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# Interpersonal Coordination in Couple Therapy

## Investigating Posture and Movement Matching and Nonverbal Synchrony between Participants



UNIVERSITY OF JYVÄSKYLÄ

FACULTY OF EDUCATION AND
PSYCHOLOGY

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# ABSTRACT

In the field of psychotherapy, research on the interpersonal coordination of movements, e.g., nonverbal synchrony, is a growing area of interest. It has been related to both therapy outcome and therapeutic alliance in individual psychotherapy; however, research in the context of couple therapy is lacking. In this thesis, the interpersonal coordination of nonverbal behavior was examined in couple therapy using data collected in the Relational Mind research project. The data comprised couple therapy sessions from 12 couples. All sessions included four participants: the spouses and two co-therapists. Interpersonal coordination can be divided into two categories: matching, which occurs when two people implicitly (unconsciously) imitate each other's postures and movements, and interpersonal synchrony, which refers to the dynamic coupling of two or more signals such as movement energy. Both kinds of interpersonal coordination were studied in this thesis. A new coding scheme was developed in Study I for observing matching between participants in couple therapy. Two categories were found: posture matching and movement matching. The relationship between nonverbal matching patterns and therapeutic alliance was qualitatively inspected in one therapy process. The patterns were found to be complex and varied from one participant to another. Intriguingly, after a session in which the alliance was evaluated as weaker, there was more matching between the co-therapists. The coding scheme was used in a multimodal microanalytic study, Study II, which concentrated on four significant moments of one couple therapy session. The aim was to integrate information from the dialogue, the participants' sympathetic arousal levels, and nonverbal matching behavior. The study revealed the context dependency and individuality of the embodied reactions; the different modalities told their own stories about the couple therapy situations. The final study was a quantitative study of 29 sessions in which interpersonal synchrony of movements, e.g., nonverbal synchrony, was obtained using a frame-differencing method and a synchrony calculation algorithm. Significant synchrony was found in all sessions. The co-therapists' synchrony differed from synchrony in other dyads in that it was always in-phase; this probably reflected the co-therapists' professional role. Body synchrony among all participants was significant in relation to all participants' alliance evaluations, while head synchrony was significant only to the therapists' alliance evaluations. Interesting patterns were found in the multiperson context: for the clients, alliance was related to synchrony in opposite-gender dyads, whereas for the therapists, synchrony in same-gender dyads was significant. The results from the three research designs gave a broad picture of the interpersonal coordination of nonverbal behavior in couple therapy and to what it was related. In couple therapy, it could be considered a marker of the therapeutic alliance; however, the patterns were more multifaceted in couple therapy than in individual psychotherapy.

*Keywords:* couple therapy, interpersonal coordination, nonverbal synchrony, posture and movement matching, therapeutic alliance, therapy outcome, multimodality, and embodiment

