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„Affect Attunement in Therapy for Children With Autism“

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Characterized by impairments in social-communicative interaction, and the presence of restricted or repetitive behavior, autism spectrum condition (ASD) is a neurodevelopmental disorder typically diagnosed in early childhood. ASD can also include deficits in structural aspects of language, such as delayed or non-present language acquisition, impaired speech comprehension, overly concrete speech including difficulties in understanding metaphors, irony, or similar tropes. Even in the absence of structural language impairments certain communicatory difficulties can persist, such as impaired turn-taking, rare or absent initiation of social interaction as well as difficulty in the use of non-verbal communication, most notably reduced eye contact, gestures, facial expression, and Intonation. Autism related differences in social interaction can sometimes already be observed in infancy as deficits in joint attention between caregiver and infant (American Psychiatric Association, 2013).

Social functioning is a major focus in ASD research and has been found to be particularly relevant for the wellbeing and overall quality of life of persons with ASD (Bottema-Beutel et al., 2019), suggesting social functioning improvements as an important target for interventions. The exact mechanisms that lead to deficits in social functioning in persons with ASD have yet to be understood. However, multiple theories about possible causes of social-communicative difficulties in ASD have been brought forward.

### **Social Functioning in Autism**

One of the most robust findings in this regard were deficits in Theory of Mind (ToM) that could be associated with communicative and other social difficulties observed in ASD (Baron-Cohen, 2000; Rosello et al., 2020). Understood as the ability to attribute mental states such as beliefs, desires, and intentions to oneself and others, ToM might present an integral ability in order to make sense of and predict the behavior of other human beings (Rosello et al., 2020). ToM was typically measured using the false-belief task, in which the action of a fictive agent has to be predicted based on the inferred mental representations of this fictive agent. The ability to predict human action in such a sequential and conscious manner is also referred to as *explicit ToM* and persons with ASD generally perform worse in this and related tasks as compared to neurotypical persons (Rosello et al., 2020). Anticipating behavior without such a deliberate reflection on the mental state of the other, is

referred to as *implicit ToM* (Rosello et al., 2020). Deficiencies in implicit ToM were found to be more pronounced in ASD than deficiencies in explicit ToM (Rosello et al., 2020; Tager-Flusberg, 2007). Concerning language, both explicit as well as implicit ToM were associated with pragmatic language abilities like indirect speech or the use of irony, suggesting language ability and ToM to be related in the development of social difficulties in ASD (Kobayashi, 2018).

A growing number of research identified alterations in sensory processing in ASD as possible causes of social difficulties and reduced ToM in ASD, suggesting that “sensory processing and social behaviors [...] may exert reciprocal influence on each other in the course of a child's development” (Thye et al., 2018, p. 151). Alterations of sensory processing in ASD were observed in a multitude of modalities such as visual, auditory, tactile, olfactory processing, and multisensory integration (Thye et al., 2018). Concerning social functioning, impairments in visual processing and multisensory integration seem to be the especially relevant. Altered visual processing in ASD, such as enhanced perceptual abilities in lower level visual processing, might make it difficult to derive relevant visual information in social situations (Thye et al., 2018). Additionally, alterations in the processing of faces in individuals with ASD, such as deficits in facial identity recognition (Kirchner et al., 2011) and in facial emotion recognition (Harms et al., 2010) have been observed. As prospective studies with children at high risk of developing ASD have shown, these alterations in visual processing can be observed before social difficulties arise (Gliga et al., 2014), suggesting that visual processing deficits could disrupt the development of social skills during childhood (Thye et al., 2018).

Another important finding in this regard are deficits in multisensory integration which were associated with ASD symptom severity (Brandwein et al., 2015). As social interactions require the integration of e.g. the other persons voice, face and gestures, deficits in multisensory integration might lead to abnormal social responses and misunderstandings (Thye et al., 2018). Additionally, problems in multisensory integration might impact language development as well as emotion recognition and imitation behavior negatively (Thye et al., 2018). Especially imitation behavior is thought to be an integral part in the development of ToM and other skills relevant to social functioning (Meltzoff & Decety, 2003) and was found to have a strong association with social functioning in ASD, eclipsing the connection of ToM with social functioning (Bottema-Beutel et al., 2019).

Early problems in integrating multisensory information might also impact another fundamental aspect of human cognition, that is the development of a sense of self, also termed self-relatedness, and the ensuing ability to differentiate between self and other (Hobson & Meyer, 2005; Thye et al., 2018). An understanding of the self and how it can relate to others might provide the basis for understanding others, as an accurate model of the self could support the representation of other people's mental states (Nijhof & Bird, 2019). While research into social functioning in ASD largely focused on the processing of information about other people such as ToM and empathy, comparably little research has focused on this form of self-processing in ASD (Memisevic & Djipa, 2022; Nijhof & Bird, 2019).

However, multiple accounts speak for atypical self-processing in individuals with ASD, that could proof to be causative for deficits in processing of others mental states and social functioning in ASD (Arnaud, 2022; Gillespie-Smith et al., 2018; Hobson & Meyer, 2005; Kana et al., 2017; Tordjman et al., 2019). Generally humans show a tendency for increased learning and remembering of self-related stimuli, such as adjectives that describe oneself (*self-reference effect*) or items owned by oneself (*ownership effect*) (Cunningham & Turk, 2017; Gillespie-Smith et al., 2018). The self-reference as well as the ownership effect have been reported to be diminished in individuals with ASD and have been negatively related to general ASD symptom severity (Gillespie-Smith et al., 2018; Nijhof & Bird, 2019). Additionally, it was shown that failure to respond to one's name being called, presents one of the earliest and most reliable predictors of a later ASD diagnosis (Werner et al., 2000), which could also point toward altered self-processing in ASD.

Taken together, altered self-processing in ASD might be able to explain deficits in social functioning in this population more adequately than theories focused on singular cognitive processes such as sensory processing or ToM. Alterations in sensory processing could proof to be constitutive of altered self-processing, which in turn could lead to the observed deficits in ToM. Altered self-processing could also explain accounts of diminished social motivation in ASD (Chevallier et al., 2012). As a functioning self-representation and the ensuing ability of self-other distinction should be necessary to show motivation towards social stimuli, altered self-processing could lead to the decreased social motivation observed in individuals with ASD (Chevallier et al., 2012).

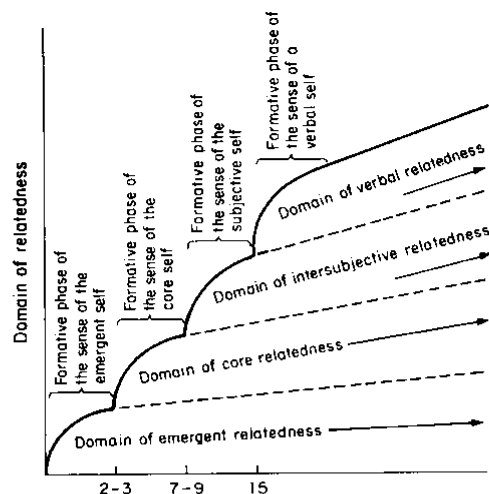
Consequently, theories concerning the initial development of a sense of self and self-other distinction provide a promising theoretical foundation for the development and evaluation of interventions in ASD. One such theory which is especially relevant in the context of ASD is the theory of the development of a sense of self proposed by Daniel Stern (Stern, 1985).

### Sterns Theory of the Development of a Sense of Self

Combining accounts from psychoanalysis (e.g. Klein, 1933; Mahler et al., 2018), empirical psychology (e.g. Piaget, 1954) and attachment theory (e.g. Ainsworth, 1979), Daniel Stern (1985) developed a theory of the development of the sense of self in infants based on four overlapping *domains of relatedness* (Figure 1), each of which corresponds to a different form of a sense of self and are best understood as “forms of social experience that remain intact throughout life” (Stern, 1985, p. 34).

**Figure 1**

*Domains of relatedness according to Stern (1985)*



*Note.* From Stern (1985)

As none of these domains become developmentally obsolete and are not to be understood in a hierarchical manner, Stern preferred the term domains of relatedness in contrast to that of stages or phases. However, each successive domain requires the preceding one, and their initial phase of formation presents a sensitive period of development (Stern 1985).

Starting from birth, a *sense of an emergent self*, which operates in the domain of emergent relatedness, is already present. This period is characterized by the infant's experience of the process of forming relations between isolated experiences in its surroundings. Central to this process is an organizing principle based on amodal perception and vitality forms. *Amodal perception* describes the infant's ability to translate information received in one sensory modality into another modality. Stern (1985) argues that this translation is based on *vitality forms*, which are best understood as dynamic forms of movement present in all behavior.

Vitality forms describe qualities of feelings that are experienced in a form such as "rushing", "fleeting", and "exploding". As information provided by the action dynamics of an overt behavior, these vitality forms provide the basis for relating different experiences to one another based on the vitality form that is evoked by those experiences. For example, a caregiver might try to sooth an infant by gently stroking it's back or by uttering some soothing sounds. Both the stroking and the utterance of sounds might share similar rhythmicity, so the infant would experience the same vitality form for both experiences. This allows the infant to integrate the two experiences and instead of one distinct stroking-caregiver and another utterance-caregiver, the infant experiences one soothing-caregiver capable of evoking the same vitality form through different modalities (Stern 1985).

Between the ages of two to three months, the infant then starts to form a *sense of a core-self* through integrating different experiences relevant to self-agency, self-coherence, self-affectivity and self-history. The infant now has the ability to recognize events that identify a self and an other, providing the basis for the sharing of subjective experiences during the formation of the *sense of a subjective self* (Stern 1985).

At ages between seven and nine months the infant discovers that the self and others include not only their overt behavior, but also subjective states of experience and that those experiences can be shared. However, as the infant is not yet verbal, this sharing must be taking place in a form that does not require the translation of subjective experiences into language. According to Stern (1985) several processes must occur to allow for an intersubjective exchange at this stage. First, the caregiver must be able to construe the inner state of the infant from its overt behavior. Then, the caregiver must show some behavior that is not a precise imitation of the infants' behavior, but still corresponds to it in some way. Ultimately, the infant must be able to

identify the caregiver's behavior as having something to do with its own affective experience. Strictly imitating the infant's behavior prohibits this experience of intersubjective exchange, as it does not convey that the inner feeling state of the infant was understood.

