addition to attention to provide a different angle of assessing the wellbeing of children with ASD. Furthermore, VAT's potential in improving the quality of sleep may provide a non-pharmacological solution worthy of exploration, particularly for children with ASD amongst whom sleep issues are common (Campbell et al., 2017; Clements-Cortes et al., 2017; Naghdi et al., 2015).

A VAT device is costly and so within the context of South Africa, a less industrialised country, affordability may be a concern. VAT may therefore seem out of reach for less privileged areas and individuals. Health professionals in South Africa may need to consider the financial feasibility of VAT by exploring options like subsidies or funding programs to increase access to this form of therapy.

5.6 Value of creative interview method

According to Dos Santos and Wagner (2018), various creative methods, including drawing while listening to music, songwriting, and drumming, offer valuable tools when working with children in therapeutic settings. These methods not only help participants feel more comfortable in the setting but also serve as effective channels for creative and explorative expression in research (Dos Santos & Wagner, 2018). During the creative interviews, each participant displayed enthusiasm and engagement while singing, drawing, using instruments, and working with playdough. They appeared more invested in responding to questions related to their VAT experiences within this creative context compared to the conventional feedback session. There was also a clear sense of them taking ownership of the interviews in that they had creative freedom to express themselves in whatever way they wanted to. For example, Participant 3 chose to use the playdough to sculpt animals which he felt depicted his VAT

experience, whereas a few others found such excitement in choosing their favourite song and rewriting it to make it their own in depicting their VAT experience.

Dos Santos and Wagner (2018) argue that creative elicitation methods also provide a means of expression beyond conventional speech. This is particularly relevant when working with children who experience speech challenges, such as those with ASD (Bridges, 2017). In this study, some participants faced challenges with verbal communication, notably those with echolalia. Even when I repeated and clarified questions, they seemed to find it difficult to articulate their feelings and experiences regarding VAT. The creative interviews addressed this issue to some extent by using music, drawing, playdough and drumming. For instance, Participant 9, who had limited speech and echolalia, enthusiastically sang an adapted version of "If You're Happy and You Know It" while adding gestures to convey his feelings regarding VAT. He then drew a picture depicting his VAT experience, which offered richness to his feedback (Figure 5.3).

While the creative interviews were valuable in getting insightful feedback about the participants' VAT experiences, it is worth noting that two participants seemed to have misunderstood the purpose of the drawing activity. Even after I encouraged them to draw about their VAT experience, they ended up drawing unrelated objects they enjoyed, treating it more as a recreational activity. This highlights that the use of creativity in this context may have its limitations. Nevertheless, I managed to find alternative creative methods for these participants to convey their VAT experiences, highlighting the versatility of this multi-faceted nature of the interviewing approach.

Although these specific observations may not be directly tied to the children's VAT encounters, they indicate the potential of creative interviews in future research involving children with ASD, particularly when conventional verbal communication may prove challenging.

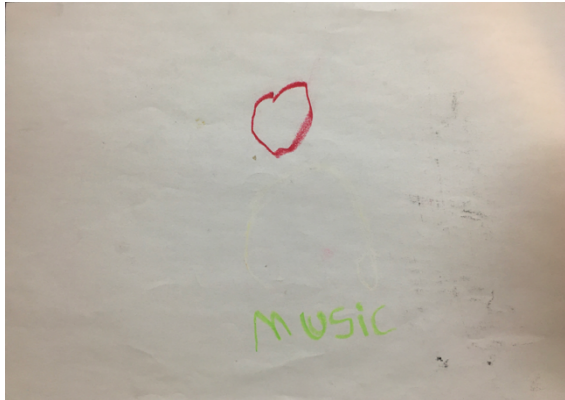


Figure 5.2: Participant 9's drawing of a heart with white headphones and written "music".

5.7 Limitations

This pilot study presents several limitations, with one of the most prominent being the small sample size of only nine participants in each group. This limits the generalisability of the findings and diminishes the study's statistical power (Button et al., 2013). Moreover, a small sample size restricts the variability in the data, introducing an element of uncertainty in drawing conclusions. Nevertheless, it is crucial to highlight that participants were chosen randomly in an effort to introduce some degree of variability into the sample, which addresses concerns about generalisability to some extent.

Furthermore, a few confounding variables were left uncontrolled during the study. The timing of attention tests lacked standardisation, revealing that participants' energy and focus levels changed throughout the day. Reports from teachers indicated a common decrease in children's concentration levels during the afternoon. I noticed signs of tiredness during afternoon tests, potentially impacting their ability to engage their attention fully. Unfortunately, scheduling constraints prevented me from addressing this issue, leading to the time of day being a confounding variable. For a few participants, attention tests occurred just before break time, which appeared to create distractions, hindering their full engagement in the tests. In future research, having additional research assistants administer assessments at consistent times could help control for this factor.

The study acknowledges that medication usage among children with ASD can be a variable impacting attention levels (Sturman et al., 2017). Due to the lack of specific medication information for each participant and the prevalence of medication use at the school, controlling

this variable was challenging. Future research could collect comprehensive medication data through informed consent and participant questionnaires, including details such as medication type, dosage, timing, and potential side effects, to better account for its influence on attention levels.

Instrumentation presented challenges as the inclusion of two children with comorbid mild intellectual disability affected their understanding and completion of NEPSY-II tests. This difficulty likely influenced outcomes, particularly in the more challenging NEPSY-II Response Set subtest. Despite efforts to control by matching participants in treatment and control groups, questions arise about the tests' validity for these individuals. Previous studies (Barron-Linnankoski et al., 2015; Shields et al., 2020) suggest potential considerations for test adaptations. However, the varied comprehensive abilities in our study could result in a ceiling or floor effect, where many participants achieve the highest or lowest possible scores, limiting the test's ability to distinguish higher or lower levels of a trait (Šimkovic & Träuble, 2019). Future studies may benefit from stricter exclusion criteria for intellectual disability to enhance test validity or exploring alternative attention assessments.

Furthermore, the impact of low-income backgrounds on participants' educational levels and their understanding of the NEPSY-II assessments is a noteworthy consideration. The decision to utilise UK norms, influenced by the circumstances that fewer than half of the participants came from low-income backgrounds, introduces a level of uncertainty around test validity. Fortunately, efforts were made to mitigate this by matching individuals from low-income backgrounds who experienced difficulties in test comprehension, thereby controlling for this variable as much as possible. It is essential to note that the NEPSY-II scores were employed for group comparisons and tracking changes over time, rather than solely interpreting the implications of isolated scores, further deeming the use of UK norms appropriate.

Practice effects appeared to contribute to an increase in attention scores over the course of the intervention, however the presence of the control group controlled for this. It is also important to consider the Hawthorne effect, which suggests that participants may perform differently when aware of being observed or tested (Sedgwick & Greenwood, 2015). Some participants might have felt some performance pressure during the NEPSY-II tests, impacting the outcome and reliability of these scores. However, it is unlikely that this significantly influenced the joint attention results. The joint attention test used in this study was designed to be discreet and was

seamlessly integrated into the assessment of the other attentional domains, ensuring that the children remained unaware of being evaluated.

Furthermore, it is essential to recognise that factors other than VAT may have played a role in the observed increase in joint attention in this study. One such factor might be the extended time the treatment group participants spent with me during VAT sessions, compared to the control group. A consistent therapeutic presence may play a role in providing clients with a sense of safety and comfort (Porges, 2017). - that a sense of safety and comfort may positively impact one's ability to engage socially, thus potentially influencing joint attention (Harder, 2022; Porges, 2017). While this additional interaction could have improved their social connection with me, it is unlikely to have significantly impacted the improvement in joint attention scores. This is because I primarily focused on delivering VAT instructions and did not actively aim to build a therapeutic relationship, however, it is still important to consider this as potentially confounding the data.

In light of these limitations, there is a clear need for further research with larger sample sizes or alternative research methodologies to gain a deeper understanding of the relationship between VAT and attention. However, it is important to note the study's significant findings regarding improved joint attention and the rich qualitative findings about their experiences. This could potentially serve as a foundation for future research exploring the applications of VAT for children with ASD.

Chapter 6: Conclusion

6.1 Summary of findings

This study explored Vibroacoustic Therapy (VAT) as a potential intervention for children with Autism Spectrum Disorder (ASD). The aim of the study was to explore the effects of VAT on attention, the children's experiences of VAT, and whether VAT is a practically implementable intervention.

The findings revealed several positive aspects of VAT. Most notably, there was a significant improvement in joint attention, a critical skill for building social connections and nurturing the overall well-being of children with ASD (Bruinsma et al., 2004). Moreover, the study indicated that VAT had a positive impact on emotion regulation, illustrated in the children's reports of relaxation, calmness and comfort relating to VAT sessions. Emotion regulation is a vital component of social engagement, showing strong links to joint attention (Porges, 2017). This potentially explains the observed improvement in joint attention of the children in the study (Porges, 2017). Many of the children in the study also expressed VAT as being gentle and enjoyable, highlighting its non-invasive and enjoyable nature. More notable findings that warrant further exploration in future research were the potential effects of VAT on sleep challenges and speech production.

On a broader scale, the study confirmed the acceptability and feasibility of VAT as an intervention for children with ASD, however, suggested it be adapted to the different stimulatory needs and sensory profiles of different children with ASD. It was notable that the children enjoyed their VAT sessions, highlighting the potential for this therapy to be integrated into therapeutic programs, therapy practices and the sensory rooms of schools for children with ASD.

6.2 Recommendations for future research

In this study, several recommendations for future research emerge, aiming to deepen our understanding of VAT's applicability and effectiveness within the context of children with ASD. Given the limitations of a small sample size in this pilot study, future research should aim to include a larger sample size, allowing for increased statistical power and enhancing the generalisability of findings. While the study focused on attention, future research could explore the impact of VAT more directly on emotion regulation, using emotion regulation assessments.

Determining immediate effects of VAT on joint attention was challenging as both mid-test and post-test 1 measure dose and treatment effects, making isolation difficult. Observed improvements likely resulted from cumulative session impact. Assessing immediate effects accurately might require assessments after session 1. This uncertainty could be a potential focus for future research. Additionally, ambiguity about when VAT effectively enhances joint attention arises from improvements after five sessions, with no earlier tests except the pre-test. Future studies could clarify with more frequent assessments. In future studies, comparative mid-test to post-test 1 analysis could also reveal if five sessions suffice for optimising joint attention as opposed to 10 sessions.

To assess the sustainability and long-term impact of VAT, future studies should consider extending the intervention period and monitoring participants over an extended duration. This longitudinal approach would allow researchers to examine whether improvements in joint attention and emotional states persist over time, providing valuable insights into the lasting effects of VAT as an intervention for children with ASD.

Given the varied responses observed in this study, future research could qualitatively explore the adaptation of VAT interventions based on individual sensory profiles. Exploring the impact of factors such as music preferences, vibration intensity, session duration, and additional activities on the effectiveness of VAT may help tailor interventions to better suit the unique needs of each child with ASD. Building on indications of VAT's potential influence on sleep mentioned in the discussion, future studies could explicitly explore its impact on the sleep patterns of children with ASD. This may be of practical importance, considering the prevalence of sleep issues in this population.

To enhance the holistic therapeutic approach, future research could explore combining VAT with other therapeutic modalities. Investigating how VAT complements or interacts with existing interventions for children with ASD could provide valuable insights into its role within comprehensive therapeutic programs.

Given the potential cost implications of VAT devices, future research, especially in regions with limited resources, should address the affordability and accessibility of VAT interventions.

Exploring options for subsidies, funding programs, or alternative low-cost adaptations will be crucial to expanding the reach of VAT to less privileged areas and individuals.

Building on the value demonstrated by creative interviews in this study, future research could further explore and refine creative elicitation methods as tools for gathering insights from children with ASD. Investigating the effectiveness of various creative approaches in capturing the experiences of participants, particularly those with communication challenges, may enhance the depth of qualitative data.

In conclusion, the recommendations outlined above aim to guide future research, paving the way for a more comprehensive understanding of VAT's potential as an intervention for children with ASD.

6.3 Conclusion

In conclusion, this study assists in laying the groundwork for further exploration of VAT as a holistic therapy approach for children with ASD. It highlights the potential for enhancing joint attention and emotion regulation while offering the flexibility of adaptation to meet individual needs. Despite the promising findings, ongoing research is crucial to address limitations and fully understand the practical applications of VAT in enriching the lives of children with ASD.

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Appendices

Appendix A: Principal of School Letter of Information



Study title: Vibroacoustic Therapy and its Effects on the Attention of Children with Autism Spectrum Disorder

Dear Principal of UNICA.

My name is Janelle Moore. I am a student at the University of Pretoria, and I am currently enrolled for a Master's degree in music therapy.

I am currently researching Vibroacoustic Therapy, a form of music therapy that involves the use of relaxing music and sound vibrations, and whether it can improve the attention of children with autism. I have been in contact with the psychologist at UNICA, and he has shown interest in assisting me with my research study. In order to conduct the study at UNICA, I would need your permission.

What will be expected of the children at UNICA school:

With the help of the school psychologist, I would like to select 23 children between the ages of 9 and 12 who present with attentional difficulties. 10 of the children will be assigned to a treatment group, where they will each receive 10 sessions of vibroacoustic therapy and do three rounds of 15-minute attention assessments during the 5 weeks. 10 more children will form part of the control group, where they will not receive any treatment, and will also do the three rounds of attention assessments. This group will be offered up to 10 free sessions of vibroacoustic therapy, once the study has ended. The remaining 3 participants will form part of the pilot group, where I will practice the study procedure with them before commencing the study, for me to get comfortable with the procedure. These three will also get offered up to 10 free sessions once the study has ended. For the children who undergo the vibroacoustic therapy sessions, their participation will involve undergoing 10 sessions over the course of 5 weeks (two sessions per week).

Each session will be 20 minutes long and will include one session of vibroacoustic therapy, where each child will be asked to sit on the mat and listen to some music. This is a non-invasive, receptive process where the child will listen to music and feel the vibrations from the speakers built in the mat. During the 20 minutes, I will check in with the child and will prioritise his or her well-being throughout the intervention. Before starting the intervention, I will provide each child with all the necessary information, using language that is easily understandable and will provide them with a "stop" sign so that they may at any point to it if they would like to stop.

The purpose of the attention assessments is to assess whether the intervention had any effects on the children's attention. The test will be administered right before session 1, straight after session 5, straight after session 10, and one week after the last session, under the supervision of the school

psychologist. The test will be approximately 15 minutes in length. During the course of the study, I will hold brief interviews with the children to get an idea of how they experience the music. I will then hold one final creative interview at the end of the 5 weeks where I encourage them to express themselves through creative means to determine how they experienced the intervention.

I will then provide the parents and teachers of each of the children with brief questionnaires to complete for the purpose of determining whether VAT led to any noticeable effects on attention, or any other effects. Before providing them with the questionnaires, they will be provided with information letters and consent forms which include a statement that participation is not compulsory. The parent consent forms state that their participation will not affect their child's participation in the study. It also informs them that they may withdraw at any time if they wish to do so.

Approval:

The study will only begin after ethical approval by the Research Ethics Committee of the Faculty of Humanities, University of Pretoria, has been obtained. I aim to start the study in April 2023.

Risks and benefits:

By participating in the research, each child is contributing towards the research on whether this intervention may improve attention. As a result, they may experience improved attention, depending on the outcome of the study. There are no risks or direct benefits in participating in this project. If a child decides to withdraw, there will be no negative consequences, nor will they need to give a reason. As the Principal of UNICA School, you are encouraged to ask any questions you might have about the study.

Video recordings: I will be video-recording each of the brief interviews and the creative interview, which will allow me to watch them back and assess how your child reacts to the intervention. These recordings will be stored on a password-protected device for 15 years at the University of Pretoria. No one except the researcher and research supervisor will have access to the video-recordings. You, or the guardians of the child-participants, may also request to view the video material if you wish to do so.

Who will have access to the results of the study:

The research will be conducted by myself as the principal researcher. The data will be used for academic purposes only. The data will be archived at the School of the Arts for a minimum of 15 years in an electronic, password-protected format. Other researchers may use the anonymised data during this period. The results of the study will be available to research participants and their guardians at the end of the study. If you would like more information on the final results of the study, you are welcome to contact me.

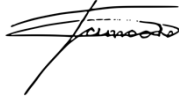
Confidentiality: Each child's privacy will be protected in the duration of this study, and no identifying information will be used in the write up of this research study.

Please feel free to contact me or my supervisor if you require more information about the study.

Janelle Moore

u20814926

Kinds regards,
Janelle Moore



Email: Janellemoore98@gmail.com

Tel.: 0812706110

Name of supervisor: Kate Farquharson

Appendix B: Consent from school



UNICA SCHOOL FOR LEARNERS WITH AUTISM

JAN-23 AJ PERUMAL

P.O. BOX 35182, MENLO PARK, 0102
Res: New Hope Campus 163 Cecilia Rd, Ashlea Gardens, Menlo Park
Hostel: 708 Bodel Str. Deerness

REG NO: GDE 211177 TS SOUTH
TEL: 012 460 6539
Email: admin@unicaschool.co.za

PRINCIPAL: Mrs A J. PERUMAL

4 January 2023

Consent Form

FULL NAME: Janelle Moore

RESEARCH TITLE: Vibroacoustic Therapy and its effects on the Attention of Children with Autism

I hereby give my consent to have Janelle Moore conduct her research project at UNICA, and acknowledge that the data may be used in current and future research. I confirm that I understand what is required of the students at UNICA in the research project. I have had the opportunity to ask questions. I am aware that a child may withdraw from the study at any time, should he/she wish to do so.

Signature of UNICA principal: Mrs AJ Perumal :

A handwritten signature in black ink, appearing to be 'AJ Perumal', written over a horizontal line.

Date:

4/01/2023

Signature of student/principal researcher:

A handwritten signature in black ink, appearing to be 'Janelle Moore', written over a horizontal line.

Appendix C: Guardian Letter of Information for Treatment Group



School of the Arts

Letter of information

Dear parent

My name is Janelle Moore. I am a student at the University of Pretoria, and I am currently enrolled for a Master's degree in Music Therapy.

Research topic: My study is entitled: *Vibroacoustic Therapy and its Effects on the Attention of Children with Autism Spectrum Disorder*.

Rationale/Aims of the study: This study aims to assess whether vibroacoustic therapy, a form of music therapy that involves the use of relaxing music and sound vibrations, can improve the attention of children with autism.

Vibroacoustic Therapy: It is a non-invasive, receptive intervention where your child will listen to music and feel the vibrations from the speakers built in a mat.