# TIIVISTELMÄ (ABSTRACT IN FINNISH)

Viime aikoina kehonliikkeiden yhteensovittautumista, eli synkroniaa, on tutkittu yhä enemmän psykoterapiassa. Sen on havaittu liittyvän terapian tuloksellisuuteen ja terapeuttiseen allianssiin eli yhteistyösuhteeseen. Tässä väitöskirjassa tutkittiin ensimmäistä kertaa kehon asentojen ja liikkeiden yhteensovittautumista pariterapiassa. Aineistona käytettiin Relationaalinen mieli monitoimijaisten terapiadialogien muutoshetkissä -projektin pariterapiavideoita. *Ensimmäisessä osatutkimuksessa* tutkittiin osallistujien välistä tahatonta asentojen ja kehonliikkeiden peilautumista. Havaintojen perusteella syntyi uusi luokittelujärjestelmä Observing Nonverbal Synchrony. Osatutkimuksessa havaittiin asentojen ja liikkeiden peilautumisen vaihtelevan istunnosta toiseen. Asentojen ja liikkeiden peilautumisen havaittiin liittyvän terapeuttiseen allianssiin kahdella tavalla: kun istunnon allianssi oli arvioitu heikoksi, terapeutit peilasivat toisiaan enemmän seuraavassa istunnossa, ja istunnossa, jonka allianssin suurin osa osallistujista arvioi heikoksi, peilautumista esiintyi selkeästi vähemmän. *Toisessa osatutkimuksessa* tutkittiin yhden pariterapiaistunnon neljää merkityksellistä kohtaa monimenetelmällisellä tutkimusotteella. Tutkimuksen tavoitteena oli yhdistää eri modaliteetteihin eli vuorovaikutuksen kanaviin kuuluva tieto: asentojen ja liikkeiden peilautuminen, sympaattisen hermoston reaktiot eli vireystila ja sanallinen vuorovaikutus istunnon aikana. Oletuksemme vastaisesti emme löytäneet toistuvia tapoja, joilla eri modaliteetit olivat yhteydessä toisiinsa, vaan pikemminkin vaikutti siltä, että eri modaliteetit kertoivat omaa itsenäistä tarinaansa pariterapian merkityksellisistä hetkistä. Tähän vaikutti osaltaan se, että reaktiot olivat yksilöllisiä, esimerkiksi terapeutit saattoivat reagoida samaan tilanteeseen toisistaan poikkeavilla tavoilla. Yksilöllistä reagointitapaa havainnollistivat myös jälkihaastattelut, joissa osallistujille näytettiin videokuvaa terapian merkityksellisistä hetkistä terapiaistunnon jälkeen ja heitä pyydettiin kertomaan istunnon aikaisista kehollisista tuntemuksistaan. Haastattelujen perusteella emme löytäneet selitysmalleja kaikkiin osallistujien kehollisiin reaktioihin. *Kolmannessa osatutkimuksessa* tutkittiin Relationaalinen Mieli -hankkeen pariterapia-aineiston 29 istunnossa pään- ja kehonliikesynkroniaa. Liikesynkronian määrittelyyn käytettiin tutkimusmenetelmää, joka määrittelee synkroniaksi kaikki samanaikaiset tai tietyn viiveen sisällä tapahtuvat liikkeet. Merkitsevää kahdenkeskistä synkroniaa esiintyi jokaisessa istunnossa ja melkein kaikissa dyadeissa. Kehon liikkeiden synkronia oli yhteydessä sekä asiakkaiden hyvinvointiin että asiakkaiden ja terapeuttien allianssiarvioihin, kun taas päänliikesynkronia oli yhteydessä pelkästään terapeuttien allianssiarvioihin. Mielenkiintoista oli, että asiakkaiden allianssiarvioinneissa korostui vastakkaista sukupuolta olevien osallistujien välinen synkronia, kun taas terapeuttien arvioinneissa korostui synkronia samaa sukupuolta olevien osallistujien välillä.

Nämä kolme tutkimusta antoivat laajan kuvan kehonliikkeiden ja asentojen yhteensovittautumisesta pariterapiassa. Kehon asentojen ja liikkeiden yhteensovittautumista tarkkailemalla voidaan terapiatilanteesta saada kuvaa esimerkiksi yhteistyösuhteen laadusta.

*Avainsanat:* Pariterapia, kehon asentojen ja liikkeiden tahaton imitointi, liikesynkronia, sanaton vuorovaikutus, terapeuttinen allianssi, terapian tuloksellisuus ja kehollisuus.

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# ACKNOWLEDGEMENTS

he wants to become a psychologist when he grows up, and when we asked him why, he said, "Because they work long days." My son, I am happy to say that working long days is now over because I have finally finished my "book" (PhD book = väitoskirja in Finnish). I love you and wish you will find your own passion in life in the future, as I have found mine in science.


Helsinki, 25.5. 2023
Petra Nyman-Salonen

# LIST OF ORIGINAL PUBLICATIONS

I   Nyman-Salonen, P., Tourunen, A., Kykyri, V-L., Penttonen, M., Kaartinen, J., & Seikkula, J. (2021). Studying nonverbal synchrony in couple therapy—Observing implicit posture and movement synchrony. *Contemporary Family Therapy, 43*(1), 69–87. https://doi.org/10.1007/s10591-020-09555-5