This special form of imitation with its focus on the sharing of inner affective experiences is known as *affect attunement* and is constitutive for the formation of a sense of a subjective self, including its inner affective experiences which can be shared with others. Affect attunement is mainly characterized by its cross modality, for example a caregiver can attune to the movement of the child with a corresponding vocal expression, as well as by its focus on the feeling state of the other rather than the overt behavior used to express the feeling state. Stern (1985) argues that there are three main features of a behavior that can be attuned to in such a cross modal way, these are intensity, timing, and shape. These features correspond to what Stern termed vitality forms (Stern, 1985; Stern, 2010), which are present in every behavior, and are therefore ideally suited to be the subject of affect attunement. Experiences of affect attunement are essential to the formation of a sense of a subjective self, provide the first experiences of intersubjective sharing of feeling states and provide an initial step towards the utilization of symbols to express and share feelings, providing the basis for the development of language.

The emergence of language and the use of symbolic representations between the ages of 15 to 18 months, characterizes the development of a *sense of a verbal self*. Symbolic play and language are shown and through verbally relating to others, a sense of a verbal self with the capacities to objectify the self, to be self-reflective and to comprehend and produce language emerges.

Again it is important to note that all of the processes mentioned above stay active throughout development and even after development of a sense of a verbal self "experience in the domains of emergent, core- and intersubjective relatedness, [...], can be embraced only very partially in the domain of verbal relatedness" (Stern, 1985, P. 162). As these processes stay active, it also allows for the possibility of tapping into these processes through interventions, which could be especially relevant in interventions for autism.



## **Relating Sterns Theory to ASD**

Considering the different challenges in ASD outlined above, it is plausible to assume these challenges having an adverse impact on the development of the self as described by Stern (1985).

Difficulties in sensory processing and especially sensory integration could lead to altered development from the onset, as these mechanisms are heavily implicated in the process of amodal perception and affect attunement alike. Additionally, differences in bodily movement have been reported in ASD (Rochat & Gallese, 2022). As the intersubjective exchanges, especially in the preverbal phases of development, largely utilize communication through movement, these differences in bodily movement could also hinder the development of the sense of self (Rochat & Gallese, 2022), e.g. by decreasing instances of affect attunement. Decreased instances of joint attention between child and caregiver reported in ASD could further diminish experiences of intersubjective exchange (Schumacher et al., 2019), especially those of affect attunement, as the attuned behavior of the caregiver is not noticed due to the attentional differences in ASD. In a similar vein, differences in ASD can lead to altered parental behavior, such as less usage of emotive nicknames, higher and more intense prosody (Danon-Boileau, 2007) and more intense motor stimulation (Trevvarthen & Daniel, 2005), among other differences in parental behavior (Malatesta et al., 2020). Altered parental behavior could further impact the development of the self by diminishing instances of affect attunement and alteration of the vitality forms (e.g., more intense motor stimulation) experienced by the child.

As noted above, vitality forms are of central importance as an early organizing principle of social interaction (Stern, 2010). Consequently, alterations in the experience, perception and processing of vitality forms could negatively impact social functioning. Vitality forms can, to some extent, also be understood as the style in which a specific behavior is carried out, for example a gentle or vigorous grasp at something. In this sense, Hobson and Lee (1999) observed that autistic children were significantly less likely to imitate the action style of an observed behavior than neurotypical children, while there was no difference in copying the goal of the observed behavior. More recent studies (Di Cesare et al., 2017; Hobson & Hobson, 2008; Rochat et al., 2013) also reported diminished vitality form recognition in children and adolescents with ASD, this seems to be the case especially for more subtle expressions of vitality forms (Di Cesare et al., 2017). Additionally, altered

expression of vitality forms and ensuing problems for neurotypical children in recognizing those vitality forms expressed by children with ASD, were reported (Casartelli, et al., 2020; Casartelli, et al., 2020).

Considering all the above, there might be limited opportunities for experiences of affect attunement for persons with ASD (Schumacher et al., 2019). Even though ASD specific differences might hinder development, they should also be seen as the persons unique way of communicating and engaging with the world (Mössler et al., 2020). Therefore, therapeutic interventions which take these unique ways of communication into account and provide instances of affect attunement might be especially effective in increasing the quality of life for persons with ASD.

### **Affect Attunement in Therapy**

Although affect attunement is generally believed to play an important role in psychotherapy (Erskine, 1998), relatively few systematic studies have investigated its role in therapy using standardized measures (Samuelsson & Rosberg, 2018). In a sample of 38 patient-therapist dyads with varying mental health issues including substance abuse, depression, and bipolar disorder, Snyder and Silberschatz (2017) found a significant negative correlation between attunement scores and symptomatic outcomes, as well as a positive relation of attunement scores and patients psychological and emotional well-being. Looking at changes in attachment style as the outcome variable in 49 patients with cluster C personality disorders Håvås et al. (2015) observed positive effects of non-verbal attunement, especially for patients with ambivalent attachment scores.

Music therapy (MT) offers the opportunity to musically relate to observable behaviors, inner states, bodily movements, and sounds, as well as the general affective dynamic expressed by one person (Trevarthen & Malloch, 2000). Revisiting Sterns' (1985) argument that timing, intensity, and shape are the three most important features of behaviors that can be attuned to, suggests that music with its capabilities to relate to these features through rhythm (timing), dynamics (intensity) and sound (shape) could be especially effective in creating instances of affect attunement based upon these pre-linguistic features (Mössler et al., 2020; Schumacher et al., 2019; Stern, 1985).

In a similar vein, observing that humans usually interact at great speed, while synchronizing in subtle rhythms of exchange, Wittman and Pöppel (1999) proposed

a general temporal principle of inter-personal communication. Human communication includes patterns of timing, vocal timbre, and melodic gestures closely related to those found in music, this general temporal principle of communication was consequently termed *communicative musicality*. Instances of *communicative musicality* were observed in healthy parent-infant interactions (Malloch & Trevarthen, 2009) and are thought to play an important role in facilitating turn-taking and, when interacting in an attuned way, the formation of a stable self (Malloch, 1999), which further suggests that MT might be especially effective in improving social functioning in persons with ASD.

Music therefore might present a way of sharing inner feeling states and being connected to others, that is not reliant on verbal interaction or capabilities, but rather through tapping into the inert capability for *communicative musicality* and by providing instances of cross-modal affect attunement (Schumacher et al., 2019; Trevarthen & Malloch, 2000; Trondalen & Skårderud, 2007).

Research into the effectiveness of MT in ASD has yielded mixed results as of now (Geretsegger et al., 2022; Marquez-Garcia et al., 2022). Compared to either placebo therapy or standard care, MT showed increased benefits on scores of global clinical improvement, symptom severity, adaptive behavior, non-verbal communication and social interaction in a recent meta-analysis (Geretsegger et al., 2022). However, these effects were often dependent on the timing of the outcome measure, with some effects disappearing after longer intervals between therapy completion and outcome measurement.

Comparing MT with a non-musical play-based intervention Sharda et al. (2018) found positive outcomes on symptom severity as measured by the Social Responsiveness Scale (SRS-II; Constantino et al., 2003) for both intervention types but no significant advantage for MT. Positive effects of MT compared to enhanced standard care on symptom severity as measured by the Autism Diagnostic Observation Schedule (ADOS; Lord et al., 2000) and SRS-II, were not observed in another study (Bieleninik et al., 2017). Conversely, MT showed significant advantages in outcome measures of social communication abilities in two studies comparing MT with a play-based placebo condition (J. Kim et al., 2008; Sharda et al., 2018). Additionally, Kim et al. (2008) observed improvements in pro social behavior and joint attention over the course of therapy, whereby the MT group showed significantly longer duration of eye-contact and higher frequency of turn-taking.

The heterogeneous findings outlined above suggest that diagnostic measures of symptom severity might not be sufficiently sensitive to therapy related changes when comparing different intervention types, especially in populations as diverse as persons with ASD, suggesting a combination of assessment methods as the best way to adequately investigate treatment effects in ASD (Marquez-Garcia et al., 2022). Additionally, methodological variables that influence the effects of a given intervention, have rarely been investigated and could help answer some of the remaining questions on the effectiveness of interventions in ASD (Marquez-Garcia et al., 2022). One such potentially impactful methodological variable is the level of affect attunement experienced in therapy.

Two studies investigated the role of attunement in MT for children with ASD. In the first study (Mössler et al., 2019), attunement was operationalized as a match on the Assessment of the Quality of Relationship Tool (AQR; Schumacher et al., 2019). The AQR features seven modes of relationship which correspond to the stages of the development of the self formulated by Stern (1985). For this study, if the therapist was on the same mode of relationship as the child, they were considered to be attuned. High levels of attunement were associated with a decrease in the total ADOS score, as well as a decrease in the social affect, and language and communication subscales of the ADOS. Higher levels of attunement were also associated with a decrease in the total score of the SRS, in contrast restricted and repetitive behaviors did not change as a function of attunement. Additionally, lower levels of attunement were observed for children with more problems in reciprocal social interaction at baseline, suggesting attunement being related to baseline characteristics of the children (Mössler et al., 2019).

In a second study, Mössler et al. (2020) again used AQR match rates but also single item ratings of attunement ranging from 0 to 5 as indicators of affect attunement during MT. Here no association between changes in ASD symptoms as measured by ADOS and SRS with attunement could be observed. Levels of attunement were again significantly associated with baseline ADOS and SRS score, suggesting that attunement might be easier to achieve in rather high functioning cases of ASD. Attunement levels were also dependent on the modus of expression of the child, showing higher levels in vocal or instrumental modes as compared to bodily expressions. Additionally, a moderately high correlation between the AQR match rate and the single item attunement rating was observed (Mössler et al., 2020).

Although attunement might present an important and impactful methodological variable for interventions in ASD, to the authors knowledge, the two studies outlined above (Mössler et al., 2019, 2020) remain the only investigations into the relationship of affect attunement and outcome measures in this population, suggesting the need for further research.