What will be expected of your child: This study will take place at school and during school hours. Your child's participation will involve participating in 10 sessions over the course of 5 weeks (two sessions per week), with each session being 20 minutes long. In each session, your child will undergo vibroacoustic therapy, during which they will be asked to sit on the mat and listen to some music. During the 5 weeks, they will also undergo 3 sets of attention assessments, each 10 to 15 minutes in length. After sessions 1, 3, 5, 7 and 9, I will hold a brief interview with your child in order to assess how they experience the sessions. I will also hold a more comprehensive, creative interview with them after the 10th session, which will involve creative elicitation methods such as art and music-making.

Ensuring your child's wellbeing: I will check in with your child and prioritise their well-being throughout the intervention. Before starting the intervention, I will provide your child with all the necessary information, using language that is easily understandable and with their school teacher present. I will also provide them with a "stop" sign so that they may point to it any time they would like to stop.

Your participation: Since the study will be taking place at school and during school hours, you will not be expected to take your child anywhere or to wait for them after school. Your participation will, however, involve completing a questionnaire, before and after the study, aimed at assessing whether you have observed any changes in your child's attention. Each questionnaire should take

Janelle Moore

u20814926

approximately 5 minutes to complete. If you choose not to participate, this will not affect whether your child will be included in the study.

Approval: The study will only begin after ethical approval by the Research Ethics Committee of the Faculty of Humanities, University of Pretoria, has been obtained. I aim to start the study in the fourth week of January, next year.

Risks and benefits: By participating in the research, you and your child are contributing towards the research on whether this intervention may improve attention. As a result, your child may experience improved attention, depending on the outcome of the study. There are no risks or direct benefits in participating in this project. If you or your child decides to withdraw, there will be no negative consequences, nor will you need to give reason. As the parent of _____ and a potential participator in the study, you are encouraged to ask any questions you might have about the study.

Video recordings: I will be video-recording each of the brief interviews and the creative interview, which will allow me to watch them back and assess how your child reacts to the intervention. These recordings will be stored on a password-protected device for 15 years at the University of Pretoria. No one except the researcher and research supervisor will have access to the video-recordings. You may also request to view the video material if you wish to do so.

Who will have access to the results of the study: The research will be conducted by myself as the principal researcher. The data will be used for academic purposes only. The data will be archived at the School of the Arts for a minimum of 15 years in an electronic, password-protected format. Other researchers may use the anonymised data during this period. The results of the study will be available to research participants and their guardians at the end of the study. If you would like more information on the final results of the study, you are welcome to contact me.

Confidentiality: Your and your child's privacy will be protected in the duration of this study, and no identifying information will be used in the write up of this research study.

Please feel free to contact me or my supervisor if you require more information about the study.

Kinds regards,
Janelle Moore



Your email: Janellemoore98@gmail.com

Tel.: 0812706110

Name of supervisor: Kate Farquharson
Email: katefarquharson@gmail.com

Appendix D: Guardian Letter of Information for Control Group



School of the Arts

Dear parent

My name is Janelle Moore. I am a student at the University of Pretoria, and I am currently enrolled for a Master's degree in Music Therapy.

Research topic: My study is entitled: *Vibroacoustic Therapy and its Effects on the Attention of Children with Autism Spectrum Disorder*.

Rationale/Aims of the study: This study aims to assess whether vibroacoustic therapy, a form of music therapy that involves the use of relaxing music and sound vibrations, can improve the attention of children with autism.

Vibroacoustic Therapy: It is a non-invasive, receptive intervention where your child will listen to music and feel the vibrations from the speakers built in a mat.

What will be expected of your child: This study will take place at school and during school hours. Your child's participation will not involve undergoing Vibroacoustic therapy. It will however involve undergoing 3 sets of attention assessments, each being 10 to 15 minutes in length. This will help towards showing if the treatment had an effect on the attention of the group that does receive the treatment. Once the study has ended, up to 10 vibroacoustic therapy sessions will be on offer for your child to undergo, without charge.

Ensuring your child's wellbeing: I will check in with your child and prioritise their well-being throughout the intervention. Before starting the intervention, I will provide your child with all the necessary information, using language that is easily understandable and with their school teacher present. I will also provide them with a "stop" sign so that they may point to it any time they would like to stop.

Your participation: Since the study will be taking place at school and during school hours, you will not be expected to take your child anywhere or to wait for them after school. Your participation will, however, involve completing a questionnaire, before and after the study, aimed at assessing whether you have observed any changes in your child's attention. Each questionnaire should take approximately 5 minutes to complete. If you choose not to participate, this will not affect whether your child will be included in the study.

Approval: The study will only begin after ethical approval by the Research Ethics Committee of the Faculty of Humanities, University of Pretoria, has been obtained. I aim to start the study in the fourth week of January, next year.

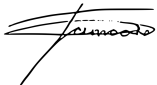
Risks and benefits: By participating in the research, you and your child are contributing towards the research on whether this intervention may improve attention. As a result, your child may experience improved attention, depending on the outcome of the study. There are no risks or direct benefits in participating in this project. If you or your child decides to withdraw, there will be no negative consequences, nor will you need to need to give reason. As the parent of _____ and a potential participator in the study, you are encouraged to ask any questions you might have about the study.

Who will have access to the results of the study: The research will be conducted by myself as the principal researcher. The data will be used for academic purposes only. The data will be archived at the School of the Arts for a minimum of 15 years in an electronic, password-protected format. Other researchers may use the anonymised data during this period. The results of the study will be available to research participants and their guardians at the end of the study. If you would like more information on the final results of the study, you are welcome to contact me.

Confidentiality: Your and your child's privacy will protected in the duration of this study, and no identifying information will be used in the write up of this research study.

Please feel free to contact me or my supervisor if you require more information about the study.

Kinds regards,
Janelle Moore



Your email: Janellemoore98@gmail.com
Tel.: 0812706110

Name of supervisor: Kate Farquharson
Email: katefarquharson@gmail.com

Appendix E: Guardian Letter of Information for Pilot Group



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

School of the Arts

Dear parent

My name is Janelle Moore. I am a student at the University of Pretoria, and I am currently enrolled for a Master's degree in Music Therapy.

Research topic: My study is entitled: *Vibroacoustic Therapy and its Effects on the Attention of Children with Autism Spectrum Disorder*.

Rationale/Aims of the study: This study aims to assess whether vibroacoustic therapy, a form of music therapy that involves the use of relaxing music and sound vibrations, can improve the attention of children with autism.

Vibroacoustic Therapy: It is a non-invasive, receptive intervention where your child will listen to music and feel the vibrations from the speakers built in a mat.

What will be expected of your child: This study will take place at school and during school hours. Your child's participation will involve receiving one session of vibroacoustic therapy at the start of the 5-week study. This is to help me create a thorough protocol before administering the treatment with 10 other children. Once the study has ended, up to 10 vibroacoustic therapy sessions will be on offer for your child to undergo, without charge.

Ensuring your child's wellbeing: I will check in with your child and prioritise their well-being throughout the intervention. Before starting the intervention, I will provide your child with all the necessary information, using language that is easily understandable and with their school teacher present. I will also provide them with a "stop" sign so that they may point to it any time they would like to stop.

Your participation: Since the study will be taking place at school and during school hours, you will not be expected to take your child anywhere or to wait for them after school.

Approval: The study will only begin after ethical approval by the Research Ethics Committee of the Faculty of Humanities, University of Pretoria, has been obtained. I aim to start the study in the fourth week of January, next year.

Risks and benefits: By participating in the research, your child is contributing towards the research on whether this intervention may improve attention. As a result, your child may experience improved attention, depending on the outcome of the study. There are no risks or direct benefits in participating in this project. If you or your child decides to withdraw, there will be no negative

Janelle Moore

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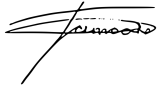
consequences, nor will you need to need to give reason. As the parent of _____ and a potential participator in the study, you are encouraged to ask any questions you might have about the study.

Who will have access to the results of the study: The research will be conducted by myself as the principal researcher. The data will be used for academic purposes only. The data will be archived at the School of the Arts for a minimum of 15 years in an electronic, password-protected format. Other researchers may use the anonymised data during this period. The results of the study will be available to research participants and their guardians at the end of the study. If you would like more information on the final results of the study, you are welcome to contact me.

Confidentiality: Your child's privacy will protected in the duration of this study, and no identifying information will be used in the write up of this research study.

Please feel free to contact me or my supervisor if you require more information about the study.

Kinds regards,
Janelle Moore



Your email: Janellemoore98@gmail.com

Tel.: 0812706110

Name of supervisor: Kate Farquharson

Email: katefarquharson@gmail.com

Appendix F: Guardian Consent Form for Treatment Group



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

School of the Arts

Vibroacoustic Therapy and its effects on the Attention of Children with Autism

Consent from parent for child to participate in study:

I hereby give my consent for my child _____ to participate in Janelle Moore's research project at UNICA and acknowledge that the data may be used in current and future research. I confirm that I understand what is required of my child in the research project. I have had the opportunity to ask questions. I am aware that my child will be informed of the study and that they may give permission. I am aware that my child may withdraw from the study at any time, should they wish to do so.

I also understand that interviews with my child will be video-recorded, and that these recordings will only be used for my own observation and will never be made public. I understand that these recordings will be stored on a password-protected device for 15 years at the University of Pretoria, and that no one except the researcher and research supervisor will have access to them. I understand that I may also request to view the video material if you wish to do so.

Name of Parent: _____

Signature of Parent: _____

Date: _____

Signature of student/principal researcher: _____

Consent from parent to participate in study:

**If you choose not to participate, this will not affect whether your child will be included in the study*

I, _____ hereby consent to participate in Janelle Moore's research project at UNICA by completing two questionnaires. I acknowledge that the data may be used in current and future research. I confirm that I understand what is required of me in the research project. I have had the opportunity to ask questions. I am aware that I may withdraw from the study at any time, should I wish to do so.

Janelle Moore

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Name of Parent: _____

Signature of Parent: _____

Date: _____

Signature of student/principal researcher: _____

Appendix G: Guardian Consent Form for Control Group



School of the Arts

Vibroacoustic Therapy and its effects on the Attention of Children with Autism

Consent from parent for child to participate in study:

I hereby give my consent for my child _____ to participate in Janelle Moore's research project at UNICA and acknowledge that the data may be used in current and future research. I confirm that I understand what is required of my child in the research project. I have had the opportunity to ask questions. I am aware that my child will be informed of the study and that they may give permission. I am aware that my child may withdraw from the study at any time, should they wish to do so.

Name of Parent: _____

Signature of Parent: _____

Date: _____

Signature of student/principal researcher: _____

Consent from parent to participate in study:

**If you choose not to participate, this will not affect whether your child is included in the study*

I, _____ hereby consent to participate in Janelle Moore's research project at UNICA by completing two questionnaires. I acknowledge that the data may be used in current and future research. I confirm that I understand what is required of me in the research project. I have had the opportunity to ask questions. I am aware that I may withdraw from the study at any time, should I wish to do so.

Name of Parent: _____

Signature of Parent: _____

Date: _____

Signature of student/principal researcher: _____

Appendix H: Guardian Consent Form for Pilot Group



School of the Arts

Vibroacoustic Therapy and its effects on the Attention of Children with Autism

Consent from parent for child to participate in study:

I hereby give my consent for my child _____ to participate in Janelle Moore's research project at UNICA and acknowledge that the data may be used in current and future research. I confirm that I understand what is required of my child in the research project. I have had the opportunity to ask questions. I am aware that my child will be informed of the study and that they may give permission. I am aware that my child may withdraw from the study at any time, should they wish to do so.

Name of Parent: _____

Signature of Parent: _____

Date: _____

Signature of student/principal researcher: _____

Appendix I: Teacher Letter of Information



School of the Arts

Dear teacher

My name is Janelle Moore. I am a student at the University of Pretoria, and I am currently enrolled for a Master's degree in Music Therapy.

Research topic: My study is entitled: *Vibroacoustic Therapy and its Effects on the Attention of Children with Autism Spectrum Disorder*.

Rationale/Aims of the study: This study aims to assess whether vibroacoustic therapy, a form of music therapy that involves the use of relaxing music and sound vibrations, can improve the attention of children with autism.

Vibroacoustic Therapy: It is a non-invasive, receptive intervention where each child participating in the study will listen to music and feel the vibrations from the speakers built in a mat.

Your participation: Your participation will involve completing a questionnaire, before and after the study, aimed at assessing whether you have observed any changes in a participating child's attention. Each questionnaire should take approximately 5 minutes to complete.

Approval: The study will only begin after ethical approval by the Research Ethics Committee of the Faculty of Humanities, University of Pretoria, has been obtained. I aim to start the study in the third week of January, 2023.

Risks and benefits: By participating in the research, you are contributing towards the research on whether this intervention may improve attention. As a result, a child they experience improved attention, depending on the outcome of the study. There are no risks or direct benefits in participating in this project. If you decide to withdraw from the study, there will be no negative consequences, nor will you need to explain your reason. As a potential participator in the study, you are encouraged to ask any questions you might have about the study.

Who will have access to the results of the study: The research will be conducted by myself as the principal researcher. The data will be used for academic purposes only. The data will be archived at the School of the Arts for a minimum of 15 years in an electronic, password-protected format. Other researchers may use the anonymised data during this period. The results of the study will be available to research participants and their guardians at the end of the study. If you would like more information on the final results of the study, you are welcome to contact me.

Janelle Moore

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Confidentiality: Your privacy will be protected in the duration of this study, and no identifying information will be used in the write up of this research study.

Please feel free to contact me or my supervisor if you require more information about the study.

Kinds regards,
Janelle Moore



Your email: Janellemoore98@gmail.com

Tel.: 0812706110

Name of supervisor: Kate Farquharson

Email: katefarquharson@gmail.com

Appendix J: Teacher Consent Form



School of the Arts

Vibroacoustic Therapy and its effects on the Attention of Children with Autism

Consent from teacher to participate in study:

I, _____ hereby consent to participate in Janelle Moore's research project at UNICA by completing two questionnaires. I acknowledge that the data may be used in current and future research. I confirm that I understand what is required of me in the research project. I have had the opportunity to ask questions. I am aware that I may withdraw from the study at any time, should I wish to do so.

Name of Teacher: _____

Signature of Teacher: _____

Date: _____

Signature of student/principal researcher: _____

Appendix K: Child Information Form



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YUNIBESITHI YA PRETORIA

School of the Arts

Hello, my name is **Janelle** and I am working on a project about **Listening to, and feeling, music**. I want to ask whether you will work with me. If you say yes, this is what we will do:

First, I will play a few games with you and ask you a few questions while we are playing. I will then ask you to sit on this chair that has speakers in it. The speakers will then start playing music that you will be able to listen to and even feel. If you can, I would like you to sit on this chair for 20 minutes. I want to see if you can sit here for the whole time and listen to the music. If you want to see how long 20 minutes is, there is a video of a car/clock that stops running when 20 minutes is up. You may relax and even close your eyes if you want to. While you are sitting on this chair, I will be sitting on a chair in the corner, reading my book and I will come tell you when 20 minutes is over. At the end, I am going to ask you a few questions. I will also voice record you as you answer the questions. If you want to stop at any time, please tell me, or point to this picture of the stop sign.



Appendix L: Child Assent Form

	<p>DO YOU UNDERSTAND EVERYTHING I EXPLAINED TO YOU?</p>
	<p>DO YOU UNDERSTAND THAT IT IS YOUR CHOICE TO HELP ME TODAY?</p>
	<p>DO YOU UNDERSTAND THAT YOU CAN STOP ANYTIME YOU WANT TO?</p>
	<p>DO YOU UNDERSTAND THAT I WILL BE USING A VIDEO/RECORDING DEVICE TODAY?</p>
	<p>DO YOU HAVE ANY QUESTIONS?</p>
	<p>ARE YOU HAPPY TO HELP ME TODAY?</p>
	<p>YES NO</p>

Please sign your name if you are happy to join in with my project.

Participant signature _____

Staff witness _____

Appendix M: Brief Feedback Schedule for Participants

Question 1:

How did it feel in your body? (use gestures)

Question 2:

How did it feel in your head? (use gestures)

Question 3:

Did you like it (thumbs up) or not like it (thumbs down)?

Question 4:

Can you tell me what it sounded like?

Appendix N: Creative Interview Schedule

Question 1:

How did it feel?

Question 2:

Can you show me how it felt, by drawing or playing an instrument?

(provide music, art materials and props, and encourage creative expression)

Appendix O: Brief Interview Data Collection Sheet

		Participant responses to question				
		Session 1	Session 3	Session 5	Session 7	Session 9
Participants	1					
	2					
	3					
	4					
	5					
	6					
	7					
	8					
	9					
	10					

Appendix P: Parent Questionnaire

Please indicate the most applicable answer for each question, and refer to the scoring system below for the questions 2 to 6:

 1 (Never) 2 (Hardly ever) 3 (Sometimes) 4 (Often) 5 (Always/almost always)

<p>1. How long is your child able to maintain focus on one object/task?</p> <p style="text-align: center;"> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> Almost no time +2 mins +5 mins +10 mins +15 mins </p>
<p>2. When focused on one object/task, is your child able to maintain focus in the presence of distractors?</p> <p style="text-align: center;"> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> 1 2 3 4 5 </p>
<p>3. Is your child able to switch his/her focus between multiple objects/tasks?</p> <p style="text-align: center;"> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> 1 2 3 4 5 </p>
<p>4. Does your child try to show you things or point to get you to look at something?</p> <p style="text-align: center;"> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> 1 2 3 4 5 </p>
<p>5. How often does your child engage in activities together with someone else?</p> <p style="text-align: center;"> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> 1 2 3 4 5 </p>

Have you noticed any other changes in your child? (Please underline whether the domains below have improved, remained the same, or worsened, and provide more information next to it, if necessary):

- Sleep habits improved/unchanged/worsened _____
- Eating habits improved/unchanged/worsened _____
- General behaviour improved/unchanged/worsened _____
- Speech improved/unchanged/worsened _____
- Mood improved/unchanged/worsened _____
- Anxiety levels improved/unchanged/worsened _____
- Sensory sensitivity improved/unchanged/worsened _____

Have any other changes occurred?

Have any changes been made to your child's medication in the last 5 weeks?