II   Nyman-Salonen, P., Vall, B., Laitila, A., Borcsa, M., Penttonen, M., Tourunen, A., Kykyri, V-L., Kaartinen, J., Tsatsishvili, V., & Seikkula, J. (2020). Significant moments in a couple therapy session: Towards the integration of different modalities of analysis. In M. Ochs, M. Borcsa, J. Schweitzer (Eds.), *Systemic research in individual, couple, and family therapy and counseling, European Family Therapy Association Series* (pp. 55–73). Springer, Cham. https://doi.org/10.1007/978-3-030-36560-8_4

III   Nyman-Salonen, P., Kykyri, V-L., Tschacher, W., Muotka, J., Tourunen, A., Penttonen, M., & Seikkula, J. (2021). Nonverbal synchrony in couple therapy linked to clients' wellbeing and the therapeutic alliance. *Frontiers in Psychology*, 21. https://doi.org/10.3389/fpsyg.2021.718353

All studies used couple therapy data collected in the Relational Mind project. The author of this thesis developed an observational method that was used in Studies I and II. In Study I, the author extracted the data from the videos, conducted the analyses, and wrote, edited, and finalized the article based on the instructions and comments made by the coauthors. In Study II, the author of this thesis conducted the nonverbal synchrony analysis using the method developed in Study I. The coauthors Berta Vall and Aarno Laitila conducted the analysis of the verbal dialogue. The integration of the results from the different modalities was done jointly. The author of the thesis wrote the article and finalized it in accordance with comments on the manuscript by the coauthors. In Study III, a frame-differencing method was used to study nonverbal synchrony in couple therapy. The author of this thesis extracted the movement data using Motion Energy Analysis, and Professor Wolfgang Tschacher performed the Surrogate Synchrony computations. Joona Muotka assisted in the statistical calculations. The author of this thesis wrote, edited, and finalized the article in accordance with the coauthors' comments.

# FIGURES

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# 1   INTRODUCTION

"…when people move synchronously or in temporal coordination, they are participating in an aspect of the other's experience. They are partially living from the other's center." Daniel Stern, 2004, p. 81.

This dissertation is founded on my clinical and scientific interest in nonverbal behavior in psychotherapy. Psychotherapy has traditionally been called the "talking cure," but more recently, the nonverbal aspects of psychotherapy have been seen as equally important as the verbal content (Philippott et al., 2003). At the same time, research in social science has taken an affective or corporeal turn (Sheets-Johnstone, 2011, 2015), and research on affective and embodied aspects (e.g., bodily states or nonverbal behavior) has been increasing. One specific aspect of nonverbal behavior in psychotherapy, interpersonal coordination, is described in the quotation above by Daniel Stern. Interpersonal coordination occurs when two people adapt to each other in their nonverbal behaviors by, for instance, nodding together. Interpersonal coordination of nonverbal behaviors was researched in all the studies of this thesis.

The dualistic position of separating the body from the mind has always puzzled me, and I have intuitively felt that the picture of a psychotherapeutic encounter is insufficient when described only by verbal dialogue. I have been interested in nonverbal or bodily behavior in psychotherapy because of my own experiences as a clinical psychologist, where I have gained insights into the psychotherapeutic process via embodied channels (facial expressions, bodily postures, and prosody). I was very fortunate to be able to use the data collected in the *Relational Mind* research project (Seikkula et al., 2015), which studied the embodied aspects of interactions in couple therapy. The research project was designed and the data were collected by the researchers in the project.

The major aim of my dissertation was to study interpersonal coordination of nonverbal behavior between participants in couple therapy. Since the concept of nonverbal behavior is very broad, I concentrated on the movements of the participants' heads and bodies and excluded facial expressions or language-related prosody. I started the process by developing an observational coding system, Observing Nonverbal Synchrony (ONS), for depicting implicit imitation

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of nonverbal behavior in couple therapy because I was not satisfied with the preexisting methods that depicted synchrony. ONS was used in the first two studies; in the third study, interpersonal coordination was defined as movement synchrony and was depicted using a popular automated method, Motion Energy Analysis (MEA; Ramseyer & Tschacher, 2011). Synchrony was calculated using the Surrogate Synchrony algorithm (SUSY; Tschacher & Haken, 2019). I used another method in the study of interpersonal coordination because I was interested in familiarizing myself with the method, and it was feasible for use on the entire Relational Mind data set. The method was used for the first time in the context of couple therapy and a multiperson setting.