### **Research Gap and Hypotheses**

As shown in the previous section affect attunement has been largely understudied especially considering its potential impact (Stern, 1985) and its reception in the practical field, especially in MT (Schumacher et al., 2019).

Two previous studies directly testing for the effects of affect attunement in MT on outcome measures for children with ASD found contradicting results (Mössler et al., 2019, 2020). It is important to note that both of these studies used diagnostic measures of symptom severity, which have been discussed as potentially not being sensitive enough to the changes in a stable and diverse condition such as ASD (Marquez-Garcia et al., 2022). Therefore, the present master thesis aimed to further investigate the role of affect attunement in interventions for ASD, by also incorporating an outcome measure sensitive to more subtle changes in specific abilities relevant to the quality of life of persons with ASD. Social functioning was shown to be highly relevant for the quality of life of persons with ASD (Kim & Bottema-Beutel, 2019) and communication abilities were found to be related to social functioning (Zaidman-Zait et al., 2021). Additionally, experiences of affect attunement might be aiding in the development of subjectivity and intersubjectivity. This development of subjectivity might be reflected in a subsequent development of social communication abilities. To adequately capture such improvements in social communication, a measure of social communication abilities was incorporated as an additional outcome measure for this master thesis.

Considering the possible beneficiary effects of affect attunement on social communication outlined above, it was expected that affect attunement is positively related to improvements in social communication after therapy.

Additionally, taking into account recent research showing positive effects of MT on symptom severity measured directly after the intervention (Geretsegger et al., 2022) a positive relationship of affect attunement with improvements of total symptom severity scores was also expected in the sample of the present master thesis.

However, as the measure of overall symptom severity also include measures of aspects of ASD not hypothesized to be impacted by affect attunement (e.g. restricted or repetitive behaviors), it was further hypothesized that the relationship of affect attunement and outcome scores after intervention, is more pronounced in the specialized measure of communication abilities compared to the measure of overall symptom severity.

As affect attunement is not exclusive to MT but can be expected to have a role in other intervention types as well (Erskine, 1998), a positive relationship of affect attunement with outcome scores was expected irrespective of the intervention type. The role of affect attunement in interventions for ASD other than MT has not been investigated so far and presents another research gap addressed in this master thesis.

MT is generally thought to be especially effective in creating experiences of affect attunement (Schumacher et al., 2019). However, affect attunement ratings have so far not been directly compared between different intervention types. Comparing the average attunement ratings in MT and a non-musical-play-based intervention (NM) could answer the question if MT truly is superior in this aspect. In this regard, higher affect attunement scores were expected in the MT condition as compared to the NM condition.

Finally, the influence of baseline participant characteristics on attunement ratings were investigated. In line with previous research (Mössler et al., 2019, 2020) lower levels of functioning at baseline, were expected to lead to lower ratings in affect attunement during intervention.

## **Methods**

This quantitative study was conducted as part of the Music for autism research project (M4A), a binational (Bergen, Norway and Vienna, Austria) assessor blinded crossover randomized controlled trial (RCT) investigating the effects of MT in children with ASD. Designed as a replication of a previous study (Sharda et al., 2018) the M4A project investigated the effect of MT and a non-music control condition (NM) on multiple outcome measures relevant to ASD, including neuroscientific outcomes.

## Participants

Children between the ages of 6 to 12 years officially diagnosed with ASD by a clinical professional and meeting diagnostic criteria of the diagnostic and statistical manual of mental disorders (DSM-V; American Psychiatric Association, 2013) were recruited. Exclusion criteria included recent or current MT, and medical contraindications, including contraindication specific to functional magnetic resonance imaging (fMRI) such as metallic implants, claustrophobia and medication known to influence brain function.

At the time of analysis, data of 27 participants was available (see Table 1). It is notable that in the present sample male participants were clearly overrepresented, with a male to female ratio of 4:1. However, previous research suggested the male to female ratio in ASD to be between 3:1 and 4:1 (Loomes et al., 2017; Özerk & Cardinal, 2020), possible gender biases in diagnosis (Loomes et al., 2017) notwithstanding, the present sample can therefore be regarded as representative for overall ASD population in terms of gender.

**Table 1**

### *Sample Characteristics*

|                     | <i>M</i> | <i>SD</i> |
|---------------------|----------|-----------|
| <b>Age</b>          | 8.93     | 2.04      |
|                     | n        | %         |
| <b>Gender</b>       |          |           |
| male                | 22       | 81.5%     |
| female              | 5        | 18.5%     |
| <b>Intervention</b> |          |           |
| MT                  | 14       | 51.9%     |
| NM                  | 13       | 48.1%     |
| <b>Site</b>         |          |           |
| Bergen              | 7        | 25.9%     |
| Vienna              | 20       | 74.1%     |

*Note.* *N* = 27. *M* = mean, *SD* = standard deviation, MT = music therapy, NM = non-music condition.

## General Procedure

After inclusion in the study, participants underwent baseline assessments of behavioral and fMRI measures, followed by randomized allocation to an intervention

type of either MT or NM. After completing the intervention which took place over three months, follow-up measures of the outcome variables were completed.

### ***Interventions***

Both MT and NM were administered by licensed music therapists in 12 weekly sessions lasting 45 minutes each. Both conditions targeted domains of creating shared experience, building meaningful relationships, and fostering self-expression while aiming at improving multisensory integration, verbal and social communication, emotion regulation, turn-taking, social appropriateness, and interaction.

In both conditions the participant could choose four activities per sessions using a visual schedule. In the MT condition participants could choose between musical instruments (piano, xylophone, djembe, kalimba, boomwhackers, kazoo, flute, bells, ukulele, eggshackers), using their voice through a microphone, and listening to or reading of stories from a book accompanied by music. The NM condition controlling for factors such as support, therapist attention, positive expectancy, and emotional engagement, included play-based activities (lego, finger puppets, puzzles, jenga, four in row, beanbags, play doh, bubbles), and reading or listening to stories without music.

Each session was recorded on video to support assessment of treatment fidelity including variables relevant to the therapeutic process.

### **Data Collection**

#### ***Affect Attunement Measure***

Using the video recordings of therapy sessions, the level of affect attunement along with overall adherence to the treatment manual was rated. The level of affect attunement was rated on a scale from 0 = *almost never attuned* to 3 = *almost always attuned* for each activity performed during the therapy session, leading to a total of four data points per session if the intended therapy structure was followed. In cases where more or less than four activities were performed, data points increased or decreased respectively for the given session. A total of three sessions (one for each month of the intervention) per participant were rated in this fashion by two separate raters. Raters were trained on the use of the treatment fidelity manual as well as in the understanding of the relevant concepts. Additionally, regular supervision



meetings of the treatment fidelity raters aimed to insure adequate understanding and consistent use of the treatment fidelity manual.

To obtain the total attunement score for a given participant, attunement ratings were averaged across data points separately for each of the two raters. In a second step, the attunement scores were averaged across the two raters leading to the final attunement score for each participant.

### ***Outcome Measures***

Two separate measures pertaining to overall autism symptom severity and social communication abilities respectively, were used.

**Social Communication.** The Children's Communication Checklist (CCC-2; Bishop, 2003) was used to assess aspects of pragmatic communication. The CCC-2 consists of 70 items measuring social communication across 10 subdomains (speech, syntax, semantic, coherence, inappropriate initiation, stereotyped language, use of context, nonverbal communication, social relations, interest) and has shown high interrater reliability and internal consistency (Norbury et al., 2004). The general communication composite score (GCC), with higher scores representing better social communication abilities was used as the primary outcome measure.

As it was not expected that parents are blind to the treatment condition of their child, the CCC-2 was completed by special educators who are familiar with the child but have a higher chance of being blind to the treatment condition.

**Symptom Severity.** The SRS-II (Constantino et al., 2003) was used as a measure of autism symptom severity. Consisting of 65 items and showing good psychometric properties (Anagnostou et al., 2015) the SRS-II measures ASD severity across five subdomains (social awareness, social cognition, social communication, social motivation, autistic mannerism) and was specifically designed for assessing ASD symptomology in children between the ages of 4 and 18 years. The total score across all subdomains, with higher scores representing higher symptom severity will be used as the outcome measure.

In contrast to the CCC-2 the SRS-II was completed by one of the caregivers of the child and therefore blinding of the assessor cannot be assumed.

## Results

Statistical analysis was performed using R 4.1.3. (R Core Team, 2022), including the tidyverse (Wickham et al., 2019), lme4 (Bates et al., 2015) and lmerTest (Kuznetsova et al., 2017) packages. Two-sided significance level was set to .05 for all calculations and 95% confidence intervals (CIs) are presented in brackets.

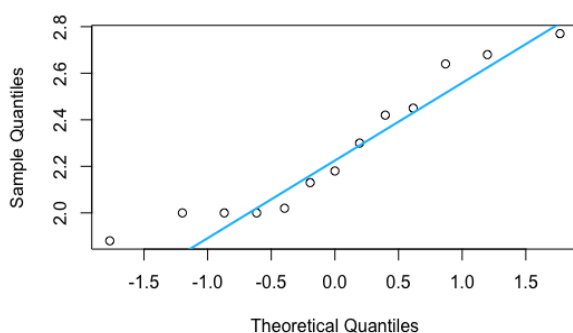
### Affect Attunement Ratings

Concerning affect attunement ratings, raters showed good reliability with an intraclass correlation of  $ICC = .75$  [.44, .89] (Koo & Li, 2016). After combining ratings, the mean affect attunement rating for the total sample was  $M = 2.43$  ( $SD = 0.30$ ). Higher affect attunement ratings were observed in the MT condition ( $M = 2.57$ ,  $SD = 0.21$ ) as compared to the NM condition ( $M = 2.27$ ,  $SD = 0.30$ ), indicating higher levels of therapist affect attunement in the MT condition.