Appendix Q: Teacher Questionnaire

Please indicate the most applicable answer for each question, and refer to the scoring system below for the questions 2 to 6:

-
- 1 (Never) 2 (Hardly ever) 3 (Sometimes) 4 (Often) 5 (Always/almost always)

<p>1. How long is this child able to maintain focus on one object/task?</p> <p style="text-align: center;"> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> </p> <p style="text-align: center;"> Almost no time +2 mins +5 mins +10 mins +15 mins </p>
<p>2. When focused on one object/task, is this child able to maintain focus in the presence of distractors?</p> <p style="text-align: center;"> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> </p> <p style="text-align: center;"> 1 2 3 4 5 </p>
<p>3. Is this child able to switch his/her focus between multiple objects/tasks?</p> <p style="text-align: center;"> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> </p> <p style="text-align: center;"> 1 2 3 4 5 </p>
<p>4. When you point to something, does this child look at it?</p> <p style="text-align: center;"> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> </p> <p style="text-align: center;"> 1 2 3 4 5 </p>
<p>5. Does this child try to show you things or point to get you to look at something?</p> <p style="text-align: center;"> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> </p> <p style="text-align: center;"> 1 2 3 4 5 </p>
<p>6. How often does this child engage in activities together with someone else?</p> <p style="text-align: center;"> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> <input type="radio"/> </p> <p style="text-align: center;"> 1 2 3 4 5 </p>

Have you noticed any other changes in this child in the classroom, when interacting with other children or adults, and when on the playground? Please explain

Appendix R: Joint Attention Test

Joint Attention task, developed by Jessica Bean and Inge-Marie Eigsti, University of Connecticut. Please cite:
 Bean, J. L., & Eigsti, I. M. (2012). Assessment of joint attention in school-age children and adolescents. *Research in Autism Spectrum Disorders*, 6, 1304-10.

JTAT Script – V3

Instructions: The following 6 prompts are to be embedded between other interactions with the participant and made to seem as natural as possible. Administer prompts at times when the participant is visually engaged in another task or object, rather than on the examiner. Check the box if the participant elicits a *correct response*. Only after giving a correct response can the participant earn additional points for an interaction.

1. [Age 3-6]: **Wave “hi” (no verbal prompt)**

[Age 6-9]: **Hold out hand for shaking (no verbal prompt)**

If refuses to shake hand, ask: “How do you feel about shaking hands?”

Correct Response

- 1pt Shake hand/wave back

If correct response given:

- 1pt Look at examiner’s face
 1pt Make eye contact
 1pt Smile
 1pt Relevant verbal response: _____

____/5

2. **Call participant’s name when s/he is not looking.**

Correct Response

- 1pt Look at examiner

If correct response given:

- 1pt Look at examiner’s face
 1pt Make eye contact
 1pt Relevant verbal response: _____

____/4

3. **Pretend to look for a pen:** “I just need to fill out the top of this form...”

[10 sec pause] “Where did I put that...?”

[5 sec pause] “I lost my pen.”

Correct Response

- 1pt Give pen to examiner

If correct response given:

- 1pt Look at examiner’s face
 1pt Make eye contact
 1pt Relevant verbal response: _____

____/4

4. **Hand pen/paper to participant (no verbal prompt)**

Correct Response

- 1pt Take pen/paper

If correct response given:

- 1pt Look at examiner’s face
 1pt Make eye contact
 1pt Relevant verbal response: _____

____/4

5. **Gaze [5 seconds] at an object belonging to the participant (no verbal prompt); then state:**

“My brother/sister has those/those...”

“Where did you get that _____?”

Correct Response

- 3pt Look at examiner, look at object (sneakers, purse, other personal item)

If correct response given:

- 1pt Relevant verbal response: _____

____/4

IF NO RESPONSE TO THE ABOVE (PROMPT): “Oh, I was looking at your _____”

Correct Response

- 1pt Look at examiner, look at object

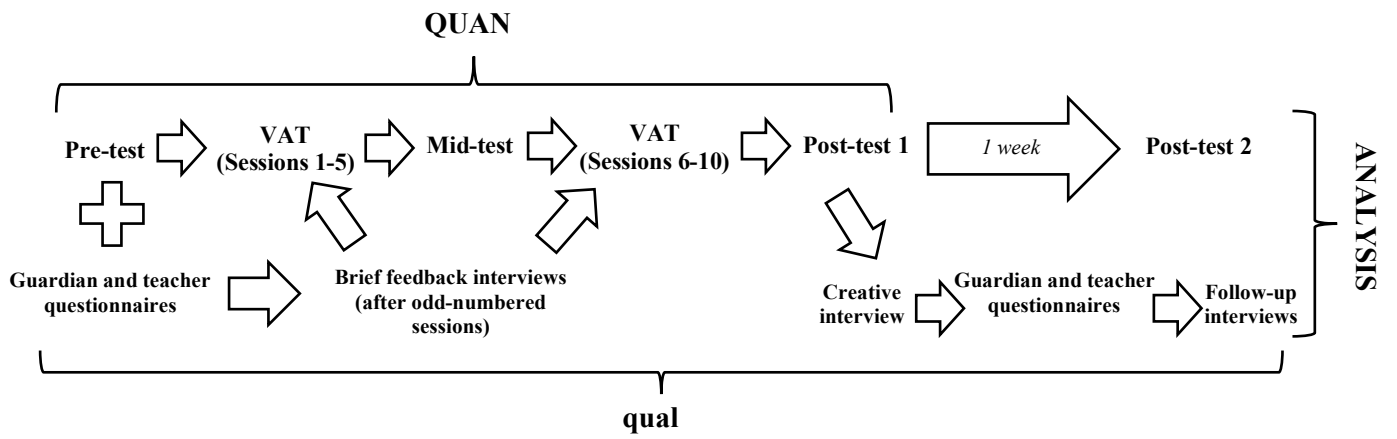
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6. Introduce the participant to a second examiner: "Did you meet _____?"	
<u>Correct Response</u> <input type="checkbox"/> 1pt Look at examiner, look at examiner #2 <u>If correct response given:</u> <input type="checkbox"/> 1pt Look at examiner's face <input type="checkbox"/> 1pt Make eye contact <input type="checkbox"/> 1pt Relevant verbal response: _____	 ___/4
TOTAL POINTS	___/25

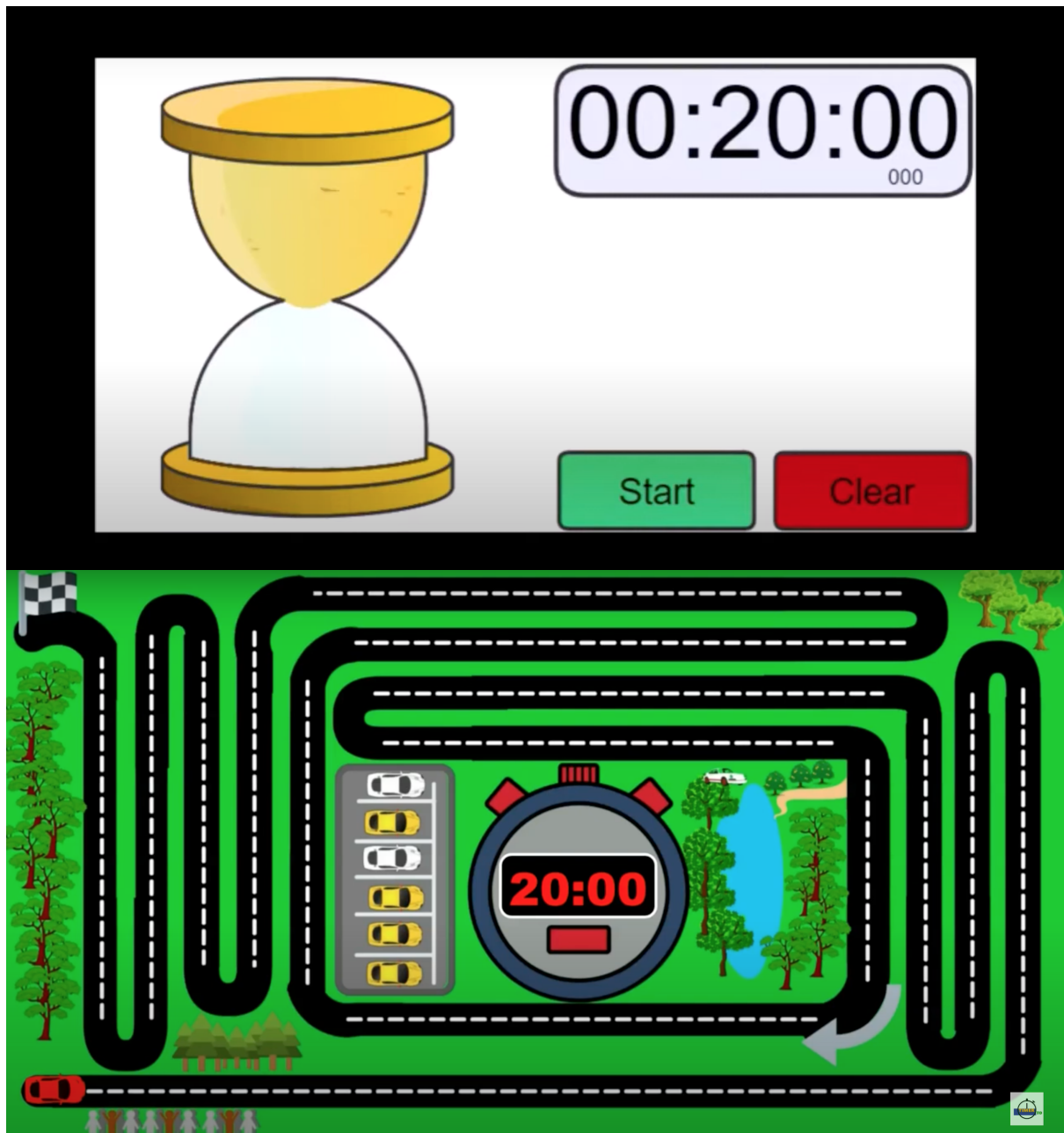
Scoring notes:

"Correct" responses involve performing the following actions after the associated prompt and are worth 1 point. Looking at the examiner's face ("face"), making eye contact ("eye"), or adding a verbal response ("verbal") are each worth an additional point. A point for a verbal response requires the participant's verbalization to add to the social nature of the response (laughing or shrugging alone do not constitute a point). Some of the correct responses require eye contact in order to follow the prompt (personal item prompt) and therefore a "correct" response is automatically scored as a minimum of 3 points. This prompt also has an optional additional press; if needed, participant only receives one point for a correct response.

Appendix S: Procedure for Treatment Group



Appendix T: Timers



Appendix U: Transcriptions of creative interviews

Cl1:1	J: Hey M	
Cl1:2	M: Hello	
Cl1:3	J: How are you?	
Cl1:4	M: Okay	
Cl1:5	J: So we're gonna do something fun today. Can you can and sit over here for me? On the- on the cushions?	
Cl1:6	[Both sit down]	
Cl1:7	J: So, we're gonna do something a bit different today	
Cl1:8	M: Yes	
Cl1:9	J: Cool. Do you like music? I know you like music, hey? What kind of music do you like?	
Cl1:10	M: I don't know.	
Cl1:11	J: Is there a song that you like? Any song? What's a cool song that you can think of?	
Cl1:12	M: [Begins hitting drum next to him]	Immediate musical interest
Cl1:13	J: Do you wanna play some drums? Come drum for me. Play anything. [Waits a bit before modelling a drumbeat at around 87bpm]	
Cl1:14	M: [Responds by repeating my drumbeat back to me & laughs]	Laughter in music
Cl1:15	J&M: [Engage in call-and-response drumming – J drums a beat and M repeats it back, accurately]	Extended engagement in drumming
Cl1:16	J: [Ends with drumroll]	
Cl1:17	M: How? [Says in surprised manner]	
Cl1:18	J: [Giggles] Do this [Demonstrates rolling fingers on drum, quickly, to make drumroll sound]	
Cl1:19	M: [Copies and drums with me in similar manner]	
Cl1:20	J: [Ends with one final beat on the drum]	
Cl1:21	M: [Responds by copying]	

Cl1:22	J: Nice. Cool, and what song do you like? We can try and sing it. Any song that you love?	
Cl1:23	M: There was ten in the bed- ten in the bed.	
Cl1:24	J: Ten in the bed?	
Cl1:25	M: Yes	
Cl1:26	J: Ten in the bed. How does it go?	
Cl1:27	M: [Instantly begins singing and hitting drum with each syllable of song] <i>There was ten in the bed [J joins drumming & singing] and the little one said roll over. Roll over...</i>	Immediate musical response
Cl1:28	J: [Tries to continue singing song] <i>So they da da da da da da da da da da roll over. Roll over. How does it go? There was ten in the bed</i>	
Cl1:29	M: [Continues hitting drum]	Extended engagement in drumming
Cl1:30	J: Let me try and find that song [Singing while looking for song on phone] <i>There was ten in the bed and the little one said...</i> [Plays song on phone] This one?	
Cl1:31	M: Yes.	
Cl1:32	[Song plays and M & J drum to the rhythm of the song – 135bpm]	
Cl1:33	J: [Stops song] Let's carry on- let's carry on here. [Picks up guitar & strums]	
Cl1:33	M: A guitar! [Says in excited manner at sight of guitar]	Excitement in music
Cl1:34	J: [Sings] <i>Nanananana</i> . [Plays guitar in finger-picking, staccato manner] <i>There were ten in the bed and the little one said?</i>	
Cl1:35	M: [Sings with increased enthusiasm] <i>Roll over!</i>	Excitement in music
Cl1:36	J: [Increases intensity of guitar, matching M's singing]	
Cl1:37	M&J: [Sings] <i>Roll over.</i>	
Cl1:38	J: [Sings & returns to finger-picking guitar] <i>So they all rolled over and one fell out?</i> Show me how it sounds when it falls out. [Hits drum, intensely] <i>Ba pa pa, on the floor! Oh no!</i>	
Cl1:39	M: [Copies intensity of drumming and laughs]	Laughter in music
Cl1:40	J: [Sings] <i>And now there's nine in the bed and the little one said?</i>	
Cl1:41	M&J: [Sings & M continues drumming] <i>Roll over, roll over.</i>	

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Cl1:36	J: [Increases intensity of guitar, matching M's singing]	
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Cl1:26	J: Ten in the bed. How does it go?	
Cl1:27	M: [Instantly begins singing and hitting drum with each syllable of song] <i>There was ten in the bed [J joins drumming & singing] and the little one said roll over. Roll over...</i>	Immediate musical response
Cl1:28	J: [Tries to continue singing song] <i>So they da da da da da da da da da da roll over. Roll over. How does it go? There was ten in the bed</i>	
Cl1:29	M: [Continues hitting drum]	Extended engagement in drumming
Cl1:30	J: Let me try and find that song [Singing while looking for song on phone] <i>There was ten in the bed and the little one said...</i> [Plays song on phone] This one?	
Cl1:31	M: Yes.	
Cl1:32	[Song plays and M & J drum to the rhythm of the song – 135bpm]	
Cl1:33	J: [Stops song] Let's carry on- let's carry on here. [Picks up guitar & strums]	
Cl1:33	M: A guitar! [Says in excited manner at sight of guitar]	Excitement in music
Cl1:34	J: [Sings] <i>Nanananana</i> . [Plays guitar in finger-picking, staccato manner] <i>There were ten in the bed and the little one said?</i>	
Cl1:35	M: [Sings with increased enthusiasm] <i>Roll over!</i>	Excitement in music
Cl1:36	J: [Increases intensity of guitar, matching M's singing]	
Cl1:37	M&J: [Sings] <i>Roll over.</i>	
Cl1:38	J: [Sings & returns to finger-picking guitar] <i>So they all rolled over and one fell out?</i> Show me how it sounds when it falls out. [Hits drum, intensely] <i>Ba pa pa, on the floor! Oh no!</i>	
Cl1:39	M: [Copies intensity of drumming and laughs]	Laughter in music
Cl1:40	J: [Sings] <i>And now there's nine in the bed and the little one said?</i>	
Cl1:41	M&J: [Sings & M continues drumming] <i>Roll over, roll over.</i>	

CI2:1	W: [Instantly hits drum a few times]	Immediate musical engagement
CI2:2	J: It's cool hey.	
CI2:3	W: Mmm [Yes]	Limited verbal response
CI2:4	J: All right. So today what we are going to do is I'm going to sh-ask you to show me how- Do you remember the mat that you were lying on and listening to- the relaxing? Do you remember all of that?	
CI2:5	W: [Plays drum]	Limited verbal response Immediate musical engagement
CI2:6	J: Hey W?	
CI2:7	W: Yeah	
CI2:8	J: Was that cool? Okay. Wait, let's first do something, some drumming. Okay. You play whatever you want, on the drum, okay?	
CI2:9	W: [Drums enthusiastically, with quick tempo]	Excitement in music
CI2:10	J: [J joins in drumming & fills in gaps and plays with some syncopation]	
CI2:11	W: [Quickens playing enthusiastically and then plays slower and in regular manner. Begins making babbling sounds to drumbeat while increasing intensity, slightly, before stopping]	Excitement in music Music has regular quality Engages vocally in music
CI2:12	J: [Makes sudden babbling sound to match W and then laughs & stops] Was that cool?	
CI2:13	W: [Reaches over to instruments]	
CI2:14	J: Do you want one of these?	
CI2:15	W: [Takes tambourine] *Thank you. yeah*	
CI2:16	J: Which one do you want?	
CI2:17	W: [Fiddles with tambourine]	
CI2:18	J: Cool. I've got some other instruments as well. [Briefly shakes shaker & beats on drum with it] You stay there and then I'll- I'll just pass you some. What do you wanna do with that? Is there any song that you like, that you wanna sing? What's your favorite song?	