## 1.1   Interpersonal coordination

We automatically and implicitly coordinate our movements and nonverbal behaviors with one another in all encounters. It is a fundamental part of being human. For instance, two people walking together automatically adjust their walking speeds to each other. During verbal encounters, turn-taking is regulated by nonverbal signs. This pervasive phenomenon has been studied extensively in psychology.

*Interpersonal coordination* refers to the interpersonal temporal and/or morphological coordination of behaviors during social interaction. Interpersonal coordination is considered an umbrella term covering a wide range of research on the tendency of humans to coordinate or synchronize during interactions. Bernieri and Rosenthal (1991) described it as follows: "*Interpersonal coordination is the degree to which the behaviors in an interaction are nonrandom, patterned or synchronized in time and form*" (p. 403). According to them, interpersonal coordination serves an important function in communication, and signals involvement and rapport between interactants.

Bernieri and Rosenthal (1991) divided interpersonal coordination into *interactional synchrony* and *matching*. Interactional synchrony is, according to them, a dynamic process in which the behavioral cycles of two or more people become more congruent, whereas matching (which today is often called *mimicry*) occurs when two persons implicitly imitate each other's postures or movements. Both types of coordination have been studied extensively using different research designs. Both types were studied in couple therapy in the studies presented here (matching in Studies I and II and interactional synchrony in Study III). Today, there is a large field of research that concentrates on interpersonal coordination. In particular, studies on synchrony can be considered a prominent and developing field of research. One difficulty with the field is, however, the multitude of concepts used. In this thesis, the term *interpersonal coordination* will be used for the general phenomena of persons coordinating their behaviors, (*nonverbal*) *synchrony* will be used when reviewing research studies that have concentrated on movement synchrony calculated with algorithms (or when the study in question has used the term synchrony), and *mimicry* will be used for studies on implicit

imitation of movements. *Matching of postures and movements* will be used when postures and movements are implicitly imitated, as used in Studies I and II. Even though the two research traditions of mimicry and nonverbal synchrony have been quite separate, both traditions have been interested in the impact coordination has on interpersonal relations (Chartrand & Lakin, 2013; Vicaria & Dickens, 2016).

## 1.2 Interpersonal coordination affects us

The tendency to coordinate our behavior with each other seems to have a profound effect on interpersonal relations. One of the earliest research findings related the synchrony of movements and gestures to liking between participants (Maxwell et al., 1985). Since then, research has increased, and several meta-analyses and reviews have been written. Meta-analyses have shown that interpersonal coordination has a robust positive effect on relationship qualities (Mogan et al., 2017; Rennung & Göritz, 2016; Vicaria & Dickens, 2016). A review by Mogan et al. (2017) on synchrony reported that it increases prosocial behaviors *(medium-sized effect)*, enhances perceived social bonding (*small to medium effect*), improves social cognition (*small to medium effect*), and increases positive affect (*small effect*). Another meta-analysis on synchrony showed that it leads to both prosocial attitudes and behavior (Rennung & Göritz, 2016). A meta-analysis reported that interpersonal coordination leads to feelings of closeness, similarity, and entitativity, and to positive judgments of one's interaction partner, including liking and felt agreement, as well as to how smoothly the interaction was felt by the participants (Vicaria & Dickens, 2016). According to a recent review (Hoehl et al., 2021), synchrony helps in predicting the behavior of one's interaction partner, reducing cognitive load and resulting in affiliative gains between synchronized parties. Individual experiments have reported that synchrony causes greater cooperation among participants (Valdesolo et al., 2010) and diminishes self-advantageous behavior (Wiltermuth & Heath, 2009).

Research on mimicry (called *matching* by Bernieri & Rosenthal, 1991), which refers to implicit (e.g., unconscious) imitation of another person's postures, movements, or mannerisms demonstrates that it has an impact on the relationship between the interactants (for a review, see Chartrand & Lakin, 2013). As synchrony, mimicking influences the relationship in many positive ways: it increases liking (Chartrand & Bargh, 1999), rapport (Lakens & Stel, 2011), and trust (Guégen et al., 2013). Those who were mimicked were more prone to sharing personal information with strangers even though the information could be embarrassing (Guégen et al., 2013).