A two-sample t-test was subsequently performed to test if the difference in attunement ratings between the MT and NM group reaches statistical significance. The t-test revealed a significant difference between the groups  $t(25) = 3.088$ ,  $p = .005$  with 95% CIs for the true difference between groups ranging from 0.10 to 0.50 and an effect size of  $d = 1.19$  representing a large effect (Cohen, 1988). Homogeneity of variance could be assumed as Levene's test revealed a non-significant difference in variance between groups with  $F(1,25) = 2.310$ ,  $p = .141$ . To test for the assumption of normality a Shapiro-Wilk test was performed which suggested normality for both the MT ( $W = 0.910$ ,  $p = .18$ ) and the NM group ( $W = 0.921$ ,  $p = .224$ ). However, graphical analysis revealed possible problems with normality especially in the MT group (see Figure 2).

**Figure 2**

*Normal Q-Q plot of attunement ratings in MT group*



Although the non-paired t-test is considered relatively robust when the assumption of normality is violated (Rasch & Guiard, 2004), a separate Mann-Whitney-U test was performed, while controlling for multiple testing through Bonferroni Correction of the alpha level (corrected  $\alpha = .025$ ). The Mann-Whitney-U test revealed a significant difference between the MT and NM groups ( $W = 142$ ,  $p = .014$ ) further substantiating a significant difference in attunement ratings, with the MT group being rated significantly higher as compared to the NM group.

### **Attunement and Outcome Measures**

To test if attunement ratings were related to clinical outcomes, linear mixed models (LMMs) with time, attunement rating, and the interaction between time and attunement rating as fixed predictors and including a fixed and random intercept were calculated (baseline models). As the main variables of interest were fixed effects the maximum likelihood (ML) estimation method was used for every model, this method allows for model comparisons and produces more accurate estimates for the fixed effects (Twisk, 2006).

### **CCC-2**

The standardized GCC scale of the CCC-2 where higher values represent better ability in social communication represented the dependent variable. Due to missing CCC-2 follow-up data, three cases (two from MT and one from NM condition) were excluded from this analysis.

Overall, the mean CCC-2 score of the whole sample did change by -0.06 between baseline and follow-up measurement with  $M_{baseline} = 71.56$  ( $SD = 14.82$ ) and  $M_{follow-up} = 71.50$  ( $SD = 16.66$ ) representing a non-significant difference according to a subsequent paired t-test ( $t(23) = 0.50$ ,  $p = .620$ )

Statistics on LMM model fit can be seen in Table 2. Compared to the baseline model, adjustment for age and therapy site did not improve model fit, adjusting for therapy type (MT vs. NM) however did yield an improved model fit.

**Table 2***LMM model fit comparison*

| Model             | <i>AIC</i> | <i>BIC</i> | <i>logLik</i> |
|-------------------|------------|------------|---------------|
| Baseline          | 392.16     | 402.63     | -189.58       |
| Adjusted for age  | 393.16     | 406.54     | -189.58       |
| Adjusted for site | 393.14     | 406.52     | -189.57       |
| Adjusted for type | 386.76     | 400.14     | -186.38       |

*Note.* All Indices relate to the comparison to the baseline model.

As the main research question concerned the relation of attunement and outcome across interventions, coefficients for both the baseline model and the model adjusted for therapy type are reported in table 3.

No significant effects could be observed in the baseline model, as CIs ranged from negative to positive associations of the predictors and the change in the CCC-2 scores from pre- to post-treatment.

Concerning the model adjusted for type the term for attunement and therapy type reached statistical significance, suggesting a positive association of attunement and baseline CCC-2 score and a difference in baseline CCC-2 scores between the NM and MT condition. The main term of interest (interaction term of attunement and time) remained non-significant, with a CI ranging from a slightly negative to a clearly positive association of attunement ratings and change in the CCC-2 scores from pre- to post-treatment.

As the adjusted model suggested, the sample differed in their baseline CCC-2 score between therapy conditions, with the mean for the NM condition at 76.08 ( $SD = 15.38$ ) and the mean for the MT condition at 68.67 ( $SD = 14.71$ ). According to a subsequent t-test this difference did not reach statistical significance ( $t(22) = 1.207$ ,  $p = .240$ ).

**Table 3***LMMs for CCC-2 as outcome*

|                          | <i>B</i>                  | <i>SE</i> | <i>df</i> | <i>t</i> | <i>p</i> |
|--------------------------|---------------------------|-----------|-----------|----------|----------|
| <b>Baseline model</b>    |                           |           |           |          |          |
| Intercept                | 40.20<br>[-10.37, 90.78]  | 24.97     | 29.80     | 1.61     | .118     |
| Time                     | -22.72<br>[-50.41, 5.20]  | 13.63     | 24.19     | -1.68    | .108     |
| Attunement               | 12.83<br>[-7.74, 33.40]   | 10.16     | 29.80     | 1.26     | .216     |
| Attunement*Time          | 8.97<br>[-2.35, 20.22]    | 5.53      | 24.17     | 1.62     | .118     |
| <b>Adjusted for site</b> |                           |           |           |          |          |
| Intercept                | 15.635<br>[-33.20, 64.45] | 24.12     | 30.28     | 0.65     | .522     |
| Time                     | -23.02<br>[-50.68, 4.77]  | 13.59     | 24.39     | -1.69    | .103     |
| Attunement               | 26.29<br>[5.30, 47.29]    | 10.37     | 29.86     | 2.54     | .017*    |
| Type                     | -15.39<br>[-27.03, -3.76] | 5.72      | 26.47     | -2.69    | .012*    |
| Attunement*Time          | 9.06<br>[-2.22, 20.29]    | 5.52      | 24.38     | 1.64     | .114     |

*Note.* P-values obtained through Satterthwaite's method. SE = Standard error, df = degrees of freedom. 95% CIs in brackets.

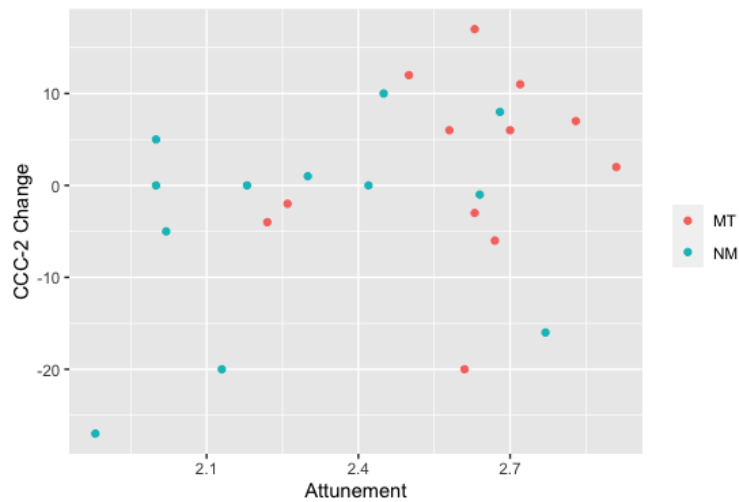
\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

**Model Assumptions.** The following assumption tests concern the baseline model, as it was more directly related to the main research question. As recommended by Zuur et al. (2010) assumptions were tested using graphical inspection. No clear violation of the assumptions could be observed and given that LMMs are considered robust against small violations of distributional assumptions (Schielzeth et al., 2020) the method is considered adequate for the present analysis.

**Linearity.** Graphical inspection did not suggest a non-linear relationship between attunement ratings and the change of CCC-2 score after intervention (see Figure 3).

**Figure 3**

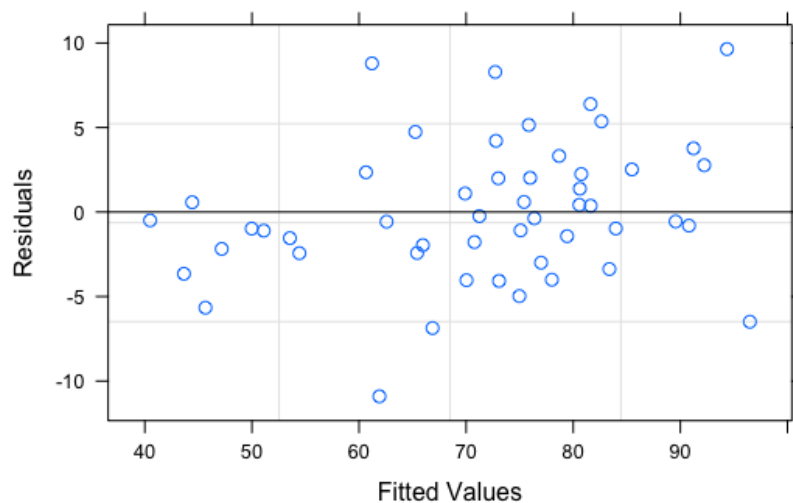
*Scatterplot of attunement ratings and CCC-2 change for the CCC-2 model*



***Homoscedasticity.*** After graphical inspection homoscedasticity was assumed (see Figure 4).

**Figure 4**

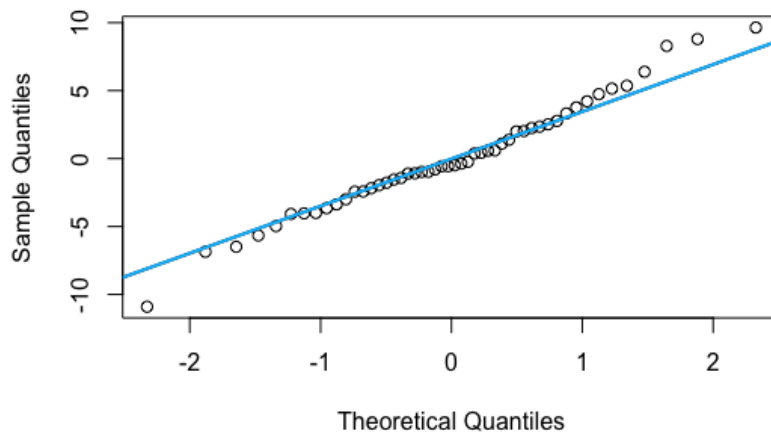
*Scatterplot of Fitted Values and Residuals for the CCC-2 model*



***Normality of Residuals.*** Graphical inspection did not reveal a problematic deviation from normality for the model residuals (see Figure 5).

**Figure 5**

*Normal Q-Q plot of residuals for the CCC-2 model*



### **SRS-II**

The standardized total SRS-II score, where lower values represent less symptom severity represented the dependent variable. One case was excluded due to missing SRS-II follow-up data and two cases were excluded due to missing SRS-II baseline data, all excluded cases were part of the NM condition.