CI2:19	W: Jingle Bells	
CI2:20	[Start singing together and playing instruments]	Immediate musical engagement
CI2:21	J: Here, I can even play it on the guitar. Let's try that [Begins strumming guitar & singing]	
CI2:22	W: [Begins shaking bells along, regularly]	Music has regular quality
CI2:23	J: [Sings] <i>Jingle Bells. Jingle Bells. Jingle all the way. Oh what fun it is to ride on a one-horse open slay. Hey. Jingle Bells. Jingle Bells. Jingle all the way. Oh what fun-</i>	
CI2:24	W: [Hits drum, intermittently at first and then begins playing regularly]	Music has regular quality
CI2:25	J: [Continues strumming guitar & singing] <i>-it is to ride on a one-horse open slay. Dashing through the snow on a one-horse open slay. All the way we go</i>	
CI2:26	W: [Changes instrument to shaker & begins shaking it to the beat of the song]	
CI2:27	J: [Continues singing] <i>Laughing all the way.</i> [Sing inaudible lyrics]. Come sing with me.	
CI2:28	W: [Joins in singing and hits shaker on drum, hitting it with every syllable of the lyrics]	
CI2:29	J: <i>Jingle Bells. Jingle Bells. Jingle all the way. Oh what fun it is to ride on a one-horse open slay. Hey</i>	
CI2:30	W: [Begins hitting shaker on drum with regular beat]	
CI2:31	J: [Continues strumming guitar & singing] <i>Jingle Bells. Jingle Bells. Jingle all the way. Oh what fun it is to ride on a-</i> [slows down and sustains last few lyrics in ending song] <i>-one-horse o-pen slaaay</i> [Increases intensity of music in ending song].	
CI2:32	W: [Also plays instruments with increased intensity and smiles in ending song]	
CI2:33	J: [Laughs] Let's- I've got an idea. Let's sing that song, but let's change the words. Let's see. Can you think of when you were lying on that mat, how it felt? Now we're gonna, we're gonna sing about that.	
CI2:34	W: Yeah	

CI2:35	J: We're gonna sing... How was it for you? Was it nice or boring or relaxing or ugly?	
CI2:36	{W: Nice. *Relaxing* [Says in calm manner]}	General pleasant experience Experience of relaxation Speech has calm quality
CI2:37	J: Was it relaxing? Let's see if we can sing and w- if we can change the words for that song. It was? Relaxing? So, let's see. What are we going to say? So instead of [Sings] <i>Jingle Bells</i> . What are we going to say about the mat?	
CI2:38	W: [Sings] <i>I like relaxing. I like relaxing in the shaking bed.</i>	Enjoyment of relaxation General pleasant experience
CI2:39	{J: [Laughs and then sings] <i>I like relaxing</i> . That's cool. [Sings] <i>I like relaxing. I like relaxing-</i>	Immediate musical response Experience of relaxation
CI2:40	W: [Sings] <i>-Banging through the drum.</i>	
CI2:41	{J: [Sings]: <i>-In the- In the shaking bed. Bed.</i> What else did it make you feel? Anything. It can be good, bad-	
CI2:42	{W: [Sings] <i>It was relaxing off the...</i> [inaudible]}	
CI2:43	J: Off the?	
CI2:44	W: [Sings] <i>Off the grading guitar</i>	
CI2:45	J: Off the grading guitar?	
CI2:46	W: Yeah	
CI2:47	J: What does that mean? [laughs].	
CI2:48	W: [Sings] <i>Off the-</i>	
CI2:49	J: What else- What did you feel when you were- So you said relaxing and-	
CI2:50	W: [Sings] <i>It was real- It was relaxing and nice</i>	Experience of relaxation General pleasant experience
CI2:51	J: I Remember that one time that you said that when you're stressed, sometimes it's nice to come here. Cause then y- then it's- it's- then you're less stressed afterwards?	
CI2:52	W: Yeah	
CI2:53	J: Okay. So maybe we can say [Sings] <i>I like relaxing. I like relaxing in the shaking bed.</i> Um-	

CI2:54	<p>W: Uh. [Sings and bounces from side to side] <i>When I feel stressed, I could relax in the shaking bed</i></p>	<p>Experience of de-stressing Music has bouncy quality Physical response in music</p>
CI2:55	<p>J: [Sings slowly and quietly while writing lyrics down] <i>When I feel stressed I could. I could re-lax in the sha-king bed. Hey! Bed. Do you wanna say "Hey" or what else can we say? Drrrr! Drrr [shakes body] Or how did the bed sound?</i></p>	
CI2:56	<p>W: [Jumps] Bum bum [makes sudden shaking movement, mimicking mat and with excitement]!</p>	<p>Enjoyment of shaking sensation</p>
CI2:57	<p>J: [Shakes body] Brrra! Bum. Okay, we gonna sing it? Are you ready? And then you're go- gonna show me with the shakers and the drums how the bed felt. Li- Was it like Drrrr [hits drum with sudden intensity]. <i>Or was it like dadadada</i> [drums in calm manner]. Or-</p>	
CI2:58	<p>W: [Hits drum twice in fast manner] <i>It was like</i> [Hits drum again in fast and excited manner]</p>	<p>Enjoyment of shaking sensation</p>
CI2:59	<p>J: Okay</p>	
CI2:60	<p>W: [Hits drum in similar manner]</p>	<p>Enjoyment of shaking sensation</p>
CI2:61	<p>J: [Plays guitar]. Okay, are we ready? One, two, a-one, two, three [Sings & W sings with at first before stopping and joining in with drumming] <i>I like relaxing, I like relaxing in the shaking bed...</i> [Pauses to put lyrics on drum where W can see]. [Continues singing while W sings softly and plays drums gently] <i>When I feel stressed I can relax in the shaking bed.</i></p>	<p>Music has gentle quality</p>
CI2:62	<p>W: [Hits drum with sudden increased intensity in response to J saying "When I feel stressed"]</p>	<p>Reflects stress through music</p>
CI2:63	<p>J: Drrrrr. Brrrr. So whenever that part comes then you're gonna show me how the shaking bed felt. Rrrrrr.</p>	
CI2:64	<p>W: [Plays drum with same increased intensity]</p>	<p>Mimics shaking sensation on drum</p>
CI2:65	<p>{J: [Sings & W continues hitting drum, quickly] <i>So, I like relaxing, I like relaxing in the shaking bed...</i> [W slows down drumming & plays with regularity] <i>When I feel stressed I can relax in the shaking bed.</i> Rrrrr.</p>	<p>Reflects relaxation through music</p>
CI2:66	<p>{W: Rrrrr [Plays drum with sudden increased intensity]</p>	<p>Reflects stress through music</p>

CI2:67	J: [Sings & W plays with slower and regular beat, matching J] <i>And, I like relaxing, I like relaxing in the shaking bed...</i>	
CI2:68	J&W: ...[Sing & W begins to dance] <i>When I feel stressed I could relax in the shaking bed</i>	Music has bouncy quality
CI2:69	W: <i>Drrrrrr!</i>	Reflects stress through music
CI2:70	J: [Laughs] <i>Aaand one, two, three, and what else are we gonna say?</i> [Sings & strums guitar] <i>Nanananana...</i>	
CI2:71	{W: [Joins in singing, enthusiastically] <i>Nanananananana!</i>	Music has vibrant quality Excitement in music
CI2:72	J: Sing anything now, about the bed [Strums guitar in regular, fast manner]	
CI2:73	W: [Sings and sways from side to side] <i>Woof woof woof woof wo- Wait wait wait, stop it.</i> [Continues singing] <i>Woof woof woof woof woof woof woof woof woof woof woof woof woof woof woof.</i>	Music has bouncy quality
CI2:74	{J: Is that how you feel?	
CI2:75	W: [Sings and and sways from side to side] <i>Woof woof woof woof woof. Woof woof woof woof woof. Woof woof woof woof woof. Woof woof woof woof woof woof woof woof woof woof woof woof woof woof.</i>	Music has bouncy quality
CI2:76	J: Okay, let's sing anything else about the bed. Anything. You can just think of it on the spot. <i>Aaand...</i>	
CI2:77	W: [Sings & sways while J continues strumming guitar] <i>I like relaxing on the shaking bed.</i>	General pleasant experience Experience of relaxation
CI2:78	J: Ya	
CI2:79	W: [Continues singing and swaying] <i>The shaking bed is nice. And it makes a</i> [shakes the bells to demonstrate shaking mat]	General pleasant experience Enjoyment of shaking sensation
CI2:80	J: And then?	
CI2:81	W: [Sings] <i>Jingle Bells...</i>	
CI2:82	J: [Sings] <i>I- I like relaxing. I like relaxing in the shaking bed...</i>	
CI2:83	{W: [begins drumming to beat of song, and in regular manner]	Music has regular quality
CI2:84	{J: [Continues singing and strumming guitar] <i>When I feel stressed I can relax in the shaking bed</i>	

CI2:85	W: Brrrrr! [Hits drum with sudden intensity]	Reflects stress through music
CI2:86	J: [Laughs & sings] <i>And I like relaxing-</i>	
CI2:87	W: [Joins in with drumming, again in a regular manner & to the pulse of my playing]	Music has regular rhythm
CI2:88	J: [Sings] <i>-I like relaxing in the shaking bed. When I feel stressed I could relax in the sha-king bed</i> [End song by slowing down & drawing out ending]. Let's sing it- How did you feel afterwards? Let's sing it in that way. So, [Sings in slow and soft manner while gently finger-picking on guitar] <i>I like relaxing. I like relaxing in the shaking bed. When I feel- *Sing with me*</i>	
CI2:89	W: [Joins in drumming, in relaxed manner]	Reflects relaxation through drumming
CI2:90	J: [Continues singing] <i>-stressed, I could relax in the shaking bed</i>	
CI2:91	{W: [Begins increasing drumming tempo]	Reflects stress through drumming
CI2:92	J: [Stops playing guitar] Is this how you felt? After being in the relaxing bed?	
CI2:93	W: Yeah.	
CI2:94	J: How did you feel before?	
CI2:95	W: Now let's draw some other words	
CI2:96	J: Do you wanna draw some other words?	
CI2:97	W: [Inaudible] [07:37]	Challenges in verbal expression
CI2:98	J: Okay so the [Sings] <i>Na na na na na.</i>	
CI2:99	W: No, [Sings in bouncy manner, informing me of lyrics] <i>Woof woof woof woof woof</i>	Music has bouncy quality
CI2:100	J: [Laughs] What does the woof mean?	
CI2:101	{W: [Continues in similar manner] <i>Woof woof woof woof woof. Dog</i>	Music has bouncy quality
CI2:102	{J: [Begins writing] I'm just gonna say woof times 10.	

CI2:103	<i>J&W: [Sings & W begins swaying body again] Woof woof woof woof woof. Woof woof woof woof woof woof woof. Woof woof woof woof woof woof woof woof woof woof woof Ohh.</i>	Music has bouncy quality
CI2:104	J: And then. So how did you feel before we came to relax? Were you like [plays guitar vigorously and makes stressed facial expression]	
CI2:105	{W: Yes	
CI2:106	J: Okay. Show me, how does stressed sound?	
CI2:107	<i>W: [Shakes body and bells while beating drum with sudden increased intensity]</i>	Reflects stress through movement Reflects stress through music Stress before intervention
CI2:108	J: [Matches W's movements and plays guitar with similar intensity]. [Sings very quickly & frantically] <i>I like relaxing. I like relaxing in the shaking bed. When I feel stressed I can relax in the shaking bed. I like relaxing. I like relaxing. Lalalala [makes blabbing sounds and then suddenly stops playing and singing].</i> And then how did it feel when you were lying on the bed?	
CI2:109	<i>W: It wa- wa- It feeled relaxing like [moves body in relaxed and flowing manner. Makes inaudible babbling sounds to describe feeling]</i>	Reflects relaxation through movement Reflects relaxation through vocal sounds
CI2:110	J: Okay. Like [Sings & plays guitar in a calmer manner] <i>I like relaxing. I like relaxing in the shaking bed. When I feel relaxed I could relax in the shaking bed.</i> And then how did it feel afterwards?	
CI2:111	<i>W: It- it feeled like I- I- It feeled like I almost melt</i>	Release of body tension
CI2:112	J: Like you almost melt? So it was calm, like [sings in a gentle and quiet manner while finger-picking on guitar] <i>I like relaxing</i>	
CI2:113	<i>W: [Joins in singing in similar calm manner] I like relaxing in the shaking bed. [W stops singing & taps drum gently with shaker]</i>	Reflects relaxation through music Reflects relaxation through movement Reflects gentleness through music
CI2:114	J: [Continues singing] <i>When I feel relaxed I can relax in the shaking bed.</i> Are we gonna do the woof? And 1, 2, 3 and [Sings with sudden increased tempo]	
CI2:115	<i>W: [Joins in singing at first and then switches to hit the shaker on the drum with increased intensity] Woof woof woof woof woof-</i>	
CI2:116	J: [Sings] <i>Woof woof woof woof woof. Woof woof woof woof woof woof woof. Woof woof woof woof woof. Brrrrrr!</i>	

CI2:117	{W: Brrrrrr!	Mimics shaking sensation vocally
CI2:118	J: [Laughs]	
CI2:119	W: Now let's- now let's do some other words for my- [Excited tone]	Excitement in music
CI2:120	J: Do you want to do some other words?	
CI2:121	W: -for my own song [Says in excited tone]	Excitement in music
CI2:122	J: For your own song?	
CI2:123	W: Yeah, for my own song – Jingle Bells.	
CI2:124	J: Okay. What else are we gonna add?	
CI2:125	W: I'm gonna add [sings] <i>When the phone's recording, we can make our own song.</i>	
CI2:126	J: [Laughs] Okay [Sings slowly and softly while writing down] <i>When the phone's recording, we can make our own song.</i> Ya?	
CI2:127	W: [Sings] <i>And now let's do the dashing on the dashing dashing dashing</i> [Dances enthusiastically].	Excitement in music
CI2:128	J: [Laughs]. [Sings slowly and softly while writing down] <i>And now let's do the dashing on the dashing dashing dashing.</i> Is that your song? Are we done?	
CI2:129	W: [Dances excitedly] <i>Yes!</i>	Excitement in music
CI2:130	J: [Laughs]. Yes! Do you wanna sing it again?	
CI2:131	W: Yeah	
CI2:132	J: 1, 2, uh-1, 2, 3 [Sings & strums guitar in regular, upbeat manner] <i>I like relaxing. I like relaxing in the shaking bed</i>	
CI2:133	W: [Joins in singing and shaking bells, regularly] <i>When I feel stressed I can relax in the shaking bed</i> [Suddenly plays drum vigorously]	Experience of de-stressing Music has regular rhythm Reflects stress through music
CI2:134	J: Woof- Oh yes- Relax in the shaking bed [plays guitar vigorously and W plays drum in similar manner]	
CI2:135	W&J: Brrrrraaaahh! [Shakes body and bells vigorously]	Reflects stress through music

CI2:136	J: And...	
CI2:137	W&J: [Sing & W dances] <i>Woof woof woof. Woof woof woof. Woof woof woof woof woof. Woof woof woof woof woof woof woof woof. Woof woof woof woof woof woof woof. And-</i>	Music has bouncy quality Excitement in songwriting
CI2:138	W: [Sings & beats drum. J follows in singing and playing guitar] <i>When the phone's recording-</i>	
CI2:139	J: [Sings] <i>-We can make a song. And now let's do the dashing-</i>	
CI2:140	W: [W begins drumming faster & dancing more vigorously]	Excitement in music
CI2:141	J: [Sings] <i>-The dashing, dashing dashing. And [Points to lyrics] When I feel stressed, I do do do do do. Woof. [Sings & W joins in singing] Woof woof woof woof woof woof woof woof woof woof woof woof woof. Oh. I like relaxing. I like relaxing in the shaking bed. When I feel stressed I could relax in the shaking bed [stops suddenly].</i>	
CI2:142	W: <i>Drrrrrrrrrr! [Shakes whole body & shaker]</i>	Reflects stress through music
CI2:143	J: [Sings & W shakes shaker along] <i>And I like relaxing. I like relaxing in the shaking bed. [W plays in regular manner] When I feel stressed I could [begins slowing music down, & sustaining words & chords in ending song] re-lax in the sha-king [plays 7th chord on guitar] Show me how it sounded [Takes a breathe in] bed [Sustains word in ending song & plays guitar with sudden intensity]</i>	Music has regular rhythm
CI2:144	W: [W drums with sudden increased intensity and shakes body]	Mimics shaking sensation on drum Mimics shaking sensation in movement
CI2:145	J: Nice, W [Gives high-five] <i>Good job. Was that fun?</i>	
CI2:146	W: <i>Yeah [says excitedly]. What other instruments do you have in there?</i>	Excitement in music
CI2:147	J: I don't have any other ones. I just have this little drum. And those shakers.	
CI2:148	W: <i>Where are the shakers?</i>	
CI2:149	J: But these are the shakers here. But I think- I think that's all for today. Unless there's any way- any other way that you wanna show me how the bed felt. Ith- I've got playdough. I've got- you can draw something.	

CI2:150	<p>W: I can draw something [Says excitedly].</p> <p>J: Do you wanna draw something? Come draw something for me and show me how the- What I'm gonna do now is I'm going to-</p>	Excitement in drawing
CI2:151	<p>Where is my pastels? Oh here. Here we go. I'm going to play that song. [Begins playing song and then suddenly stops it] Uh oh. Let me just record this here. [Connects phone to speaker] And I want you to show me how this song... [Plays song] Do you remember this song?</p>	
CI2:152	<p>W: Yeah [Begins drawing]</p>	Experience of relaxation Enjoyment of shaking sensation
CI2:153	<p>J: Okay. Are you gonna draw for me how it felt? You can draw you or colours or anything you want to show me how it felt lying on the mat. And it can be good or bad or boring or fun or relaxing</p>	
CI2:154	<p>W: It felt relaxing [Says in relaxed tone]. It shaked me [Says enthusiastically]</p>	Describes shaking sensation
CI2:155	<p>J: It saved you?</p>	
CI2:156	<p>W: No, it shaked me.</p>	Challenges in verbal expression
CI2:157	<p>J: Oh, it shaked you.</p>	
CI2:158	<p>W: There's the shaking bed [Points to drawing]</p>	Experience of relaxation Pleasant feelings in heart
CI2:159	<p>J: Oh cool.</p>	
CI2:160	<p>W: So I'm gonna draw... [Inaudible]</p>	Experience of relaxation Pleasant feelings in heart
CI2:161	<p>J: *Music Therapy*</p>	
CI2:162	<p>W: And that was with the headphones</p>	Experience of relaxation Pleasant feelings in heart
CI2:163	<p>J: Yes.</p>	
CI2:164	<p>W: It was wired to the floor.</p>	Experience of relaxation Pleasant feelings in heart
CI2:165	<p>J: Yes. And how did your heart feel when you were doing it? You can even pick another colour if you want to.</p>	
CI2:166	<p>W: [Inaudible] ...And it felt relaxing [Says in calm tone]. It was... [Inaudible]. Like that. It was doing the same face [Indicates heart as also smiling].</p>	Experience of relaxation Pleasant feelings in heart
CI2:167	<p>J: Oh cool. The sa- was it also a smiley face? your heart?</p>	

CI2:168	W: Yeah.	
CI2:169	J: Cool.	
CI2:170	W: It's almost that song that... [Inaudible] ...When I was relaxing like the shaking bed [14:15]	
CI2:171	J: This one, that's playing here?	
CI2:172	W: What is it? What is the name of this song?	
CI2:173	{J: It's called A Fresh Start.	
CI2:174	W: A fresh start. A fresh start [Said while continuing to draw]	
CI2:175	J: Yes	
CI2:176	W: A fresh start.	
CI2:177	J: Nice	
CI2:178	W: And it felt good.	General pleasant feelings
CI2:179	J: That's good. [W hands me drawing]. Nice. Thanks W. This is amazing. Cool. So that's all for today. Did you enjoy this?	
CI2:180	W: Yes	
CI2:181	J: Did you like this session?	
CI2:182	W: Yeah	
CI2:183	J: It was lots of fun, hey? Cool. So I'm- I'm actually- I'm- We're done now. And we're not gonna do any of the relaxing anymore. Or any of the drawing and stuff, but this was fun hey?	
CI2:184	W: Yeah.	
CI2:185	J: It was nice to meet you W	
CI2:186	W: Yeah	
CI2:187	J: Hey? Is there anything else you wanna say before I leave, or before I don't see you. I might see you one more time next week.	
CI2:188	W: Yeah.	
CI2:189	J: Okay? Is that fine?	