Mimicry increases when the participant's goal is to affiliate with others (Lakin & Chartrand, 2003) but decreases when there is a goal not to affiliate (Johnston, 2002). Persons with similar views were mimicked more (Van Swol & Drury, 2006) as well as attractive people (van Leeuwen et al., 2009). Mimicry increases after social exclusion (Over & Carpenter, 2009) and when one feels guilt

(Martin et al., 2010). All these results indicate that mimicry is an important component of establishing a relationship.

However, the features of the mimickers also affect the amount of mimicry. High self-monitors (who monitor and control their public image) mimic their peers more and mimic powerful people more than the powerless (Cheng & Chartrand, 2003). A positive mood in the mimicker was related to them mimicking more (Van Baaren et al., 2006). In addition, mimicry affects how others evaluate the mimicker; mimickers were evaluated as less socially competent if they had mimicked someone who was considered unfriendly (Kavanagh et al., 2011).

Even though studies have found mainly positive effects of interpersonal coordination on relationship quality, the relationship is moderated by other variables. Some studies suggest that the affiliation type between interactants affects interpersonal coordination: there is more coordination between friends than strangers (Cornejo et al., 2018; Latif et al., 2014), and there is more synchrony when the interaction is positive (Kimura & Daibo, 2006). In addition, more synchrony between interactants leads to positive effects (Tschacher et al., 2014), and even strangers dancing in synchrony have been reported to bond with each other (Tarr et al., 2016).

Even negative effects of interpersonal coordination have been demonstrated. Being in synchrony has been related to making people more easily manipulated into being aggressive toward others (Wiltermuth et al., 2012), blurring boundaries between persons (Paladino et al., 2010), and impairing self-regulation of affect (Galbusera et al., 2019).

Interpersonal coordination also seems to be influenced by contextual variables. It decreases in negative contexts, such as during arguments (Paxton & Dale, 2013), during interactions with a tardy partner (Miles et al., 2010), or when interacting with an out-group member (Bourgeois & Hess, 2008; Yabar et al., 2006). However, to complicate the picture further, it increased in a situation in which trust was violated (Cornejo et al., 2018): participants synchronized more with a confederate after a breach of trust, implicitly suggesting that synchrony is used as a means of repairing the connection to one's interaction partner. But what is the reason behind the fact that synchrony and mimicry affect relationship quality?

## 1.3   Why does interpersonal coordination affect us?

There are some theoretical suggestions on why interpersonal coordination affects relationship quality. One model is the *Russian-doll model of empathy* (de Waal, 2007; de Waal & Preston, 2017), according to which implicit imitation can be understood as a bottom-up process of empathy. During imitation of another's movements, one feels the movements within oneself and thus implicitly understands the other person better. Experimental studies on mimicry confirm this link: mimicry results in better emotional attunement (Stel & Vonk, 2010), and empathic persons tend to mimic others more (Finset & Ørnes, 2017; Sonnby-Borgström, 2002; Sonnby-Borgström & Jönsson, 2003).

The discovery of mirror neurons in the macaque monkey (Gallese et al., 1996) and in humans (for a review, see Rizzolatti & Graighero, 2004; for a meta-analysis, see Molenberghs et al., 2012) led to a paradigm shift in research from the individual perspective to the two-person perspective. In the mirror neuron system, the same neural circuits that are activated when performing a movement are activated by merely observing another making the movement with a shareable intention. The mirror neuron system has been reported to be involved in imitation by automatically mapping the observed movements onto a motor program (see Molenberghs et al., 2009) and has been demonstrated at least in the imitation of facial expressions and hand movements (Leslie et al., 2004).

According to Gallese et al. (2007), mirror neurons enable us to feel the other person's actions inside ourselves, *as if* we had done them ourselves. The mirror neuron system has been proposed as a neural basis for bottom-up empathy (Gallese, 2001) and an *embodied simulation mechanism* that enables us to be empathic (Gallese & Goldman, 1998; Gallese et al., 2007). Interestingly, persons suffering from disorders in empathy, such as highly functioning autistics or persons with Asperger's syndrome, seem to have deficits in how they imitate others in face-to-face interactions (Avikainen et al., 2003).