Overall, the mean SRS-II score of the whole sample did change by -0.84 between baseline and follow-up measurement, with  $M_{baseline} = 72.96$  ( $SD = 7.90$ ) and  $M_{follow-up} = 72.12$  ( $SD = 8.15$ ) representing a non-significant difference according to a subsequent paired t-test ( $t(23) = 0.76$ ,  $p = .455$ ).

Concerning the LMM adjustment for age, site, and therapy type did not improve model fit (see Table 4).

**Table 4**

*LMM model fit comparison*

| Model             | <i>AIC</i> | <i>BIC</i> | <i>logLik</i> |
|-------------------|------------|------------|---------------|
| Baseline          | 340.12     | 351.60     | -164.06       |
| Adjusted for age  | 341.97     | 355.36     | -163.99       |
| Adjusted for site | 342.12     | 355.50     | -164.06       |
| Adjusted for type | 340.80     | 354.19     | -163.40       |

*Note.* All Indices relate to the comparison to the baseline model.

Coefficients for the model are reported in table 5. No statistically significant effects were observed in the SRS-II model, including the main term of interest (interaction term of attunement and time) with a CI ranging from a slightly negative to a clearly positive association of attunement ratings and change in the SRS-II scores from pre- to post-treatment.

**Table 5**

*LMM for SRS-II as outcome*

|                       | <i>B</i>                 | <i>SE</i> | <i>df</i> | <i>t</i> | <i>p</i>  |
|-----------------------|--------------------------|-----------|-----------|----------|-----------|
| <b>Baseline model</b> |                          |           |           |          |           |
| Intercept             | 70.30<br>[42.94, 97.33]  | 13.47     | 34.72     | 5.23     | <. 001*** |
| Time                  | -14.89<br>[-35.42, 5.12] | 9.92      | 24.28     | -1.50    | .146      |
| Attunement            | 1.11<br>[-9.89, 12.24]   | 5.48      | 34.77     | 0.20     | .841      |
| Attunement*Time       | 5.73<br>[-2.41, 14.10]   | 4.04      | 24.29     | 1.42     | .168      |

*Note.* P-values obtained through Satterthwaite's method. SE = Standard error, df = degrees of freedom. 95% CIs in brackets.

\*p<.05, \*\*p<.01, \*\*\*p<.001

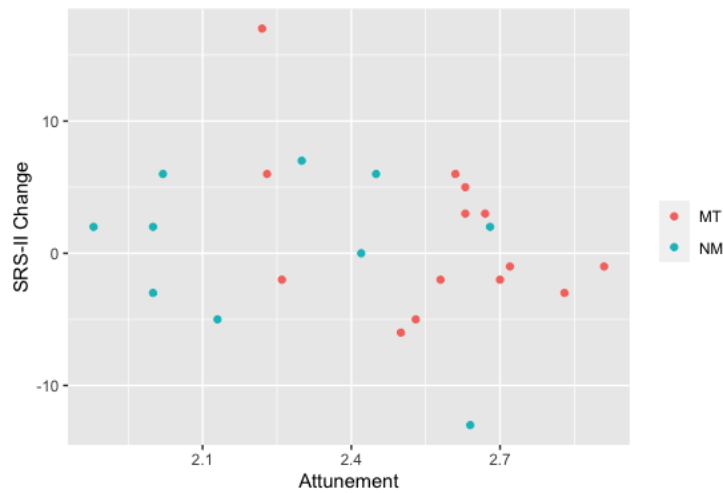
**Model Assumptions.** Assumptions were tested in the same manner as for the CCC-2 models.

**Linearity.** Graphical inspection did not suggest any non-linear relation of attunement ratings and changes in SRS-II scores (see Figure 6).



**Figure 6**

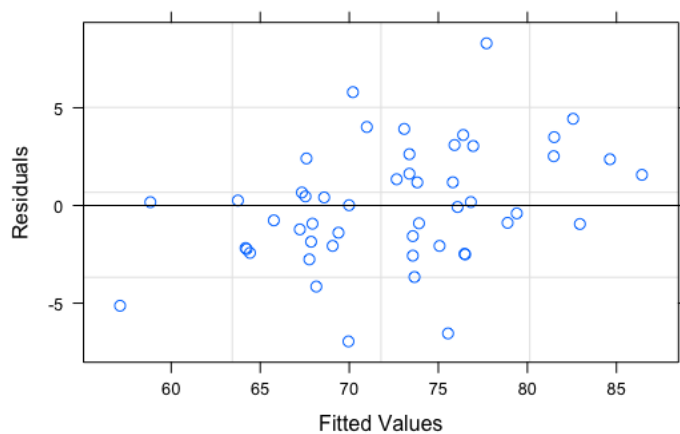
*Scatterplot of attunement ratings and SRS-II change*



***Homoscedasticity.*** After graphical inspection homoscedasticity was assumed (see Figure 7).

**Figure 7**

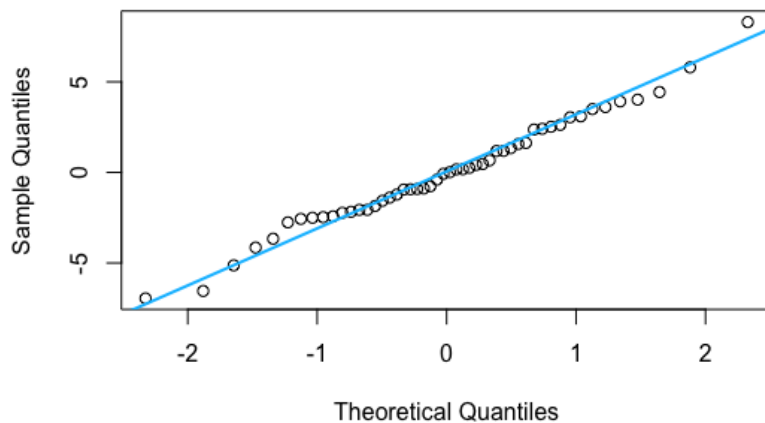
*Scatterplot of Fitted Values and Residuals for the SRS-II model*



***Normality of Residuals.*** Graphical inspection did not reveal a problematic deviation from normality for the model residuals (see Figure 8).

**Figure 8**

*Normal Q-Q plot of residuals for the SRS-II Model*

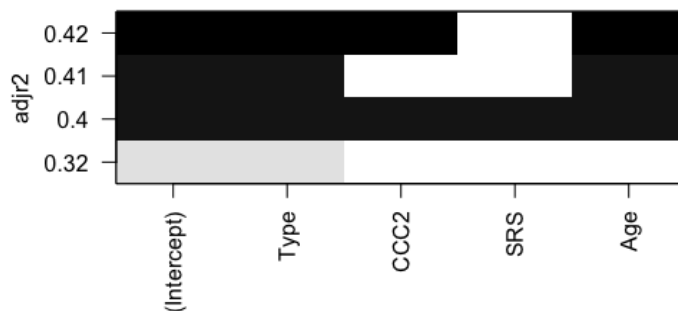


### **Baseline Characteristics and Attunement Ratings**

To investigate the influence of baseline participant characteristics on attunement ratings, a multiple linear regression analysis was performed. As there was little previous research on possible factors influencing attunement in therapy, the best subset selection method was used to identify the combination of predictors with the best model fit by comparing the *adjusted R<sup>2</sup>* between models. Therapy type, age, baseline CCC-2, and baseline SRS-II scores were initially included as predictors, with the model including therapy type, age and baseline CCC-2 score achieving the best model fit (see Figure 9).

Results of the regression analysis are presented in Table 6. Both therapy type and CCC-2 score at baseline significantly and positively predicted attunement ratings during therapy.

A post-hoc power analysis using G\*Power 3.1 (Faul et al., 2009) revealed an achieved power of  $P = .31$  to detect an effect of  $f^2 = 0.15$  representing a medium sized effect according to Cohen (1988).

**Figure 9***Inclusion of predictors via best subset method*

Note. Included predictors highlighted in gray/black. adjr2 = Adjusted  $R^2$

**Table 6***Results of regression analysis with attunement as outcome*

|              | <i>b</i>                  | <i>SE B</i> | $\beta$ | <i>p</i> | <i>F</i>         | $R^2$ | Adj $R^2$ |
|--------------|---------------------------|-------------|---------|----------|------------------|-------|-----------|
| Model        |                           |             |         | .003**   | 6.280<br>(3, 23) | .45   | .38       |
| Intercept    | 1.904<br>[1.078, 2.731]   | 0.40        |         | <.001*** |                  |       |           |
| Therapy type | 0.332<br>[0.115, 0.550]   | 0.10        | 0.57    | .004**   |                  |       |           |
| CCC-2        | 0.008<br>[0.001, 0.014]   | 0.01        | 0.38    | .033*    |                  |       |           |
| Age          | -0.025<br>[-0.074, 0.031] | 0.025       | -0.15   | .406     |                  |       |           |

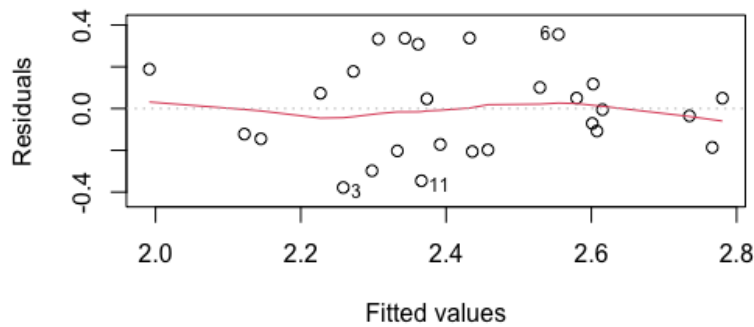
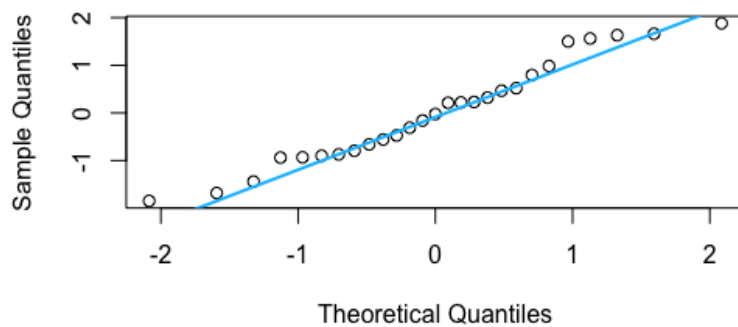
Note. 95% CIs in brackets. Degrees of freedom in parentheses.

\* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$

### **Model Assumptions**

Inspection of standardized residuals, cooks distance and leverage did not reveal any outliers or influential cases. Variance inflation factor and tolerance did not suggest problematic multicollinearity between predictors.

After graphical inspection homoscedasticity (see Figure 10) and adequate normality of residuals (see Figure 11) were assumed.

**Figure 10***Scatterplot of Fitted Values and Residuals***Figure 11***Normal Q-Q plot of Residuals*

## Discussion

The present master thesis set out to investigate the role of therapist affect attunement during both music therapy (MT) and a non-musical play-based therapy (NM) with children with ASD. While affect attunement ratings were significantly higher in MT compared to the NM condition, therapist affect attunement ratings did not predict changes in outcome measures of symptom severity and social communication ability across intervention types. This finding is in line with previous research unable to find an association of affect attunement and outcome measures of symptom severity in MT for children with ASD (Mössler et al., 2020). Additionally to therapy type, baseline social communication abilities significantly predicted therapist affect attunement, suggesting that it is easier for therapists to attune to children with relatively better social communicative abilities. Contrary to previous research (Mössler et al., 2019, 2020), baseline symptom severity did not predict therapist affect attunement.

### **Attunement as a Predictor of Therapy Outcomes**

Although it was hypothesized that affect attunement ratings would positively predict outcome measures especially for social communication abilities, no such relation could be observed in this master thesis. While being in line with previous research not finding an effect of affect attunement measures on measures of therapy outcome (Aafjes-van Doorn et al., 2022; Mössler et al., 2020) other studies found significant effects in MT (Mössler et al., 2019), and psychotherapy (Erskine, 1998; Håvås et al., 2015; Snyder & Silberschatz, 2017). Also considering the proposed importance of affect attunement in the psychological development of infants (Legerstee et al., 2007; Markova & Legerstee, 2006; Markova & Siposova, 2019; Stern, 1985), raises the question as to which factors are contributing to these inconclusive results in research on affect attunement so far?

One factor responsible for the heterogenous results in research on affect attunement in therapy, could be the inconsistent definition and operationalization of the concept itself. This can be illustrated by examining two measures designed to measure therapist attunement in psychotherapy, the Patient's Experience of Attunement and Responsiveness Scale (PEAR; Snyder & Silberschatz, 2017), and the Therapist Attunement Scales (TASc; Talia et al., 2020).

The PEAR defines attunement as the therapists ability to accurately perceive the patients experience and to respond in such a way that the patient "has the experience of the therapist 'really getting' what is going on for him or her" (Snyder & Silberschatz, 2017, p. 609). Consequently, the PEAR consists of self-report items such as "My therapist had accurate empathy for my needs and feelings today".

The TASc is more focused on attachment related variations of therapist attunement, defining attunement as "a process in which the therapist contributes to define and make sense of present internal states" (Talia et al., 2020, .. 196). Attunement is assessed via the analysis of therapy transcripts, thereby exclusively analyzing the content of what was said during therapy. Utterances by the therapist that are coded as "Expression", "Clarification", "Not-knowing statement", or "Objective statement" can receive one of 40 attunement markers while utterances that are coded as "Inquiry", "Action", or "Education" are defined as not being part of attuned therapist behavior.

Both measures do not take into account one of the essential features of affect attunement as defined by Stern (1985), namely the fact that attunement often occurs

across modalities, highlighting the importance of taking non-verbal behavior and prosody into account when trying to adequately measure its influence on the therapeutic process. Additionally, these examples illustrate the conceptual proximity of these definitions of affect attunement to broader psychotherapeutic constructs such as sense-making (Gennaro et al., 2011) and empathy.

Especially empathic abilities of therapists are thought to play an important role in psychotherapy (Watson, 2016) and comprise an essential feature of some specific psychotherapeutic approaches (Rogers, 1985/2021). Snyder and Silberschatz (2017) tried to distinguish affect attunement from empathy by following Erskines (1998) definition of attunement as a process involving affective and cognitive empathy to connect to another person while also being able to communicate this connection to the other person. However, this definition still does not explicitly incorporate the possibility of the communication about the mutual understanding and connection to take place in non-verbal, cross-modal forms. While the ability to empathize with another person is clearly necessary to attune to the person, disregarding the technical aspects of how and when to communicate this connection could lead to problems in the validity of the operationalization, leading to a conflation of the effects of attunement and empathy when predicting outcomes based on these constructs.

It is important to note that while Sterns' original conception of affect attunement was that of a largely unconscious behavior observed in the interaction between caregiver and child (Stern, 1985), it was additionally defined as a specific therapeutic intervention or technique in the music therapy literature (Schumacher et al., 2019). The definitory conflation of affect attunement with closely related constructs that represent state-like traits of the therapist (e.g. empathy) rather than a specific technique used by the therapist, further complicates the comparability between studies and could be responsible for the inconclusive results on the relation of attunement and therapy outcome so far.

Similarly problematic is the often interchangeable use of the term affect attunement and therapeutic relationship (e.g. Mössler et al., 2019), as again the therapeutic relationship represents multifactorial construct thought to be a product of, as well as a framework for specific therapeutic interventions and techniques (Goldfried & Davila, 2005) and should therefore be treated and measured separately from any one specific intervention technique or process variable.

### **Moderation-Mediation Model of Affect Attunement and Therapeutic Alliance**

The notion of a possible conflation of affect attunement measures and the quality of the therapeutic relationship is further substantiated by the use of the AQR tool in two of the studies relating attunement to outcome measures (Mössler et al., 2019, 2020). As the AQR tool is primarily designed to assess the quality of relationship for a given music therapist-client dyad (Schumacher et al., 2019), it is possible that the AQR match rate used as a predictor of therapy outcome in the two studies, more closely resembled the quality of relationship rather than the use of affect attunement as a therapeutic technique. However, Mössler et al. (2020) reported a correlation of  $r = .49$  between AQR match rate and attunement scores based on fidelity analysis of video taped therapy sessions. As it can be expected that the attunement scores according to the fidelity ratings included observations of cross-modal instances of affect attunement, this correlation could mean that the AQR match rate represents an adequate measure of therapist affect attunement. Another explanation for the correlation between attunement scores according to fidelity analysis and AQR match rate could be that attunement is exerting a beneficiary effect by positively influencing the therapeutic relationship, which could in turn positively affect therapy outcomes. A concept closely related to the therapeutic relationship, yet more clearly defined is that of the *therapeutic alliance*.

The therapeutic alliance is defined as a collaborative stance between therapist and client, that is characterized by an agreement on therapeutic goals and tasks, and the bond between therapist and client (Bordin, 1979). The quality of the therapeutic alliance has been shown to positively predict therapy outcomes in psychotherapy for adults across more than 30 000 patients with differing mental health problems in a meta-analysis, explaining about 8% of the variation in treatment outcome measures (Flückiger et al., 2018). While the therapeutic alliance received substantial attention in general psychotherapy research, comparatively little research concerning the effects of the therapeutic alliance on therapy outcomes in interventions for children with ASD has been published (Brewe et al., 2021).

However, a positive relationship of alliance measure and treatment outcome were observed in children and youth with ASD between the ages of 12 to 21 undergoing a mindfulness-based treatment program (Brewe et al., 2021). Additionally, three studies investigating the effects of alliance measures and treatment outcomes in cognitive-behavioral therapy for children with ASD, observed a

similar positive relationship (Albaum et al., 2020; Kerns et al., 2018; Klebanoff et al., 2019), as did another study investigating this effect in a community-based social skill intervention for youths with ASD (Kang et al., 2021).

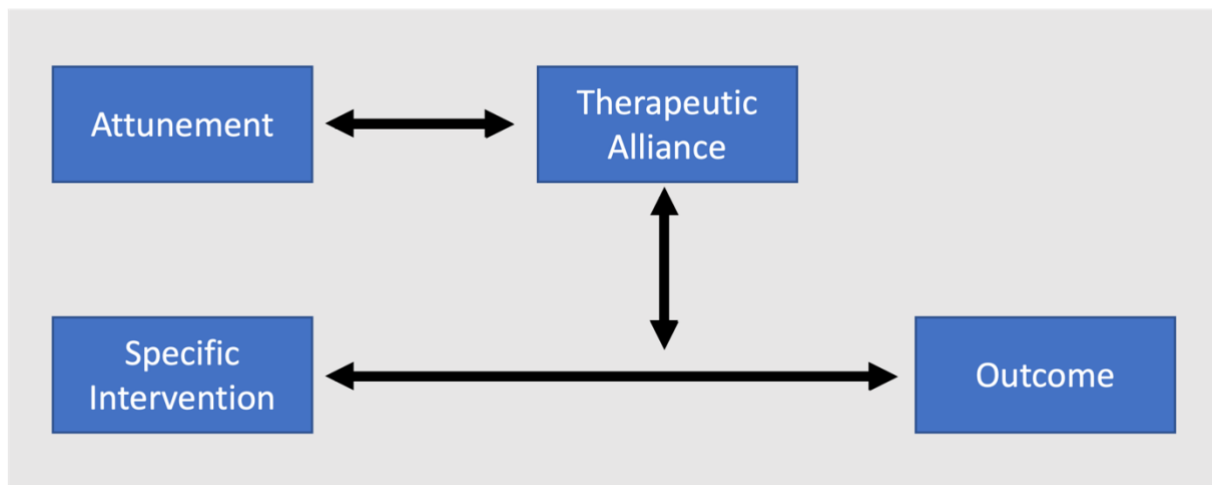
Considering the evidence of positive effects of therapeutic alliance on treatment outcomes above, suggests that any possible beneficiary effect of affect attunement in the treatment of children with ASD could be moderated by the therapeutic alliance, rather than affect attunement directly influencing treatment outcomes. Also, it is still unclear which aspects of ASD are most susceptible to be influenced by the working alliance. Considering the possibility that the quality of the alliance acts as a framework for supporting the effects of specific interventions or techniques (Goldfried & Davila, 2005), the specific effects on outcome measures might be predicated on the goal of these specific interventions or techniques whereby the quality of the alliance represents a mediating factor that could be influenced by the use of affect attunement (see Figure 12). In this vein, affect attunement, therapeutic alliance, and specific interventions, are best understood as interrelated constructs of the therapeutic process influencing each other bidirectionally over the course of therapy (Goldfried & Davila, 2005).