CI2:190	W: Yeah	
CI2:191	J: Cool	
	Description of drawing:	
CI2:192	Stick figure lying on mat that plugs into the wall and has a remote. He is wearing headphones, smiling, has closed eyes, and has a red heart on his chest	General pleasant experience Demonstrates happiness in drawing

CI3:1	J: What we are going to do- So first, I wanted to ask- What is your- Is there a song that you love?	
CI3:2	R: Umm	Limited verbal response
CI3:3	J: Or what do you want to you? Do you want to play some drums with me?	
CI3:4	R: [Nods head]	Limited verbal response
CI3:5	J: Do you wanna? Can you play some drums? Show me what you can play. It can be anything and I'll play it with you.	
CI3:6	R: [Begins drumming in a slow, regular manner at around 70bpm and picks it up to around 120 bpm]	Music has regular quality Immediate musical response
CI3:7	J: [Matches R's drumming and fills gaps until R ends drumming] [drum together for a short while]	
CI3:8	J: Nice. That's cool. And what el- do- are there any songs that you enjoy listening to? What's one of your favourite songs?	
CI3:9	R: Uhhhh. An African song?	
CI3:10	J: An African song? Cool. Also, cause it's Africa Day, hey? Okay, what African song do you like?	
CI3:11	R: This- this goes like [vocalises sound of drumbeat while hitting drum. Starts slow with little confidence and speeds up, slightly] <i>Doo doo doo doo doo doo doo doo doo...</i>	Immediate musical response Hesitancy in music
CI3:12	J: Oh, that's cool. Do you know the name of the song?	
CI3:13	R: I don't know.	
CI3:14	J: Or any of the words in it?	
CI3:15	R: [Sighs] I just kind of made my song by myself-	
CI3:16	{J: Oh did you make it up? Why don't we- Let's make a song then.	
CI3:17	R: Okay	
CI3:18	J: Okay. How does it go? Let's make up any song.	
CI3:19	R: Okay. So this is goes like this [Begins drumming in regular manner at around 95bpm with more confidence]	Music has regular quality growing confidence in music
CI3:21	{J: Do you want me to add some guitar? [Picks up guitar and begins playing, matching R's drumming]	

CI3:22	R: Mmhm [nods]	
CI3:23	J: [Continues playing with R and begins singing] Eeeeeee-ooooo-eeeeee. What can you sing with it?	
CI3:24	R: With- with this? Um. This- just this [in shy manner]	
CI3:25	J: Just this? You don't wanna sing with it?	
CI3:26	R: [Hits drum once in response]	Drumming as communication
CI3:27	J: Well, we can sing anything with it. You know like [Sings & plays guitar at around 175bpm] <i>In the jungle, the mighty jungle-</i>	
CI3:28	R: [Joins in singing softly while still drumming along in regular manner]	Music has regular quality
CI3:29	J: [Continues singing & strumming guitar] <i>-the lion sleeps tonight. In the jungle, the mighty jungle, the lion sleeps tonight. Eeee-oooo-eeee-oooo-eeee-oh wambawe. Eeee-oooo-eeee-oooo-eeee-oh wambawe.</i> Let's sing different lyrics now. We can make up any.	
CI3:30	R: [Sings something inaudible softly and briefly]	
CI3:31	J: [Sings to melody of Uyimbube] <i>Lalalalalalala</i>	
CI3:32	{R: [Joins in singing while still drumming in regular manner] <i>Lalalalalalala</i> [Picks up drumming tempo & plays in double time - increasing confidence] <i>Lalalalalala</i>	Music has regular quality Growing confidence in music
CI3:33	J: Now let's make up other lyrics. Anything [Stops playing guitar and R then stops drumming]. Ummm. Maybe about Africa Day. [Sings & begins playing guitar again at slower tempo] <i>Today is..</i>	
CI3:34	{R: [Sings and begins drumming, regularly at around 82bpm] <i>Today is Africa Day. And it's also Friday. All the African countries.</i>	Music has regular quality
CI3:35	J: Nice, let's do that again. [Sings & R joins in singing and continues drumming in slow, regular manner] <i>Today is Africa Day. It's also Friday. All the African countries.</i> And again! [Increases intensity of guitar playing]	
CI3:36	R: [Sings louder and with more confidence] <i>Today is Africa Day. It's also Friday. And all the African countries.</i> [Inaudible] ... 54 <i>countires...</i>	Growing confidence in music Confidence in non-lexical vocables
CI3:37	J: [Sings & R increases drumming tempo] <i>Aaand Eeee-oooo-eeee-oooo-eeee-oh wambawe.</i> And let's carry on singing. Anything.	
CI3:38	R: [Sighs in uncertain manner]	Hesitancy in lyric formulation
CI3:39	J: Are you tired now? [Stops playing guitar]	

CI3:40	R: [Nods]	Expression of tiredness Limited verbal response
CI3:41	J: I've got an idea. Do you remember the mat that we were lying on? That relaxing mat?	
CI3:42	R: [Nods]	Limited verbal response
CI3:43	J: Can you sing for me how that felt? You can sing anything.	
CI3:44	R: [Hits drum once and sighs as if unsure what to say]	Challenges in verbal expression
CI3:45	J: Like, you can say uh whether it was nice or boring or fun or relaxing. [Sings and gently strums guitar] <i>Nanaaa</i>	
CI3:46	R: [Sings] <i>Nananana</i> [Begins drumming and increases tempo while singing with growing confidence]	Growing confidence in music
CI3:47	J: Nice! [Matches with guitar playing and singing]	
CI3:48	R: [Continues singing and drumming]	
CI3:49	J: What do you wanna say about the bed? Anything.	
CI3:50	R: No, it's just the pillows [Seems to mishear & speaks in unconfident manner]	Limited confidence in speech
CI3:51	J: [Stops strumming guitar] Just the?	
CI3:52	R: Pillows. Just um- I'm just gonna sit here [says in unconfident manner]	Limited confidence in speech
CI3:53	J: You're just gonna sit? Okay. But let's- But s- But I'm thinking that can we sing about that bed? Like, how did it feel? If you can give me one word.	
CI3:54	R: Fun.	Experience of fun
CI3:55	J: Was it fun? So, maybe we can say [Begins strumming and singing slowly and softly to melody of Uyimbube – 130bpm] <i>It was fun-</i>	
CI3:56	[R begins drumming gently] <i>-to lie on the bed. Nananananana.</i> Can you think of anything else to say?	
CI3:57	R: It's relaxing. [Sings & J joins] <i>It was nice and relaxing...</i>	Experience of relaxation General pleasant experience
CI3:60	J: [Sings] <i>Nanananana</i>	
CI3:61	R: It's comfortable.	Experience of comfort
CI3:62	J: [Sings & R joins in singing and drumming in calm manner at around 130 bpm] <i>It's comfortable. It's comfortable. It's comfortable.</i> And what else?	Reflects calmness in music Experience of comfort

CI3:63	R: Nice.	General pleasant experience
CI3:64	J: [Sings & R continues drumming and singing softly] <i>It is nice. It is nice. It is nice.</i>	
CI3:65	{R: [Sings] <i>It's comfortable. Lalalalalala</i>	Experience of comfort
CI3:66	J: [Sings] <i>eeee-oooo-eeee-oooo-eeee Oh wambawe.</i>	
CI3:67	R: [Increases tempo of drumming with enthusiasm]	Enjoyment in drumming
CI3:68	J: [Sings & matches R's increasing tempo on guitar] <i>eeee-oooo-eeee-oooo-eeee Oh wambawe</i>	
CI3:69	R: [Increases intensity of drumming more]	Enjoyment in drumming Music has vibrant quality
CI3:70	J: While strumming with increased intensity] How did it feel? Show me on the drum how it felt. [Stops playing guitar]. Was it like [rubs hand over top of guitar] Relaxing? Or was it like [Hits drum with sudden intensity]?	
CI3:71	R: Soft [Rubs drum, gently]	Reflects gentleness on drum Experiences VAT as soft
CI3:72	J: Soft? [Strums guitar in gentle, matching manner]	
CI3:73	R: [Begins drumming and singing in gentle manner] <i>It is soft and... And it is always comfortable</i>	Experiences VAT as soft Reflects gentleness through music Experience of comfort
CI3:74	J: Nice! [Matching drumming and singing on guitar]	
CI3:75	R: [Continues singing] <i>And it is comfortable so you can relax and- [Inaudible]</i>	Experience of comfort Experience of relaxation
CI3:76	J: Cool.	
CI3:77	R: [Continues singing, confidently & J joins in singing] <i>Ahhhh oh ah oh eeee. Ahhhh oh ah oh eeee oh Wambawe. [Suddenly stops singing and drumming. Sighs as if becoming tired]</i>	Singing has confident quality
CI3:78	J: [Stops strumming guitar] And are you done? [Laughs]	
CI3:79	R: Yup	
CI3:80	J: So now I'm just going to ask you one more thing. So, what I'm gonna do now.. That was so cool. You're so good at writing a song on the spot hey.	
CI3:81	R: Hm?	
CI3:82	J: You just- we just wrote that on the spot. It was very cool. So what I'm going to do now, Rodney, is I'm going to play that song that we played when you were lying on the mat, and I want you to	

	either- Do you want to draw or do you want to umm play with playdough?	
CI3:83	R: Playdough [says with uncertainty]?	
CI3:84	J: Playdough? Okay cool. So I'm going to give you some playdough here. And I'm going to show you the different- here's the different colours and everything. I've got lots and lots of playdough. And I want you to think how- s-joe I've got lots. Okay, one more. I want you to show me with any of these colours, how- how did the- how did the relaxing make you feel? Which colour did it make you feel? [Begins playing VAT music on speaker]	
CI3:85	R: [Points to the pink playdough]	
CI3:86	J: So do you wanna pl- use the pink one? Can you- Oh, this is so sticky.	
CI3:87	R: Yup	
CI3:88	J: Can you show me with this how it felt being on the mat? You can do whatever you want. [Gives playdough] You can draw a heart or you can draw the m- I mean or you can make the mat, or you can make anything. Anything that this music and the relaxing made you think of or feel. And it doesn't even need to make sense. It can even just be like a blob or anything.	
CI3:89	R: [Plays with playdough for a few minutes]	
CI3:90	J: And you can use other colours if you want as well. You can add to it.	
CI3:91	R: *Okay. This is nice*. [Whispers to self, inaudibly] [10:10]	Enjoyment of sculpting
CI3:92	R: [Continues playing with playdough]. Yup yup.	
CI3:93	J: You done?	
CI3:94	R: I made a snail [Says with increased enthusiasm].	Excitement in sculpting
CI3:95	J: Oh cool. No ways. Do you like snails?	
CI3:96	R: Mhmm [Yes]	
CI3:97	J: [Giggles] That's so cool. What's the snail doing?	
CI3:98	R: It is doing this. It's slow [Holds and speaks in gentle and sensitive manner]	Sensitively holds sculpture Reflects sculpture as slow
CI3:99	J: [Giggles] That's so cool.	
CI3:100	R: [Sighs, contentedly]	Expression of contentedness
CI3:101	J: Nice. And does the snail make you feel anything?	

CI3:102	R: It feels comfortable.	Reflects comfort through sculpture
CI3:103	J: Comfortable?	
CI3:104	R: And always slimy.	Describes physical qualities of sculpture
CI3:105	J: And slimy. Does the snail have anything to do with the mat or how you felt on it at all? Or not really?	
CI3:106	R: Mhmm [Nods in agreement]	Associates VAT with liked animal
CI3:107	J: It's a cool snail. Maybe cause a snail's like slow and relaxed and..	
CI3:108	R: Yeah, it doesn't also bite	Reflects sculpture as non-aggressive
CI3:109	J: It doesn't bite. Did you feel like you were the snail on the- on the- when you were relaxing?	
CI3:110	R: Hmm. Kind of	Associates VAT with liked animal
CI3:111	J: Kind of? [Giggles] That's very cool. Nice.	
CI3:112	R: *I'm gonna*	
CI3:113	J: What are you going to do now? Or anything?	
CI3:114	R: I'm gonna make another one that's- that's really- that's gonna take like time [Begins creating new sculpture]	
CI3:115	J: Ahh. Okay. Has this got to do with the mat at all? Or no?	
CI3:116	R: Yup	Associates sculpture with VAT
CI3:117	J: Show me how-how it felt on the mat. But that's cool that you did a snail as well cause snails are relaxing and slow and it's almost like the mat can make you feel like a snail in a way, hey? It can make you feel slow and relaxed.	
CI3:118	R: [Continues sculpting something with playdough and speaks to self, inaudibly]. Done	
CI3:119	J: Cool. What's that?	
CI3:120	R: Well this is- I made a new animal that's [Inaudible]	Challenges in verbal expression
CI3:121	{J}: Awesome	
CI3:122	R: It's called a pre- pre -pre preda- predaladolphin.	Challenges in verbal expression
CI3:123	J: No ways. That's so cool.	
CI3:124	R: Mhmm.	

CI3:125	J: And what can you tell me about this animal?	
CI3:126	R: This animal's very kind.	Reflects sculpture as kind
CI3:127	J: Very kind? Ahhh that's so cool.	
CI3:128	R: Pre- pretty nice	Reflects sculpture as nice
CI3:129	J: Pretty nice? Cool.	
CI3:130	R: And cute.	Reflects sculpture as cute
CI3:131	J: And cute? It does look cute. It's a cool animal, hey. Does it remind you of the mat at all or how you felt when lying on it, or anything like that?	
CI3:132	R: Yeah, the mat was soft. Good. Nice.	Associates VAT with liked animal Reflects sculpture as soft
CI3:133	J: Almost like that- that animal?	General pleasant experience
CI3:134	R: Mhmm [Nods head]	
CI3:135	J: Like gentle and kind	
CI3:136	R: And pretty	
CI3:137	J: And pretty. That's nice. And soft? Is it a quiet animal? A gentle animal?	
CI3:138	R: A- A gentle animal	Reflects sculpture as gentle
CI3:139	J: A gentle animal.	
CI3:140	R: It doesn't bite	Reflects sculpture as non-aggressive
CI3:141	J: And it makes you feel good?	
CI3:142	R: Mmhm [Nods head]	Associates sculpture with pleasant feelings
CI3:143	J: Is it your friend?	
CI3:144	R: Yup	
CI3:145	J: That's cool. Nice. Can I take a photo of the animal?	
CI3:146	R: Of course.	
CI3:147	J: Yay. Let me take a photo [Takes photo]	
CI3:148	R: [Inaudible]	
CI3:149	J: [Giggles]. Nice. Very cool. So you think that animal, just like the mat, was like soft and quiet and gentle- the animal was also like that?	

CI3:150	R: Mhmm [Nods] <i>Video stops abruptly (Storage full)</i>	
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CI4:1	J: So, I first wanted to ask you. Do you like any songs? Are there any songs that you really like? What's your favourite song?	
CI4:2	N: Music	
CI4:3	J: Music?	
CI4:4	N: [Nods]	Limited verbal response
CI4:5	J: And which- Can you sing me any song that you like? Or do you know the name of any song?	
CI4:6	N: When you put the headphones [Gestures putting headphones on head]	Associates headphones with enjoyable music Concrete association
CI4:7	J: Oh you like that one?	
CI4:8	N: [Nods]	Limited verbal response Enjoyment of VAT music
CI4:9	J: Nice. Do you wanna try something on the drum?	
CI4:10	N: [Instantly begins playing the drum]	Immediate musical response
CI4:11	J: Let's try play something. Come play anything for me.	
CI4:12	[N begins playing instantly and N & J drum together for a while. N begins playing in irregular, soft manner while J matches]	Music has irregular quality Music has soft quality
CI4:13	N: [Suddenly stops playing on own as if uncertain]	Hesitancy in music
CI4:14	J: Play anything.	
CI4:15	[J & N continue drumming together. N plays in irregular manner & J matches]	Music has irregular quality
CI4:16	J: Can you show me- Do you remember lying on that mat? How did it sound? Can you show me how it sounded? Either like this? [Rubs drum, gently] Or how did it feel? Show me on the drum	
CI4:17	N: [Plays regular & calm beat on drum]	Reflects regularity through drumming Reflects calmness through drumming
CI4:18	J: Did it feel like that? Did it feel like this [Plays drum, quickly and intensely] Or did it feel like that [Rubs drum, gently] or [drums relatively quickly]	
CI4:19	N: [Plays slow and steady beat]	Reflects regularity through drumming Reflects calmness through drumming
CI4:20	J: Nice. And is there any song that you like to sing?	
CI4:21	N: Mmm [Yes].	Limited verbal response

CI4:22	J: What song?	
CI4:23	N: [Inaudible]	Challenges in verbal expression
CI4:24	J: Hmm?	
CI4:25	N: [Inaudible]	Challenges in verbal expression
CI4:26	J: "Dashaun"?	
CI4:27	N: Mm [yes]	Limited verbal response
CI4:28	J: How does it go? Show me how it goes. Sing it.	
CI4:29	N: [Hums a short, inaudible melody]	
CI4:30	J: Nice. What's it called?	
CI4:31	N: [Inaudible]	Challenges in verbal expression
CI4:32	J: "That Shaun"?	
CI4:33	N: Mm [Yes]	Limited verbal response
CI4:34	J: Do you know how to spell it- How to write it?	
CI4:35	N: [Shakes head]	Limited verbal response Limited writing ability
CI4:36	J: No? And who's it- Do you know who sings it?	
CI4:37	N: [Nods]	Limited verbal response
CI4:38	J: Who?	
CI4:39	N: AKA	
CI4:40	J: AKA? Ahh. Let's see. Let's see. AKA [Looks on phone] You said it's called?	
CI4:41	N: The song's name is. Uhh. The song- It's name is nnn...	Challenges in verbal expression
CI4:42	J: Is it company? [Begins listing songs] All eyes on me? Jika? Lemons? Fella in Versace? The world is yours? Don't forget to pray? Baddest? Do you know what it looks like? [Shows phone to N]	
CI4:43	N: Mm [yes].	Limited verbal response
CI4:44	J: Which one is it? [shows phone]	
CI4:45	N: Mmm [Points to song on phone]	Limited verbal response
CI4:46	J: This one? [Plays beginning of song on phone]	

CI4:47	N: Mmm [Yes]	Limited verbal response
CI4:48	J: Oh cool. Let me connect it to the speaker then... [connects to speaker]	
CI4:49	[Song plays]	
CI4:50	N: [Immediately begins hitting drum to beat of the song]	Immediate musical response
	J: [Joins in drumming]	
CI4:51	[Song ends]	
CI4:52	J: Cool, thanks N. It's a nice song. So now, I wanna ask you. I'm gonna put this paper over here and what I'm gonna ask you is- I'm gonna play this song that was relaxing. Do you remember that song?	
CI4:53		
CI4:54	N: Yeah	
CI4:55	J: I'm gonna see if- Can you draw how it felt, or how it looked- You can draw you lying on the mat. Or you can draw anything – colours. Okay? [Plays song] Do you remember this song?	
CI4:56	N: [Nods]	Limited verbal response
CI4:57	J: Do you like it?	
CI4:58	N: Ya	Enjoyment of VAT music
CI4:59	J: So you can draw anything for me. Draw- draw for me how it felt on the mat, or anything.	
CI4:60	N: A heart? [Seems to ask to draw heart]	
CI4:61	J: Anything that you want that makes you- shows you how you felt when you lay on the mat. Okay? So when you were listening to this music and lying there, how did it feel? Show me. Draw anything you want.	
CI4:62	N: [Engages in drawing for a while]	
CI4:63	J: Cool. Almost done? Nice. Cool. So what can you tell me about the picture?	
CI4:64	N: Beautiful	Perceives drawing as beautiful
CI4:65	J: Beautiful? Nice. And is this- who's this? You? [Points to stick figure lying on mat]	
CI4:66	N: [Nods]	Limited verbal response
CI4:67	J: And this? The mat?	

CI4:68	N: [Nods]	Limited verbal response
CI4:69	J: And what does this say? [points to "music" written]	
CI4:70	N: Music.	Demonstrates love for VAT music in drawing
CI4:71	J: Music and? [Points to "love" written]	
CI4:72	N: Love.	Demonstrates love in drawing
CI4:73	J: And? [Points to "girl" written]	
CI4:74	N: Girl [Points to J]	
CI4:75	J: [Laughs] Where's- what- am I the girl?	
CI4:76	N: [Nods]	
CI4:77	J: Ah cool. And what else? So you liked- did you love it? [Points to drawing of heart] What did you love about it?	
CI4:78	N: You [Points to J].	Positive feelings for facilitator
CI4:79	J: Me? [laughs] And the music?	
CI4:80	N: [Gives thumbs-up]	Gestures in response Enjoyment of VAT music
CI4:81	J: You loved the music. And you loved the mat? [Points to drawing of mat]	
CI4:82	N: [Nods]	Limited verbal response
CI4:83	J: Ahh. Okay, cool. Thanks N. This is so cool. Awesome. Nice. Then that's all for today, okay?	
CI4:84	N: Mm	Limited verbal response
CI4:85	J: Thanks N. Bye.	
CI4:86	Drawing description: Stick figure lying on mat, smiling, with headphones on, and heart above. Words written on the paper are "Love", "Music" and "Girls"	General pleasant experience Enjoyment of VAT music Demonstrates love in drawing

CI5:1	J: Come sit here	
CI5:2	Q: [Inaudible]	Challenges in verbal expression
CI5:3	J: Do you like the drums?	
CI5:4	Q: Yes	
CI5:5	J: Do you wanna play it?	
CI5:6	Q: [Inaudible]	Challenges in verbal expression
CI5:7	J: Come. Let's play the drum.	
CI5:8	Q: [Inaudible]	Challenges in verbal expression
CI5:9	J: Play something for me.	
CI5:10	Q: [Immediately begins hitting drum in irregular manner]	Immediate musical response
CI5:11	J: [Joins in drumming, trying to match Q's playing]	
CI5:12	Q: [Drumming becomes more regular]	Music has regular quality
CI5:13	J: Let's play softer [drums softer and Q follows]. And now, louder [Drums louder and Q follows] [Ends drumming] Nice. Cool.	
CI5:14	Q: [Points to and reaches for guitar]	Nonverbally requests music
CI5:15	J: Do you wanna play some guitar?	
CI5:16	Q: Yes	
CI5:17	J: What song do you like? What's your favourite song? Hm?	
CI5:18	Q: [Instantly begins singing what sounds like song "Ten in the Bed"]	Immediate musical response
CI5:19	J: [Begins strumming guitar, gently & humming & singing] ...Roll over. What are you singing?	
CI5:20	Q: Not... [Inaudible]	Challenges in verbal expression
CI5:21	{J: [Sings & strums guitar to melody of Ten in the Bed] <i>Nananana</i>	
CI5:22	Q: That's not that song. [Sings same melody with inaudible lyrics]	Challenges in lyric articulation
CI5:23	J: [Sings] <i>Roll over.</i>	
CI5:24	Q: [Continues singing melody with inaudible lyrics]	Challenges in lyric articulation
CI5:25	J: [Sings & strums guitar] <i>Na na in the bed and the little one said roll over. Roll over.</i> [Builds intensity on guitar] <i>So they all rolled over and</i>	

	<i>one fell out</i> [stops guitar suddenly & bangs on drum in drumroll manner]. What other song?	
CI5:26	Q: Not that song.	
CI5:27	J: Not that song?	
CI5:28	Q: This song [Continues singing, inaudibly]	Challenges in lyric articulation
CI5:29	J: Sing louder.	
CI5:30	Q: [Sings inaudible lyrics]	Challenges in lyric articulation
CI5:31	J: [Begins strumming on guitar] That's cool. Do you know what it's called? What the name is?	
CI5:32	Q: [Inaudible] [02:23]	Challenges in lyric articulation
CI5:33	J: Hmm?	
CI5:34	Q: [Inaudible]	Challenges in lyric articulation
CI5:35	[Inaudible conversing]	
CI5:36	J: Okay. That's so cool. So, Qawe.	
CI5:37	Q: yes	
CI5:38	J: I'm now gonna ask you. Do you remember when you were lying on here- on this mat?	
CI5:39	Q: Yes	
CI5:40	J: And it was- How did it feel for you?	
CI5:41	Q: Nice	General pleasant experience
CI5:42	J: Was it nice?	
CI5:43	Q: Yes	
CI5:44	J: Can you show me on the drum how it felt? Was it like this [<i>Rubs drum, gently</i>] or this [<i>Plays drumroll with slightly increased intensity</i>] or this [<i>Increases intensity in drumming even more</i>] Or how did it feel?	
CI5:45	Q: [Instantly hits drum in calm & regular manner]	Music has regular quality Music has calm quality
CI5:46	J: [Joins in drumming in similar manner, matching Q] Is that how it felt being on the mat? Hey? Nice. Cool.	
CI5:47	Q: [Increases intensity of drumming, suddenly & with enthusiasm]	Music has vibrant quality

CI5:48	J: [Matches Q's increased intensity on drum & starts singing] <i>It was relaxing. You said it was nice?</i>	
CI5:49	Q: Yes.	
CI5:50	{J: [Sings while still drumming with Q] <i>It was nice. It was nice. It was nice, nice, nice.</i> And what else? [Continues singing while still drumming with Q] <i>It was...</i> What else? [Stops drumming]	
CI5:51	Q: [Stops drumming in response]	
CI5:52	J: [Sings and starts drumming in similar manner again] <i>It waas-</i>	
CI5:53	Q: [Joins in drumming again in similar regular manner]	Music has regular quality
CI5:54	J: [Sings] <i>Nice, nice. It was nice, nice, nice.</i> And what else? [Continues singing] <i>It was?</i>	
CI5:55	Q: Nice! [Stops drumming and says in excited manner]	Excitement in music
CI5:56	J: [Stops drumming] Nice and? Anything else? [sings] <i>It waas...</i> Let's do this [Picks up guitar and starts strumming]	
CI5:57	Q: [Inaudible] [04:08]	Challenges in verbal expression
CI5:58	J: Do you know this one? [Starts singing & playing guitar] <i>If you're happy and you know it clap your hands</i>	
CI5:59	Q: [Instantly hits both drums in response to song enthusiastically and sings along quietly. Continues drumming to rhythm of J singing]	Immediate musical response Excitement in music
CI5:60	J: [Sings and plays guitar in regular manner at 120 bpm while Q drums and sings along] <i>If you're happy and you know it, hit the drum. If you're happy and you know it and you really wanna show it. If you're happy and you know it, hit the drum. Boom, boom. If you're happy and you know it hit the drum</i> [Stops playing guitar and indicates to Q to hit drum]	
CI5:61	Q: [Responds by hitting drum, twice, with enthusiasm]	Excitement in music
CI5:62	J: [Continues singing and strumming guitar] <i>If you're happy and you know it hit the drum</i> [Stops playing guitar and indicates to Q to hit drum]. [Continues singing and strumming guitar] <i>If you're happy and you know it and you really wanna show it. If you're happy and you know it, hit the drum</i> [Stops playing guitar and indicates to Q to hit drum].	
CI5:63	Q: [Responds by hitting drum, twice, with enthusiasm]	Excitement in music
CI5:64	J: Nice. And now we're gonna go [Sings & strums guitar] <i>If you're happy and you know it, sing lala</i> [Stops strumming]	
CI5:65	Q: [Sings with J while drumming] <i>Lalala</i>	

CI5:66	J: [Sings & strums guitar] <i>If you're happy and you know it, sing lala</i> [Stops strumming]	
CI5:67	Q: [Sings with J while drumming and bouncing body] <i>Lalala</i>	Music has bouncy quality
CI5:68	J: [Continues singing and strumming guitar] <i>If you're happy and you know it and you really wanna show it. If you're happy and you know it, sing lala</i> [Stops strumming]	
CI5:69	Q: [Sings with J while drumming] <i>Lalala</i>	
CI5:70	J: Now. What can you tell me about the mat? [Sings] <i>When I'm lying on the mat...</i>	
CI5:71	Q: <i>To dance [requests to add dancing to song].</i>	Expression through dancing
CI5:72	J: Sorry?	
CI5:73	Q: <i>Dance.</i>	
CI5:74	J: Dance? Oh! [Sings & plays guitar in similar rhythm as before] <i>If you're happy and you know it, let's dance-</i>	
CI5:75	Q: [Dances while drumming on both drums]	Expression through dancing
CI5:76	J: [Sings & continues strumming] <i>If you're happy and you know it, let's dance. Dance for me</i>	
CI5:77	Q: <i>Dance! [says enthusiastically while drumming]</i>	Growing excitement in music Growing excitement in dancing
CI5:78	J: [Sings & continues strumming] <i>If you're happy and you know it and you really wanna show it. If you're happy and you know it, let's dance</i>	
CI5:79	Q: <i>Dance! [says enthusiastically while drumming]</i>	Growing excitement in music Growing excitement in dancing
CI5:80	J: [Stops strumming] Nice. And then, Q? When you're lying on the mat, how does it feel?	
CI5:81	Q: <i>Nice! [Says enthusiastically while still dancing. Stops drumming]</i>	Excitement in music General pleasant experience Excitement in dancing
CI5:82	J: [Sings & plays starts strumming] <i>So when you're lying on the mat, it feels nice</i>	
CI5:83	Q: [Joins in singing and continues drumming on both drums with increased energy]	Music has vibrant quality
CI5:84	J: <i>When you're lying on the mat, it feels nice. When you're lying on the mat. When you're lying on the mat. When you're lying on the mat it feels nice. And what else? [Continues singing] When you're lying on the mat, it's?</i>	
CI5:85	Q: <i>Nice</i>	General pleasant experience

CI5:86	J: [Stops strumming] What else? It's?	
CI5:87	Q: Nice	General pleasant experience
CI5:88	J: And?	
CI5:89	Q: Great	General pleasant experience
CI5:90	J: [Sings and strums guitar again] <i>When you're lying on the mat, it's great</i>	
CI5:91	Q: [Joins in drumming on both drums again, enthusiastically. Sings softly but louder on "great"]	Growing enthusiasm in music Music has vibrant quality
CI5:92	J: [Continues singing in similar enthusiastic manner] <i>When you're lying on the mat, it's great. When you're lying on the mat, when you're lying on the mat, when you're lying on the mat it's great!</i>	
CI5:93	Q: Great! [Sings enthusiastically]	Growing enthusiasm in music
CI5:94	J: And what else? [Continues singing] <i>When you're lying on the mat, it's?</i>	
CI5:95	Q: Great	General pleasant experience
CI5:96	J: And?	
CI5:97	Q: Nice	General pleasant experience
CI5:98	J: And? Is it- what else? Is it bad or good or relaxing or boring or fun or sounds nice?	
CI5:99	Q: Fun	Experience of fun
CI5:100	J: [Continues singing] <i>When you're lying on the mat, it's fun!</i>	
CI5:101	Q: [Joins in drumming on both drums again & sings softly but even louder on "fun"]	Excitement in music Growing enthusiasm in music
CI5:102	J: [Continues singing] <i>When you're lying on the mat, it's fun! When you're lying on the mat, when you're lying on the mat. when you're lying on the mat, it's fun!</i>	
CI5:103	J&Q: Yaaay!	Excitement in music
CI5:104	J: [Stops strumming guitar] And how do you feel afterwards? Are you like yaaay! [Shakes body, excitedly] or are you like yaaay [says softly and gestures flowy movements]?	
CI5:105	Q: Yay [Doesn't move body & says it softly]	Reflects relaxation through tone of voice

CI5:106	J: How do you feel after you're on the mat? Is it like [Shakes body, excitedly] or do you feel like this [gestures flowy movements]?	
CI5:107	Q: Yes [Doesn't move body & says it softly]	Reflects relaxation through tone of voice
CI5:108	J: Which one? Show me. One or two?	
CI5:109	Q: Two	Experience of relaxation
CI5:110	J: Two? Okay [Starts singing in slow, gentle, flowing manner – 90bpm] When I'm lying on the mat, I'm relaxed.	
CI5:111	Q: [Joins in singing, softly and plays both drums, gently]	Reflects relaxation through music Music has gentle quality
CI5:112	J: [Continues singing and strumming guitar] When I'm lying on the mat, I'm relaxed. When I'm lying on the mat, When I'm lying on the mat, When I'm lying on the mat, I'm relaxed. And anything else? [Stops strumming]	
CI5:113	Q: Nice.	General pleasant experience
CI5:114	J: Nice. And let's do the last- let's do all of them – Nice, great, fun and relaxed. [Begins singing and strumming guitar]	
CI5:115	Q: [Joins in singing, softly & gently while drumming on both drums]	Music has gentle quality
CI5:116	J: [Sings] When I'm lying on the mat, it's nice. When I'm lying on the mat, it's great. When I'm lying on the mat, it is really fun. When I'm lying on the mat, it's relaxing and nice [Increases intensity of strumming in ending song]	
CI5:117	Q: [Hits drums in similarly intense & enthusiastic manner]	Music has vibrant quality
CI5:118	J: Nice! There we go. So, I'm gonna ask you one more thing. What we're gonna do now is I'm gonna ask you if you can draw. Do you like drawing?	
CI5:119	Q: Yes. On the table	
CI5:120	J: On the table? Okay. We can draw here on the floor. Is that fine?	
CI5:121	Q: No. [Inaudible]	Challenges in verbal expression
CI5:122	J: Okay, let's draw on the drum. Here we go.	
CI5:123	Q: No. [Inaudible]	Challenges in verbal expression
CI5:124	J: Do you wanna draw on the table?	
CI5:125	Q: Yes.	
CI5:126	J: Okay, let's go draw at- let's go sit at the table.	

CI5:127	[Both move to table]	
CI5:128	J: So ,we're gonna draw- I want you to draw- How did it feel when you were on the mat?	
CI5:129	Q: It felt nice.	General pleasant experience
CI5:130	J: Was it nice? Come draw it for me. You can draw the mat and you can draw Qawe lying on it and what did it- or you can draw colours or lines. Anything that you felt when lying on it, okay? <i>[Plays VAT song while Q draws].</i> Do you remember this song?	
CI5:131	Q: Yes.	
CI5:132	J: So we're gonna draw how it feels. What does this song make you feel- and anything about the mat.	
CI5:133	Q: [Immediately begins drawing and continues for a short while] I've done it.	Immediate engagement in drawing
CI5:134	J: Cool, carry on. Show me more. You can add colours and anything you want.	
CI5:135	[Q draws for a while and then stops]	Extended engagement in drawing
CI5:136	J: Are you done?	
CI5:137	Q: Yes.	
CI5:138	J: Cool. What can you tell me about this? About the drawing? Can you tell me anything about it [Q starts drawing again] or are you still busy?	
CI5:139	Q: Busy. Another song.	Request to change VAT music
CI5:140	J: Another song?	
CI5:141	Q: Yes	Request to change VAT music
CI5:142	J: Okay [Plays new song]	
CI5:143	Q: [Inaudible] [Recording ends abruptly as teacher walks in]	Challenges in verbal expression
CI5:144	Drawing: Stick figure standing next to a car and what looks like a rock. There is a house and yellow, squiggly lines above him.	Drawing as fun activity

CI6:1	J: Okay A. So we can sit. You can sit down. And.. So A, can you play the drums?	
CI6:2	A: Mmm [Yes]	Limited verbal response
CI6:3	J: Come play it for me	
CI6:4	A: [Plays drum in fast tempo & relatively regular – 200bpm]	Immediate musical response Music has regular quality
CI6:5	J: [Matches playing on drum]	
CI6:6	A: [Drumming gets slower and more regular] Drums.	Music has regular quality
CI6:7	[Drumming ends naturally]	
CI6:8	J: Nice. So do you remember lying on the mat when we were listening to the music?	
CI6:9	A: Mhm [Yes]	Limited verbal response
CI6:10	J: Cool. Can we sing about it?	
CI6:11	A: Mhm [Yes]	Limited verbal response
CI6:12	J: So, maybe let's sing...	
CI6:13	A: Twi... [Begins singing Twinkle Little Star]	Immediate musical response
CI6:14	J: What do you want to sing? [Strums guitar and sings, gently – 85bpm. A instantly joins in singing with confidence] <i>Twinkle twinkle little star. How I wonder what you are. Up above the world so high. Like a diamond in the sky. Twinkle twinkle little star. How I wonder what you are</i> [Stops strumming]. Let's change the words now, to sing about the mat.	Immediate musical response Confidence in singing
CI6:15	A: Mhm [Yes].	Limited verbal response
CI6:16	J: What should we say?	
CI6:17	A: <i>Incy Wincy Spider</i> [Requests new song]	
CI6:18	J: [Sings & strums guitar in similar gentle manner] <i>Incy Wincy Spider went climbing up the wall.</i> And then?	
CI6:19	A: <i>The water.</i>	
CI6:20	J: Ya, sing.	
CI6:21	A: [sings] <i>The water</i>	
CI6:22	J: [Continues humming to the melody of Incy Wincy Spider] <i>Nananana... Out came the sun and dried up all the rain and- [A joins in singing, softly] -the incy wincy spider climbed up the wall again.</i> And what should we call this? The music mat? Hey?	