The possibility of this indirect relationship of affect attunement and therapy outcome suggests that future research should incorporate measures of both affect attunement and the quality of the therapeutic alliance, in order to investigate their relationship. Additionally, the use of multiple outcome measures with differing sensitivity to changes intended by the intervention type and relevant to persons with ASD should be incorporated. Lastly, considering the effect size of therapeutic alliance to be in the medium range (Flückiger et al., 2018) the hypothesized indirect relationship of attunement and outcome would suggest that a possible effect could be small and thereby hard to reliably detect. This could explain the inconsistent results so far, as previous studies could have been underpowered to detect such a small effect. Therefore, subsequent studies need to include comparably larger sample sizes.



**Figure 12**

*Possible Relationship of Attunement, Therapeutic Alliance, and Outcome*



### **Attunement, Interpersonal Synchrony and Therapeutic Alliance**

Although investigating the relationship of affect attunement and therapy outcomes according to the hypothesized model above could further our understanding of these processes, it is still possible that affect attunement and the therapeutic alliance are indeed conflating constructs rather than clearly separable aspects of therapy.

One of the most readily observable aspects of affect attunement is the correspondence of vitality forms between one person and another, for example an utterance characterized as moving up and down in pitch can be attuned to by head movements that are synchronized to this pattern in intonation. Such patterns of interpersonal synchronization have received increased attention in psychotherapy research (Kleinbub et al., 2020), whereby synchronization patterns between therapist and client have been found to be predictive of the quality of the therapeutic alliance and therapist empathy as perceived by the client (Koole & Tschacher, 2016). Synchronization is therefore often discussed as an objective marker for the quality of the therapeutic alliance (Koole & Tschacher, 2016).

However, interpersonal synchrony and affect attunement do differ in two aspects. First, while affect attunement is focused on the affective quality (vitality form) of the others behavior (Stern, 1985), synchrony can be achieved by simply mirroring the movement of the other without noticing or communicating something about the feeling state. Secondly, interpersonal synchrony between therapist and client has only been studied in the same modality so far (Altmann et al., 2020; Koole &

Tschacher, 2016; Ramseyer & Tschacher, 2011), while affect attunement is also characterized by cross-modal synchronization (Stern, 1985). Despite these differences however, it can be argued that the observable features of both affect attunement and interpersonal synchrony largely overlap, especially as affect attunement is not exclusively conceptualized as being cross-modal but can also occur in the same modality (Stern, 1985).

Considering these shared observable features of affect attunement and interpersonal synchrony, and the relation of interpersonal synchrony with the quality of the therapeutic alliance (Koole & Tschacher, 2016), it is possible that measures of affect attunement based on video analysis more closely resemble a proxy measure of the quality of the therapeutic alliance rather than a direct measure of the level of affect attunement used as a therapeutic technique. This again could explain the inconclusive literature in affect attunement research so far, as small effect sizes should be expected with the therapeutic alliance showing a medium effect on outcomes in the past (Flückiger et al., 2018) and synchrony measures not taking into account other factors important for the therapeutic alliance, such as goal and task agreement (Bordin, 1979).

### **Macro- vs. Microprocess**

By extracting a single index of therapist affect attunement for each therapist-client dyad, the present master thesis adopted a macro level perspective on the relationship between affect attunement and therapy outcome, expecting that higher levels of affect attunement lead to better therapy outcomes. It can be questioned if such a macro level approach is suited to adequately investigate the effects of affect attunement on the therapeutic process, or if approaches more sensitive to specific patterns and fluctuations in affect attunement within and between therapy sessions would present a more adequate approach.

While Stern (1985) underlined the importance of experiences of attunement for the development of the infant, he also explicitly mentioned instances of *misattunement* that could be beneficial for development. Misattunement occurs when a caregiver over- or undermatches the vitality form expressed by the child. Stern differentiated between intentional misattunement from true misattunement caused by an inability to detect and/or match the affective state of the infant. Intentional misattunement is seen as a strategy of the caregiver to regulate the child's arousal by

intentionally over- or undermatching the expressed affective state of the child, while still matching close enough to maintain an affective connection to one another, consequently this behavior is also referred to as *tuning* (Stern, 1985).

In therapy similar occasions of purposefully misattunement could prove to have beneficial effects. For example, if a client is upset during therapy, it could be detrimental to match this negative affect with the same intensity. In this situation it would probably be best for the therapist to match some aspects of the arousal to communicated acceptance and understanding of the client's emotional state, while purposefully misattuning to other aspects to help regain emotional balance and support emotion regulation (Grecucci et al., 2015). Investigating affect attunement from a macro level perspective runs the risk of missing such possibly beneficiary dynamics of the therapeutic process. Considering this possible dynamic, the negative relationship of therapist affect attunement and ASD symptom severity reported in previous studies (Mössler et al., 2019, 2020) could represent an adequate therapeutic strategy, rather than difficulties in attuning to children with higher symptom severity, as children with higher ASD symptom severity could be in need of more regulation by the therapist through purposeful misattunement.

In a similar vein, investigations into within and between therapy session variations of the therapeutic alliance revealed fluctuations in the quality of the therapeutic alliance to be beneficial to the therapy outcome (Eubanks et al., 2018). Defined as a deterioration in the alliance caused by disagreement on the goals or tasks, or a strain on the emotional bond between therapist and client, *ruptures* in the therapeutic alliance and their subsequent repair have been shown to be both beneficial for the quality of the therapeutic alliance and therapy outcomes (Eubanks et al., 2018). Alliance ruptures can be further classified in *confrontational ruptures*, where the client explicitly expresses anger or dissatisfaction with some aspect of the therapy, and *withdrawal ruptures* characterized by the client moving away from the therapist by avoiding to answer questions or hiding dissatisfaction by being overly appeasing (Safran et al., 2011). It has been shown that during the repair of confrontational ruptures therapists show an significant increase in nonverbal synchrony (Deres-Cohen et al., 2021). This suggests, that in phases where interpersonal facets of the therapeutic alliance are focused on by the therapist, such as at the beginning of therapy and during alliance ruptures, therapists tend to

increase their synchrony in order to (re-)establish positive rapport (Deres-Cohen et al., 2021; Koole & Tschacher, 2016).

In a similar way, affect attunement might be beneficial in therapy phases where the development or repair of the therapeutic alliance is the main focus, leading to a positive relation of affect attunement and outcome improvements in those phases. Conversely, in phases that require for example support in regulating strong affective states, purposeful misattunement to this affect could lead to a negative association of affect attunement and outcome improvements. Focusing on investigating these microprocesses of affect attunement in therapy could shed further light into its impact on therapy outcomes and possibly present a more ecologically valid form of investigating the mechanisms of therapy.

### **The Special Case of Music Therapy and ASD**

While the above deliberations largely represent factors of affect attunement relevant across different therapy types, as well as across different clinical populations, it is important to consider some factors specific to MT and ASD.

MT represents a unique case among intervention types that incorporates an additional mode in which the therapist can attune to the client's expressions and emotional states, as the therapist can musically attune to the client. Additionally, it can be argued that instances of cross-modal attunement could be more frequent in MT as many examples of MT practice describe musical attunement to non-musical expressions of feeling states by the client (Mössler et al., 2020; Schumacher et al., 2019; Thompson & Elefant, 2019; Trondalen & Skårderud, 2007). It was therefore hypothesized that attunement ratings in the MT condition would be higher compared to the NM condition.

This hypothesis was supported by the present master thesis, as attunement ratings were indeed significantly higher in the MT condition as in the NM condition and therapy type significantly predicted therapist affect attunement. However, it is important to note that all therapists involved were exclusively trained as music therapists and did not receive prior training in play therapy. It is therefore possible that trained play therapists would have obtained similar attunement ratings in the NM condition as music therapist in the MT condition as a function of their prior training and experience with this intervention type. In a previous study comparing MT with a play-based intervention for children with ASD (Kim et al., 2009) instances of joyful

synchrony between therapist and child were significantly more frequent in the MT condition. As this study also involved play therapists (along with music therapists and social workers) in the play-based condition, this suggests that MT could indeed represent an intervention type especially suited for creating experiences of affect attunement.

In contrast to the majority of the general psychotherapeutic literature, where the term attunement is unclearly defined and often conflated with constructs such as empathy, therapeutic relationship, and alliance, some literature on MT defines affect attunement as a specific therapeutic technique (Schumacher et al., 2019). The definition of affect attunement as an explicit music therapeutical technique could also mean, that affect attunement receives comparably more focus in the training of music therapists, leading to increased use of this technique in MT as compared to other intervention types. This ability to also attune to the client musically, might be especially relevant when working with children with ASD.

Children in general are often not self-referred and do not understand the reason as to why they are in therapy (Green, 2006), making the formation of a good therapeutic alliance especially challenging and important in this population (Burnham Riosa et al., 2019). Difficulties in social communication and other aspects of social functioning in children with ASD (Davidson et al., 2015) could make forming a bond between therapist and child additionally challenging. Also disorganized patterns of interpersonal synchrony have been proposed as an early marker for the development of ASD (Trevvarthen & Daniel, 2005). Given that interpersonal synchrony plays a role in the formation of relational bonds as outlined above, alterations in interpersonal synchrony could further challenge its formation in a therapeutic setting. Comparing the quality of the therapeutic alliance between children with ASD and anxiety disorder (AD) and typically developing children with AD during cognitive behavioral therapy, Klebanoff et al. (2019) indeed found significantly worse ratings of the therapeutic alliance in the ASD group. Additionally, ASD symptom severity and depression symptoms showed a negative association with the therapeutic alliance early in treatment in another study (Brewer et al., 2021). Given that persons with ASD characteristically struggle in forming interpersonal relationships (Davidson et al., 2015), a strong relational bond between therapist and child might be especially beneficiary for children with ASD, as the therapeutic relationship can act as a

laboratory for learning and practicing social skills in an safe environment (Klebanoff et al., 2019; Ramsay et al., 2005).