Cl6:23	A: Mmm [Yes]	Limited verbal response
Cl6:24	J: Do you like it? Let's sing about it. Umm [Starts singing to melody of Twinkle Twinkle & finger-picks guitar, gently – 100bpm] <i>The music mat was?</i>	
Cl6:25	A: Nice.	General pleasant experience
Cl6:26	J: [Continues singing & finger-picking guitar] <i>Very nice</i> . What else can you sing? [Waits for A to respond which she does not] Okay let's sing [Sings and finger-picks on guitar] <i>The music mat was very nice</i> . [A joins in singing, softly] <i>The music mat was very nice. The music mat was very nice. The music mat was very nice. The music mat was very nice.</i> And what else about the music mat? Was it- [Begins singing and finger-picking guitar again] <i>-The music mat was?</i>	
Cl6:27	A: Very!	
Cl6:28	J: Very what? Was it relaxing or sad or happy or boring or fun? What was it?	
Cl6:29	A: Relax!	Experience of relaxation
Cl6:30	J: [Sings & finger-picks on guitar] <i>So the music mat was relaxing. The music mat was relaxing.</i> And carry on.	
Cl6:31	A: [A joins in singing, softly and gently]	Singing has calm quality
Cl6:32	J: [Continues singing & finger-picking on guitar] <i>The music mat was relaxing. The music mat was relaxing. The music mat was relaxing. The music mat was relaxing.</i> [Stops playing guitar] And what else?	
Cl6:33	A: [Inaudible]	
Cl6:34	J: Mmm. What else can you say? [Sings] <i>It made me feel...</i> How did it make you feel?	
Cl6:35	A: Sad [seems to misunderstand question]	Expression of sadness
Cl6:36	J: Sad? Why?	
Cl6:37	A: Because it's happy happy.	Expression of happiness
Cl6:38	J: Did it make you happy?	
Cl6:39	A: Mmm [agreeing, enthusiastically]	Expression of happiness
Cl6:40	J: Okay so [Sings & finger-picks guitar. A joins in singing, quietly] <i>The music mat made me happy. The music mat makes me happy. The music mat makes me happy. The music mat makes me happy. The music mat makes me happy.</i> [slows down and sustains last line in ending song. Plays 7 th chord & strums guitar intensely in ending]. Nice Akhona. So now we're gonna draw a little picture. Are you ready?	
Cl6:41	A: Mmm [Yes]	Limited verbal response

Cl6:42	J: Can you draw for me how the music mat made you feel? Can you draw it on here? <i>[Puts paper and pastels on drum in front of A].</i> I'm going to play one of the songs that we played on the music mat.	
Cl6:43	A: Mmhm [Okay]	Limited verbal response
Cl6:44	J: [Begins playing song on speaker] Do you remember this song?	
Cl6:45	A: [Nods & immediately begins drawing]	Limited verbal response Immediate engagement in drawing
Cl6:46	J: So how did this make you feel? How did the mat- You can draw anything.	Music as significant element of VAT
Cl6:47	A: [Continues drawing] Music.	
Cl6:48	J: Ohh. And what about the music?	
Cl6:49	A: Music [Says enthusiastically & points. Continues drawing for a while]. Music.	Enjoyment of VAT music Excitement in drawing
Cl6:50	J: Cool. And draw any pictures. You can even draw happy or sad.	
Cl6:51	A: [Continues drawing for a few minutes and then holds drawing up to show me]	Shares drawing experience
Cl6:52	J: Are you done?	
Cl6:53	A: Mm [yes]	Limited verbal response
Cl6:54	J: Nice. Cool. Thanks A	
Cl6:55	A: No problem	
Cl6:56	J: You're done. Cool. No problem. Thanks A. We're done for today. Did you like that?	
Cl6:57	A: Yeah.	Enjoyment of creative interview
Cl6:58	J: Was it fun?	
Cl6:59	A: Mm [Yes]	Experience of fun
Cl6:60	J: Cool. Alright. So you can go back to class now.	
Cl6:61	Drawing Stick figure lying on VAT mat, smiling, with music notes above head and saying "Music".	Enjoyment of VAT music General pleasant experience Demonstrates happiness in drawing

CI7:1	J: Here we go. Okay R, come sit down with me	
CI7:2	R: Yes	
CI7:3	J: *Yes*. Right, let's go sit on that – Go sit on that cushion. Come sit over here.	
CI7:4	[Both sit down on cushions]	
CI7:5	J: Okay, so, R, I wanted to ask you. How did you- Do you remember lying on that thing? Lying on the mat?	
CI7:6	R: Yes	
CI7:7	J: How did it feel?	
CI7:8	R: Warm	Experience of warmth
CI7:9	J: Warm? Can you show me? So, look here [Puts instruments in front of R] I've got all of these instruments over here. You said you wanted to draw though, hey?	
CI7:10	R: Yes.	
CI7:11	J: Okay, do we- let's- let's draw something. [Put's paper & pastels in front of R] I want you to show me- First, what's your favourite song? Do you have any songs that you really like?	
CI7:12	R: MacDonald	
CI7:13	J: Hm?	
CI7:14	R: MacDonald had a farm	
CI7:15	J: MacDonald?	
CI7:16	R: Yes	
CI7:17	J: Old MacDonald?	
CI7:18	R: MacDonald.	
CI7:19	J: [Sings] <i>Old MacDonald had a farm</i> . That one?	
CI7:20	R: Yes	
CI7:21	{J: [sings] <i>Ee I ee I oh</i> . You like that one?	
CI7:22	R: Yes, I do.	
CI7:23	J: Nice. Should we quickly sing it?	
CI7:24	R: Yes	

CI7:25	J: Do you wanna sing- We can even sing it on the guitar	
CI7:26	R: Yeah	
CI7:27	J: ...before we draw. And then, which instrument do you want to play with?	
CI7:28	R: Ya [Misunderstands]	Difficulty comprehending speech
CI7:29	J: Do you want to play on the drum with me? Or the shaker?	
CI7:30	R: [Picks up bells] The shaker.	
CI7:31	J: Okay [Strums guitar]	
CI7:32	R: No. Like this. [leans over and strums guitar once]	
CI7:33	{J: It's cool hey?	
CI7:34	R: Like this [strums my guitar once]	
CI7:35	{J: [Starts singing and strumming guitar, gently – 130bpm] <i>Old MacDonald had a farm-</i>	
CI7:36	R: [Instantly starts shaking bells to song, with greater intensity than guitar & excitedly. Joins in singing]	Immediate musical response Excitement in music
CI7:37	J&R: [Sing together] <i>eeee-aaaa-eeee-aaaa-ooooh</i>	
CI7:38	R: [Stops shaking bells]	
CI7:39	J: [Continues singing & strumming guitar] <i>And on that farm he had a?</i>	
CI7:40	R: A sheep! [Says enthusiastically]	Excitement in music
CI7:41	J: He had a sheep? [Continues singing & strumming guitar] <i>Sheep. Eee-aaa-</i>	
CI7:42	R: [Joins in singing enthusiastically]	Excitement in music
CI7:43	J&R: [Sing together] <i>eee-aaa-oohhh</i>	
CI7:44	J: With a?	
CI7:45	R: With a.. With a cow.	
CI7:46	{J: [Continues singing & strumming guitar] <i>With a baa baa here and a-</i>	
CI7:47	J&R: [R joins in singing, enthusiastically] <i>-baa baa there. Here a baa, there a baa, everywhere a baa baa. Play your instrument.</i>	Excitement in music
CI7:48	R: Cow	
CI7:49	J: Cow? [Sings & strums guitar] <i>With a moo moo here-</i>	

CI7:50	J&R: [R joins in singing and shaking bells vigorously] <i>-and a moo moo there. Here a moo, there a moo, everywhere a moo moo</i>	Music has vibrant quality
CI7:51	R: [Suddenly stops playing & singing] I want this one [Takes drum]	
CI7:52	J: [Stops strumming and singing] Okay, you want the big drum?	
CI7:53	R: [Hits big drum three times]	
CI7:54	J: [Takes drum away and gives R bigger drum] You wanna play this big drum here? Here's the big one	
CI7:55	R: [Immediately starts playing quick beat on drum, enthusiastically]	Immediate musical response Excitement in music
CI7:56	J: [Matches drumming with guitar strumming. Starts singing] <i>Old MacDonald had a farm. Eee-aaa-eee-aaa-oooh. And on that farm he had a R (participant's name). He had a R.</i>	
CI7:57	R: [Looks at J & joins in singing, still hitting drum with similar, quick tempo and in excited manner]	Excitement in music
CI7:58	J: [Sings with R] <i>Eee-aaa-eee-aaa-oooh</i> . What did the R (participant name) say?	
CI7:59	R: [Inaudible singing & quickens drumming in excited manner] <i>Eee-aaa-eee-aaa-oooh</i>	Excitement in music
CI7:60	J: [Continues singing and strumming guitar in slightly faster manner, matching R's drumming] <i>And on that farm he had a... Eee-aaa-eee-aaa-oooh. With a...</i>	
CI7:61	[J continues singing and R drums along, enthusiastically]	
CI7:62	J: [Stops strumming while R continues drumming] Let's try this. So, and on that farm he had this mat	
CI7:63	J&R: [Sing together] <i>Eee-aaa-eee-aaa-oooh</i>	
CI7:64	J: [Still strumming & J drumming] And what did the mat do?	
CI7:65	R: <i>Eat the grass</i> [Seems to be speaking about cow]	Difficulty comprehending speech
CI7:66	J: It?	
CI7:67	R: <i>In the ground</i>	
CI7:68	[Both suddenly stop playing music]	
CI7:69	J: And what did it do- the mat? How did the mat feel on the farm? What did it say? <i>Drrr drrr</i> [shakes body, intensely] or <i>mm</i> [makes gentle, flowy movements with body]	
CI7:70	R: <i>Yes Drrr</i> [Drumming intensity matches vocalisation]	Mimics shaking sensation on drum
CI7:71	J: [Sings and strums guitar] <i>Drrr drrr here and a drrrr.</i>	

CI7:72	R: [Increases intensity of drumming, excitedly]	Enjoyment of shaking sensation Music has vibrant quality
CI7:73	J: [Follows increased intensity on guitar] How did the-	
CI7:74	R: [Enthusiasm & volume of singing increases. J joins] -a farm. Eee-aaa-eee-aaa-oooh! Ooo-oo-oo	Growing enthusiasm in music
CI7:75	J: [Sings & strums guitar] Moo moo here and a moo moo there	
CI7:76	[Inaudible singing & improvising together in upbeat manner]	Music has vibrant quality
CI7:77	R: [Continues to drum with increased intensity]	Music has vibrant quality
CI7:78	J: [Stops singing & strumming guitar] Nice R! Let me try and drum with you [Switches from guitar to drum]	
CI7:79	R: Ya	
CI7:80	J: Okay. You're gonna try and drum anything for me.	
CI7:81	R: Ya [Begins drumming with great intensity & enthusiasm]	Excitement in music Immediate musical response
CI7:82	J: [Matches drumming] *And soft* [Begins drumming softly]	
CI7:83	R: [Continues drumming, enthusiastically]	Excitement in music
CI7:84	J: [Stops drumming & R follows] So, R, I wanna ask you. Do you remember the mat when you were lying on it?	
CI7:85	R: Yes	
CI7:86	J: How did- can you show me on the drum how it felt? What did it feel like?	
CI7:87	R: [Begins drumming quickly, gently and regularly] Warm	Experience of warmth Reflects shaking sensation on drum
CI7:88	J: Warm? And if you could show me a sound that it- or how it felt on the drum. Was it kind of like this [drums quickly and intensely]	
CI7:89	{R: Calm	Experience of calmness
CI7:90	{J: Or was it like this? [Gently rubs drum]	
CI7:91	R: Like this [Plays drum quickly and quietly]	Mimics shaking sensation on drum
CI7:92	J: Like this? [Copies R's drumming]	
CI7:93	R: *Yes*	
CI7:94	J: Okay. And then, if you can draw it, how did it feel? So I'm just gonna play a song in the background- on the speaker here [Puts paper in front of R and connects phone to speaker]	
CI7:95	[Teacher walks in and interrupts session]	

CI7:96	R: Teacher?	
CI7:97	J: Yes? Yes?	
CI7:98	R: Yes, I'm a good boy [Says in pleasing manner].	
CI7:99	J: I know you are. Okay, we're gonna play one more song and then you're gonna draw something for me, okay?	
CI7:100	R: Yes.	
CI7:101	[Song begins playing on speaker]	
CI7:102	J: There we go. Okay, are you ready?	
CI7:103	R: Yes	
CI7:104	J: Okay, I want you to draw how you felt when you were on the machine. And you can draw any colours or lines or anything of how it made you feel	
CI7:105	R: Let me draw R.	
CI7:106	J: Maybe you can even draw R lying on the mat?	
CI7:107	R: On the mat [Immediately starts drawing and continues for a while] It's warm. R is warm	Immediate response in drawing Demonstrates warmth in drawing
CI7:108	J: Ramadan is warm? That's so cool. And show me-how does that- you can use colours and anything to show me that you're warm	
CI7:109	R: Let me use yellow [Continues drawing for a while] Here, he's warm	Demonstrates warmth in drawing
CI7:110	J: Oh nice. And anything else? Add anything else you want to add to the drawing, okay? Show me how else it felt [Looks at drawing] That is warm?	
CI7:111	R: Mmm [Yes]	
CI7:112	J: That's nice. Did you like it?	
CI7:113	R: Yes, I do.	General pleasant experience
CI7:114	J: Did you like lying on the mat? [Looks at drawing] This is Ramadan on the mat and this is a sun saying that you're feeling warm?	
CI7:115	R: Yes.	Demonstrates warmth in drawing
CI7:116	J: That's very cool. And can you show me with your body- if you can show me with your body how it felt- if you could act out for me [demonstrates flowy movements with body]	
CI7:117	R: Yes [doesn't seem to understand]	

CI7:118	J: Can you act it out for me- if you look at me, R?	
CI7:119	R: [Doesn't seem to understand & points to drawing] This the body.	Difficulty comprehending speech
CI7:120	J: Is that the body? Okay.	
CI7:121	R: Yes	
CI7:122	J: And then you?	
CI7:123	R: Huh?	
CI7:124	J: How did it feel? Was it like this [Shakes body, vigorously] or was it like [Makes flowing movements with body]	
CI7:125	R: Like this [hugs self]	Associates VAT with hug
CI7:126	J: Like that? Did it feel- it felt nice?	
CI7:127	R: Yes.	Pleasant physical sensations
CI7:128	J: Okay cool. Olay R, are you done? Is there anything else you want to draw or do or say	
CI7:129	R: I'm fine	
CI7:130	J: You fine?	
CI7:131	R: [Nods]	
CI7:132	J: Are you sure?	
CI7:133	R: Yes	
CI7:134	J: Do you wanna go back to class?	
CI7:135	R: Yes	
CI7:136	J: Okay, cool	
CI7:137	R: Bye bye	
CI7:138	J: Bye R. Thank you.	
CI7:139	R: Thank you for everything	Expression of appreciation
CI7:140	J: It's a pleasure. Bye bye.	
	Drawing	
CI7:141	Tiny stick figure lying on large, expansive VAT mat with sun in corner of page.	Demonstrates warmth in drawing Demonstrates mat as expansive

CI8:1	J: Okay. L?	
CI8:2	L: Yes?	
CI8:3	J: Do you remember when we were on that bed? On that mat and we listened to music?	
CI8:4	L: Yes.	
CI8:5	J: How did you- How was it?	
CI8:6	L: I like it.	General pleasant experience
CI8:7	J: And what's your favourite song?	
CI8:8	L: Favourite song [Echolalic response]	Challenges in verbal expression
CI8:9	J: Ya. What song do you like?	
CI8:10	L: Ummm. Um. Ummm. [Shrugs shoulders]	Limited verbal response
CI8:11	J: Hey?	
CI8:12	L: I choose the- Umm. I choose the... The... The wheels on the bus.	
CI8:13	J: [Starts strumming guitar & singing – 140bpm] <i>The wheels on the bus go round and-</i> Well let's actually sing it different [Changes to higher key and continues strumming guitar & singing] <i>The wheels on the bus go-</i> [hit drum to encourage L to join] <i>-round and round</i>	
CI8:14	L: [Hits drum once, hesitantly]	Hesitancy in music
CI8:15	J: [Continues playing guitar and singing and hitting drum intermittently] <i>-round and round. Round and round.</i>	
CI8:16	L: [Joins in singing, softly]	Hesitancy in music
CI8:17	J: [Sings and strums guitar] <i>The wheels on the bus go round and round, all day long.</i> And then with me- sing it with me.	
CI8:18	L: [Joins in singing more confidently and hits drum once more]	Growing confidence in music
CI8:19	J: [Continues singing and strumming guitar] <i>The wheels on the bus go round and round-</i> And hit the drum.	
CI8:20	L: [Joins in hitting drum to beat, regularly]	Music has regular quality Growing confidence in music
CI8:21	J: [Continues singing and strumming guitar] <i>-round and round. Round and round. The wheels on the bus go round and round all day long.</i> Nice Lerutla [Stops strumming guitar] Now let's change the lyrics. What do you want to say about the mat? [Strums guitar & sings] <i>The music mat goes?</i>	
CI8:22	L: [Sings – echolalic response] <i>The music mat goes?</i>	Challenges in verbal expression

CI8:23	J: What does- how does it go?	
CI8:24	L: Umm. Zhhhhhh [mimics mat & shakes body]	Mimics shaking sensation vocally Mimics shaking sensation in movement
CI8:25	J: Zhhhhh? Okay. [Starts singing & strumming guitar again] <i>So the music mat goes? Zhhhh</i>	
CI8:26	L: [Sings] Zhhhhhh. Zhhhhhh [mimics mat & shakes body]	Mimics shaking sensation vocally Mimics shaking sensation in movement
CI8:27	J: [Sings] <i>The music mat goes?</i>	
CI8:28	J&L: [Sing together while making shaking body movements.] <i>Zhhhhh. All day long.</i>	Mimics shaking sensation vocally Mimics shaking sensation in movement
CI8:29	J: [Stops guitar] And do you- how do you feel about the music mat? [Sings and strums guitar again] <i>The music mat makes me?</i> [Stops guitar]	
CI8:30	L: [Sings with enthusiasm and confidence. Sways from side to side] <i>The music mat go...</i>	Excitement in music Confidence in music Music has bouncy quality
CI8:31	J: [Sings and strums guitar] <i>The music mat makes me?</i> What does it make you? Happy or relaxed or sad or what?	
CI8:32	L: Relax	Experience of relaxation
CI8:33	J: Relax? Okay. [Sings and strums guitar, gently] <i>The music mat makes me relax-</i>	
CI8:34	L: [Joins in singing, quietly & gently]	Music has calm quality
CI8:35	J&L: [Sing together and J strums guitar] <i>-me relax, me relax. The music mat makes me relax all day long.</i>	Experience of relaxation
CI8:36	J: [Stops strumming] Nice Lerutla! That's so cool. Now what I'm going to ask you to do is can you draw what the music mat was like and if you liked it? And you can just draw anything you want, okay? Is that fine?	
CI8:37	L: Ya	
CI8:38	J: You can draw you on the music mat or anything to show how you feel about it. I'm just going to play this song and you'll remember this song. [Plays VAT song] Remember this song?	
CI8:39	L: Yeah.	
CI8:40	J: Ya. There you go. So now you can just draw anything you want, okay?	
CI8:41	L: Okay, I choose blue	
CI8:42	J: You choose blue?	
CI8:43	L: Ya. [Instantly draws & engages for a while]. Look it's me! [Excitedly]	Excitement in drawing Immediate engagement in drawing

CI8:44	J: Nice! And do you wanna draw anything else? The mat or music?	
CI8:45	L: Music	
CI8:46	J: Okay.	
CI8:47	L: Alright. I choose- I choose yellow.	Associates music with colour
CI8:48	J: Nice.	
CI8:49	L: [Continues drawing for a while] I'm going to draw music	Demonstrates music in drawing
CI8:50	J: Cool, do it. Ya.	
CI8:51	L: [Draws for a while & then points to yellow squiggle] Here's music.	Demonstrates music in drawing
CI8:52	J: Is that the music? Nice!	
CI8:53	L: Yes	
CI8:54	J: And how does it make you feel?	
CI8:55	L: How does it make you feel [Echolalic response]	
CI8:56	J: Hey? What does it make you feel?	
CI8:57	L: Happy	Expression of happiness Enjoyment of VAT music
CI8:58	J: Happy? Can you show that on the picture? Show me happy. Do you wanna draw anything more?	
CI8:59	L: Yeah [Doesn't draw]	
CI8:60	J: Or do you wanna play with- do you wanna show me with playdough how it made you feel?	
CI8:61	L: Yeah.	
CI8:62	J: Which colour?	
CI8:63	L: I choose white	
CI8:64	J: White. Okay show me- How did the mat feel? Show me with the playdough. How did the music mat feel?	
CI8:65	L: [Begins playing with playdough] Like the mat. Feel good.	Pleasant physical feelings Associates VAT with pleasant feelings
CI8:66	J: It feels good? And show me with the playdough. How does it feel.	
CI8:67	L: It feel. It feel better.	Feelings of improved state
CI8:68	J: Better? And then if you can move in any way. Like, if you can show me in the way you move, how did the mat feel?	
CI8:69	L: How did the mat feel? [Echolalic response]	

CI8:70	[L continues playing with playdough]	
CI8:71	J: Nice. Thanks Lerutla. Are we done now?	
CI8:72	L: Yes. [Gives playdough back]	
CI8:73	J: And the music? How did it feel?	
CI8:74	L: This song?	
CI8:75	J: Yes. You like it?	
CI8:76	L: Yeah.	Enjoyment of VAT music
CI8:77	J: Nice. Okay Lerutla. We are done. Alright. Thank you	
CI8:78	L: You're welcome	
CI8:79	J: Bye bye	
CI8:80	L: Bye	
	Drawing:	
CI8:81	Stick figure with yellow squiggle next to it.	Demonstrates music in drawing

CI9:1	J: Alright. So. R? Can you play the drum?	
CI9:2	R: [Instantly hits drum]	Immediate musical response
CI9:3	J: Nice. Let's play [Hits drum a few times] Can you do this? [Hits drum again]	
CI9:4	R: [Hits drum a few times in response]	
CI9:5	J: [Establishes 1-2-3 beat on drum – 100bpm]	
CI9:6	R: [Copies drumming]	
CI9:7	J&R: [Drum rhythm together for a few seconds and then stop]	
CI9:8	J: Nice [Start new beat]	
CI9:9	[Engage in call-and-response drumming with J leading & R following]	
CI9:10	J: Nice, R. Alright. R, do you remember the mat that you lay on?	
CI9:11	R: [nods]	Limited verbal response
CI9:12	J: Was it nice?	
CI9:13	R: [nods]	General pleasant experience Limited verbal response
CI9:14	J: Did you like it?	
CI9:15	R: [nods]	General pleasant experience Limited verbal response
CI9:16	J: Hey? Do you like to sing? What song do you like?	
CI9:17	R: [Smiles]	Limited verbal response
CI9:18	J: Do you like [sings & stums guitar] <i>If you're happy and you know it, clap your hands</i>	
CI9:19	R: [Claps hands twice & joins in singing, softly]	Physical response in music Immediate musical response
CI9:20	J: [Continues singing & strumming on guitar] <i>If you're happy and you know it, clap your hands</i>	Singing as verbal response
CI9:21	R: [Claps hands twice]	Physical response in music
CI9:22	J: [Continues singing & strumming on guitar] <i>If you're happy and you know it, and you really wanna show it. If you're happy and you know it, clap your hands</i>	
CI9:23	R: [Claps hands twice]	Physical response in music

C19:24	J: Nice, R. And, when you're lying on the mat, how does it make you feel? [sings] <i>When I'm lying on the mat, I'm?</i>	
C19:25	R: I-	Challenges in verbal expression Increased verbal response after singing
C19:26	J: [sings] <i>When I'm lying on the mat, I'm?</i>	
C19:27	R: Mat	Challenges in verbal expression Increased verbal response after singing
C19:28	J: Happy? Or sad? Or relaxed? Or... When I lie on the mat, I'm?	
C19:29	R: [Inaudible]	Challenges in verbal expression Increased verbal response after singing
C19:30	J: Are you happy or relaxed [Thumbs up] or [Thumbs down] [Sings] <i>When I lie on the mat, I'm?</i> [Gives thumbs up & then thumbs down]	
C19:31	R: [Responds with smile and thumbs up]	Gestures positive experience Expression of happiness
C19:32	J: [sings] <i>When I'm lying on the mat. When I'm lying on the mat. When I'm lying on the mat, I'm?</i> [Gives thumbs up]	Immediate physical response Challenges in verbal expression
C19:33	R: [Gives thumbs up]	Gestures positive experience Limited verbal response
C19:34	J: Should we try that?	
C19:35	R: [Inaudible mumbling]	Challenges in verbal expression Increased verbal response after singing
C19:36	J: [Takes out guitar and begins strumming, gently and slowly. Starts singing] <i>When I lie on the mat, I'm? When I lie on the mat, I'm?</i> Let's try the happy one. [Sings] <i>If you're happy and you know it, clap your hands</i>	
C19:37	R: [Claps hands twice, enthusiastically]	Excitement in music Physical response in music
C19:38	J: [sings] <i>If you're happy and you know it, clap your hands</i>	
C19:39	R: [Claps hands twice, enthusiastically]	Excitement in music Physical response in music
C19:40	J: [sings] <i>If you're happy and you know it, and you really wanna show it. If you're happy and you know it, clap your hands</i>	
C19:41	R: [Claps hands twice, enthusiastically]	Excitement in music Physical response in music
C19:42	J: Nice. [Sings] <i>And if you're happy and you know it, stomp your feet</i>	
C19:43	R: [Stomps feet, enthusiastically]	Excitement in music Physical response in music
C19:44	J: [sings] <i>If you're happy and you know it, stomp your feet</i>	
C19:45	R: [Stomps feet, enthusiastically]	Excitement in music Physical response in music

C19:46	J: [sings] <i>If you're happy and you know it, and you really wanna show it. If you're happy and you know it, clap your hands</i>	
C19:47	R: [Stomps feet, enthusiastically]	Excitement in music Physical response in music
C19:48	J: Nice, Rofhiwe. And [sings] <i>And if you're happy and you know it, let's dance</i>	
C19:49	R: [Dances, enthusiastically]	Excitement in music Physical response in music
C19:50	J: Nice [sings] <i>If you're happy and you know it, let's dance</i>	
C19:51	R: [Dances, enthusiastically]	Excitement in music Physical response in music
C19:52	J: [sings] <i>If you're happy and you know it, and you really wanna show it. If you're happy and you know it, let's dance</i>	
C19:53	R: [Dances, enthusiastically]	Excitement in music Physical response in music
C19:54	J: And, what else? If you're.. Hmm	
C19:55	R: [Inaudible]	
C19:56	J: [sings] <i>And if you're happy and you know it, hit the drum</i>	
C19:57	R: [Hits drum twice, enthusiastically]	Excitement in music Physical response in music
C19:58	J: Nice [sings] <i>If you're happy and you know it, hit the drum</i>	immediate musical response
C19:59	R: [Hits drum twice, enthusiastically]	Excitement in music Physical response in music
C19:60	J: [sings] <i>If you're happy and you know it, and you really wanna show it. If you're happy and you know it, hit the drum</i>	immediate musical response
C19:61	R: [Hits drum twice, enthusiastically]	Excitement in music Physical response in music
C19:62	J: Nice, R. And when you're lying on the mat, do you remember the mat? When you listen to the music. Do you remember that? How was that? Hey? Did you like it?	immediate musical response
C19:63	R: Like it [Echolalic response]	
C19:64	J: Do you remember lying on the mat? Hey R? Was it nice or not nice? Did it make you happy or sad? Hey? So [Sings] <i>When you're lying on the mat, you're? Happy? Or relaxed?</i> [Sings & strums guitar gently] <i>When I'm lying on the mat, I'm happy?</i>	
C19:65	R: [Inaudible mumble]	Challenges in verbal expression
C19:66	J: [Sings] <i>When I'm lying on the mat, I'm happy. When I'm lying on the mat. When I'm lying on the mat. When I'm lying on the mat, I'm?</i> [Stops strumming]	
C19:67	R: [Thumbs up]	Physical response in music

<p>C19:68</p>	<p>J: Happy! [Sings & starts finger-picking guitar in relaxed manner] <i>When I'm lying on the mat, I'm relaxed. When I'm lying on the mat, I'm relaxed. When I'm lying on the mat. When I'm lying on the mat. When I'm lying on the mat, I'm relaxed. Yay. So, R, can you draw here?</i> [Plays VAT song through speaker] Do you remember this song?</p>	<p>Gestures positive experience</p>
<p>C19:69</p>	<p>R: Yes</p>	
<p>C19:70</p>	<p>J: So, I'm gonna ask you, R. Can you draw how it was to lie on the mat? Hey? [Puts paper and pastels on drum] Can you draw how it felt lying on the mat?</p>	
<p>C19:71</p>	<p>R: [Immediately begins drawing and engages for a while][Draws headphones in white]</p>	<p>Immediate response in drawing</p>
<p>C19:72</p>	<p>J: And is there anything else that you want to draw? What is this? Is this the headphones?</p>	
<p>C19:73</p>	<p>R: [Demonstrates headphones on ears]</p>	<p>Concrete association</p>
<p>C19:74</p>	<p>J: Ahh. And anything else that you wanna draw? Hey? Do you wanna add anything?</p>	
<p>C19:75</p>	<p>R: [Immediately continues drawing for a few minutes before stopping]</p>	<p>Immediate response in drawing</p>
<p>C19:76</p>	<p>J: Are you done? [Waits a bit] Okay. Thanks R. Wow. What's this? [Points to headphones on drawing]</p>	
<p>C19:77</p>	<p>R: Music.</p>	<p>Demonstrates music in drawing</p>
<p>C19:78</p>	<p>J: And this? [Points to drawing]</p>	
<p>C19:79</p>	<p>R: Heart.</p>	<p>Demonstrates love in drawing</p>
<p>C19:80</p>	<p>J: What is it saying?</p>	
<p>C19:81</p>	<p>R: What is it saying [Echolalic response]</p>	
<p>C19:82</p>	<p>J: I love music?</p>	
<p>C19:83</p>	<p>R: I love music [Echolalic response]</p>	
<p>C19:84</p>	<p>J: Ah. Good. Thanks R. That's all.</p>	
<p>C19:85</p>	<p>R: [Inaudible]</p>	<p>Challenges in verbal expression</p>
<p>C19:86</p>	<p>Drawing: Headphones with heart above and written "music" below</p>	<p>Demonstrates love in drawing Demonstrates love for VAT music in drawing</p>

		Concrete association
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Appendix V: Coding of engagement in creative interviews

Participant	Age	Gender	General engagement	Summary	
P1	9	M	C11:12 C11:14 C11:15 C11:27 C11:33 C11:81 C11:99 C11:105 C11:111 C11:131 C11:143	Immediate musical interest Laughter in music Extensive engagement in drumming Immediate musical response Excitement in music Challenges in verbal expression Limited verbal response Confidence in music Immediate engagement in sculpting Immediate engagement in drawing Drawing as fun activity	Participant 1 was immediately drawn to music, showing enthusiasm and laughter. They were highly engaged in drumming and confident in their musical responses. However, they faced difficulties with verbal expression, leading to limited spoken responses. On the other hand, they readily embraced sculpting and drawing, finding these activities fun.
P2	9	M	CR2:1 CR2:3 CR2:9 CR2:11 CR2:11 CR2:54 CR2:54 CR2:71 CR2:97 CR2:137 CR2:150	Immediate musical engagement Limited verbal response Excitement in music Music has regular quality Engages vocally in music Music has bouncy quality Physical response in music Music has vibrant quality Challenges in verbal expression Excitement in songwriting Excitement in drawing	Participant 2 immediately engaged with music, showing excitement, vocal engagement, and a vibrant quality in their responses. However, their verbal responses were limited, indicating challenges in expression. They also displayed enthusiasm for songwriting and drawing as creative activities.
P3	11	M	CR3:2 CR3:6 CR3:6 CR3:11 CR3:19 CR3:26 CR3:36 CR3:38 CR3:40 CR3:44 CR3:50 CR3:67 CR3:69 CR3:77 CR3:91 CR3:94 CR3:104	Limited verbal response Music has regular quality Immediate musical response Hesitancy in music Growing confidence in music Drumming as communication Confidence in non-lexical vocables Uncertainty in lyric formulation Expression of tiredness Challenges in verbal expression Limited confidence in speech Enjoyment in drumming Music has vibrant quality Singing has confident quality Enjoyment of sculpting Excitement in sculpting Describes physical qualities of sculpture	Participant 3 showed limited verbal responses and hesitancy in music at first, but displayed growing confidence throughout, especially in drumming. He expressed enjoyment and excitement in both drumming and sculpting activities. Despite initial shyness in verbal expression, the participant demonstrated confidence in non-lexical vocables and singing. Additionally, they expressed enjoyment in sculpting, describing the physical qualities of their creations with enthusiasm.
P4	12	M	C14:4 C14:10 C14:12 C14:12 C14:13 C14:15 C14:23 C14:35 C14:80	Limited verbal response Immediate musical response Music has irregular quality Music has soft quality Hesitancy in music Music has irregular quality Challenges in verbal expression Limited writing ability Gestures in response	Participant 4 faced challenges in verbal expression and lyric articulation but demonstrated an immediate and growing excitement in music. Their engagement extended to dancing, and they expressed excitement during both music and dancing activities. Additionally, the participant immediately engaged in drawing and sustained their involvement, indicating a perception of drawing as a fun activity.
P5	11	M	C15:2 C15:10 C15:12 C15:14 C15:22 C15:59 C15:67 C15:71 C15:77 C15:77 C15:133 C15:135 C15:144	Challenges in verbal expression Immediate musical response Music has regular quality Nonverbally requests music Challenges in lyric articulation Excitement in music Music has bouncy quality Expression through dancing Growing excitement in music Growing excitement in dancing Immediate engagement in drawing Extended engagement in drawing Drawing as fun activity	Participant 5 faced challenges in verbal expression and lyric articulation but displayed immediate and growing excitement in both music and dancing, with a preference for music having a bouncy quality. They nonverbally requested music, expressed themselves through dancing, and immediately engaged in drawing, sustaining their involvement for an extended period, indicating that drawing was perceived as a fun activity.
P6	9	F	C16:2 C16:4 C16:4 C16:14 C16:45 C16:51 C16:57	Limited verbal response Immediate musical response Music has regular quality Confidence in music Immediate engagement in drawing Shares drawing experience Enjoyment of creative interview	Participant 6 encountered challenges in verbal expression and lyric articulation but demonstrated an immediate and growing excitement in music. Their engagement extended to dancing, and they expressed excitement during both music and dancing activities. Additionally, the participant immediately engaged in drawing and sustained their involvement, indicating a perception of drawing as a fun activity.

T7	12 M	<p>C17:28 C17:36 C17:36 C17:50 C17:74 C17:107 C17:139</p>	<p>Difficulty comprehending speech Immediate musical response Excitement in music Music has vibrant quality Growing enthusiasm in music Immediate response in drawing Expression of appreciation</p>	<p>Participant 7 exhibited a limited verbal response but showed immediate and confident musical engagement with music of regular quality. They immediately engaged in drawing, shared their drawing experience, and expressed enjoyment during the creative interview.</p>
T8	10 M	<p>C18:8 C18:10 C18:14 C18:18 C18:20 C18:30 C18:30 C18:30 C18:43 C18:43</p>	<p>Challenges in verbal expression Limited verbal response Hesitancy in music Growing confidence in music Music has regular quality Excitement in music Confidence in music Music has bouncy quality Excitement in drawing Immediate engagement in drawing</p>	<p>Participant 8 faced challenges in verbal expression with limited responses but demonstrated growing confidence in engaging with music, which had a regular and bouncy quality. They expressed excitement and confidence in drawing, engaging with it immediately.</p>
T9	11 M	<p>C19:2 C19:11 C19:19 C19:19 C19:25 C19:25 C19:37 C19:71</p>	<p>Immediate musical response Limited verbal response Physical response in music Singing as verbal response Challenges in verbal expression Increased verbal response after singing Excitement in music Immediate response in drawing</p>	<p>Participant 7 exhibited an immediate musical response, with limited verbal response but increased verbal engagement after singing. They showed a physical response to music and expressed excitement in both music and drawing, responding immediately to the latter.</p>