Considering these challenges and the importance of the therapeutic alliance for children with ASD, having the capability to foster the therapeutic alliance through musical attunement in MT might present one of the core advantages of MT over other treatments for children with ASD. Attuning musically to the child also offers additional advantages when working with lower functioning children on the ASD spectrum for example nonverbal children with ASD. Although to the authors knowledge no previous study examined affect attunement or therapeutic alliance in this population specifically, it stands to reason that forming a good therapeutical alliance is especially challenging when not being able use language in fostering this formation. Again, musically attuning to utterances, bodily movement and facial expressions might proof to be especially relevant in forming a therapeutical alliance when working with this population.

### **Predictors of Therapist Affect Attunement**

Possible ASD specific factors of the therapeutic alliance and affect attunement also make clear the importance of investigating which characteristics specific to client and therapist influence the use and effectiveness of affect attunement and the therapeutic alliance. In this vein, it was hypothesized that lower levels of functioning at baseline would negatively predict therapist affect attunement.

Contrary to this hypothesis and previous research (Mössler et al., 2019, 2020) autism symptom severity did not predict therapist affect attunement in the present master thesis. However, social communication ability as measured with the CCC-2 did significantly and positively predict therapist affect attunement. Suggesting that the level of functioning in the realm of social communication might present an important factor for therapists' ability to attune to their client. The importance of social interaction abilities for affect attunement was also highlighted in previous research (Mössler et al., 2019). Therapists therefore might benefit from specialized training in attuning to children with ASD with lower levels of social communication abilities and non-verbal children with ASD. Specifically focusing on and attuning to bodily and other non-verbal expressions by the child, might help in creating higher levels of affect attunement during therapy and could help in establishing and maintaining a positive therapeutic alliance in this population.

As overall ASD symptom severity negatively predicted the quality of the therapeutic alliance in previous studies (Albaum et al., 2020; Klebanoff et al., 2019). ASD symptom severity could be indirectly associated with affect attunement through the therapeutic alliance, rather than ASD symptom severity directly impacting therapist affect attunement. With ratings of affect attunement via video analysis according to fidelity principles possibly being more sensitive to aspects specific to affect attunement (e.g., cross-modal matching) than other measures used in previous research (e.g., Mössler et al., 2019, 2020), social communication abilities might present a factor specifically influencing affect attunement, while ASD symptom severity is more closely associated with the therapeutic alliance rather than affect attunement.

However, due to the unclear definition and operationalization of affect attunement in previous research outlined above and the omission of a separate measure of the therapeutic alliance in this master thesis, relatively little is known as to what factors influence therapist affect attunement per se, as conflation of affect attunement measures and the quality of the therapeutic alliance might be present. Given that the quality of the therapeutic alliance might influence therapist affect attunement (Figure 12), any factor relevant to the therapeutic alliance could also influence affect attunement. Finding factors especially relevant to affect attunement is therefore predicated on future research incorporating measures of affect attunement and the therapeutic alliance separately to accurately model this possible relationship.

Understanding affect attunement as a dyadic process, characteristics of the therapist such as age, experience, personality and attachment representation (Talia et al., 2020) as well as characteristics of the therapist-client dyad such as gender and personality match, should be investigated as possible predictors of affect attunement during therapy in future studies.

## **Future Directions**

Concerning all the different elements proposed to contribute to the therapeutic relationship Horvath (2005) wrote, that considering “the significant overlap evident among these ‘elements’, and the lack of a conceptual model knitting these elements into a cohesive framework, [...]. The time is approaching to renew vigorous dialogue to clarify what we mean by the concepts ” (Horvath, 2005, p.5). It is probably the main achievement of the present master thesis to open up a dialogue on such

clarifications and presenting a possible framework for future research into affect attunement and the therapeutic alliance.

In order to aid the comparability of future research, a clear definition and differentiation of the term affect attunement is needed. To this end, it is necessary to be aware of the multitude of definitions and conceptions of affect attunement in the past literature and to only use the term affect attunement, when referring to therapist-client interactions in line with Stern's definition of affect attunement (Stern, 1985) in future studies. Where affect attunement is defined as a specific therapeutic technique as in the MT literature (Schumacher et al., 2019), it would be beneficial to refer to this technique as musical attunement in order to differentiate between the largely unconscious affect attunement of caregiver and child and the willful application of affect attunement in MT, as well as providing a clear distinction to the construct of the therapeutic alliance.

As mentioned above, the relationship of affect attunement and the therapeutic alliance needs further investigation to identify possible interrelations between these constructs and their relation to therapy outcomes. Making necessary the inclusion of separate measures of the therapeutic alliance and affect attunement in future studies in order to achieve this goal.

Additionally, developing reliable and objective measures of affect attunement in therapy is needed. The similarities of the observable features of interpersonal synchrony and affect attunement could be taken advantage of by incorporating some of the objective measures of interpersonal synchrony (Bulling et al., 2023; Kleinbub et al., 2020) into research on affect attunement. Using automated algorithm-based programs to analyze behavioral aspects of the therapist-client interaction has been successfully reported in several studies (Bulling et al., 2023). Combining such programs to investigate cross-modal synchronization could present several advantages over manually coding instances of affect attunement. It would significantly reduce the time and cost associated with coding of therapy sessions, allowing for analysis of more sessions per client and producing continuous measures of affect attunement over the course of therapy. This could also mean that larger sample sizes, which have been discussed as an important factor of future research into affect attunement above, would be easier to achieve. By obtaining a continuous measure of affect attunement, a micro level approach investigating the impact of specific fluctuations and patterns of affect attunement on therapy outcomes could be



realized. Combining this with a micro level approach on measures of the therapeutic alliance, could further our understanding in the interrelation of affect attunement and the therapeutic alliance, making possible to investigate if affect attunement has direct implications for therapy outcomes such as the proposed link to the development of subjectivity and intersubjectivity.

## **Limitations**

Apart from the limitations outlined above the present master thesis is additionally limited by a small sample size and its correlational design limiting causative inferences to be drawn from the results. As outlined above, the size of possible effects of affect attunement on outcome measures should be expected to be small, suggesting large sample sizes to be necessary to reliably detect a possible relation of affect attunement with therapy outcome.

Experimental manipulation of affect attunement levels would allow for causal inferences on its effect in therapy. In future studies participants could for example be randomly assigned to therapists who either did or did not receive specialized training in the implementation of affect attunement prior to the start of therapy (Mössler et al., 2019). It is also important to note that affect attunement ratings were generally rather high and showed limited variance between therapist-client dyads, further suggesting a need of experimental manipulation of this variable in future studies.

Additionally, no therapist characteristics were available for the analysis of predictors of the affect attunement ratings. Future studies would benefit from incorporating characteristics of therapist and the therapist-client dyad, in order to better understand factors relevant to affect attunement in therapy.

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## Appendix

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| Social Responsiveness Scale 2 (SRS-II)           | Constantino et al., 2003 |

## **Abstract**

The present master thesis set out to investigate the role of therapist affect attunement during 12 sessions of either music therapy (MT) or a non-musical play-based therapy (NM) with children between the ages of 6 and 12 years with autism. Affect attunement was measured via video analysis of therapy sessions. While affect attunement ratings were significantly higher in the MT condition compared to the NM condition, affect attunement levels did not predict therapy outcomes on general autism symptom severity or social communication abilities. Children's social communication abilities at baseline did significantly and positively predict therapist affect attunement levels during therapy. Possible explanations of the inconclusive results in research on affect attunement so far and the relationship between affect attunement and the quality of the therapeutic alliance are discussed. A theoretical framework for future studies on affect attunement and therapy outcomes is proposed, highlighting the need to further investigate the interrelation of affect attunement and other factors of therapy such as the therapeutic alliance.

## **Abstract - German**

Die vorliegende Masterarbeit untersuchte die Rolle von Affect Attunement in der Therapie von autistischen Kindern. Klient:innenspezifische Faktoren, welche das Ausmaß des von der/dem Therapeut:in gezeigten Affect Attunement beeinflussen, wie auch der Zusammenhang von Affect Attunement mit Therapieresultaten in den Bereichen der allgemeinen Symptombelastung und sozialen Kommunikationsfähigkeit, wurden untersucht. Kinder im Alter von 6 bis 12 Jahren nahmen entweder an 12 Einheiten Musiktherapie (MT-Gruppe) oder an ebenso vielen Einheiten einer spielbasierten Therapie (NM-Gruppe) teil. Das Ausmaß an Affect Attunement während der Therapie, wurde durch die Analyse von Videoaufzeichnungen der Therapieeinheiten gemessen, während Symptombelastung und soziale Kommunikationsfähigkeit mithilfe standardisierter Fragebögen erhoben wurden. Das Ausmaß an Affect Attunement der Therapeut:innen wurde in der MT-Gruppe signifikant höher als in der NM-Gruppe bewertet. Affect Attunement zeigte allerdings keinen signifikanten Zusammenhang mit den untersuchten Therapieresultaten, während die vor Therapiebeginn gemessene soziale Kommunikationsfähigkeit der Klient:innen das Ausmaß an Affect Attunement signifikant und positiv vorhersagte. Mögliche Erklärungen für die bisher unklaren

Ergebnisse der Forschung zu Affect Attunement, sowie die Beziehung zwischen Affect Attunement und der Qualität der therapeutischen Allianz, werden diskutiert. Ein theoretischer Rahmen für zukünftige Studien zum Zusammenhang von Affect Attunement und Therapieergebnissen wird vorgeschlagen, welcher die Notwendigkeit hervorhebt, die Wechselbeziehung zwischen Affect-Attunement und anderen Faktoren der Therapie, z. B. der therapeutischen Allianz, weiter zu untersuchen.