However, as the main claim has been that imitation relates to the bottom-up process of empathy, nonverbal synchrony has been linked to top-down empathy or cognitive empathy (i.e., perspective taking) as well. Nonverbal synchrony has been found to enhance the ability to reason about another person's mind (Baimel et al., 2018), partly by reducing the egocentric perspective and by making us concentrate on the person we are interacting with (Miles et al., 2010). It seems that implicit coordination affects us through many different pathways and impacts numerous aspects of our relationships.

It has been debated what the function of imitation is. Farmer, Ciaunica, and Hamilton (2018) recognized two differing views on how synchrony (or imitation) develops and what its function is. According to them, the *nativist view* stresses that implicit imitation occurs from birth and enables us to get connected to others and understand them, while the *empiricist associative learning account* emphasizes that imitation is a socially acquired process or skill through which we learn new motor skills (such as eating with a fork vs. eating with chopsticks) and how to live in the socially constructed reality.

Another framework describing how a link between two persons is established has been described by Fuchs and Koch (2014). According to their *embodied affectivity model*, the body functions as a medium of emotional perception. As we interact with others, we are impressed by the other's movements (or emotions), and we express our own emotions through movement. The affective qualities in the environment and our bodily resonance are in constant interaction and result in circular interaffectivity, and this embodied contact with the other(s) remains at the background of our awareness. This suggests a clear embodied link between interactants. Fuchs and De Jaegher (2009) stated that, during interaction, we are not deciphering or simulating the

movements of others but entering into a process of embodied interaction and generating common meaning through it.

Even though the frameworks of interpersonal coordination vary, they all have in common that they emphasize the meaning of embodied practices to enable us to connect with others. Thus, it is not surprising that research on interpersonal coordination has become a significant area of research.

## 1.4   Definitions of interpersonal coordination

Interpersonal coordination, specifically synchrony, has been studied in many domains: movements (cf. Lakens, 2010), electrodermal activity (Bar-Kalifa et al., 2019; Karvonen et al., 2016), pitch (e.g., vocal synchrony) (Imel et al., 2014; Reich et al., 2014), facial expressions (Golland et al., 2019), heart rate and heart rate variability, and breathing (Tschacher & Meier, 2020). Even neural synchronization during verbal interaction has been studied using hyperscanning methods (Jiang et al., 2021; for a review, see Mende & Schmidt, 2021), and synchrony between the interactants' brains has been documented in a variety of situations (Czeszumski et al., 2020).

Possibly due to the vast amount of research, the field is scattered, and many different concepts have been used to describe interpersonal coordination (see Table 1 for a non-exhaustive overview of studies from research fields closely related to psychotherapy). Interpersonal, interactional, and behavioral synchrony have often been used interchangeably; even the same authors use different concepts in different studies (cf. Miles et al., 2009: interpersonal synchrony; Miles et al., 2011: behavioral synchrony). There is no clear consensus in the field on what concepts should be used. In psychotherapy research, nonverbal synchrony has been used in the majority of studies on the subject (Altmann et al., 2019; Lutz et al., 2020, 2014; Paulick et al., 2018a, 2018b; Prinz et al., 2021; Ramseyer & Tschacher, 2011). In the studies, nonverbal synchrony is operationalized as synchrony of movement calculated with an algorithm.

TABLE 1      Concepts used in interpersonal coordination studies

| Concept | Article type | References |
|---|---|---|
| Interpersonal coordination | Review | Cornejo et al. (2017) |
| | | Vicaria and Dickens (2016) |
| | Experimental design | Richardson et al. (2007) |
| | Review of interpersonal coordination in psychotherapy | Wiltshire et al. (2020) |
| | Theoretical article | Mayo and Gordon (2020) |
| | Couples' head movements | Hammal et al. (2014) |

| Concept | Article type | References |
|---|---|---|
| | Brain research review | Mu et al. (2018) |
| Interpersonal synchrony | Experimental studies | Lumsden et al. (2014)<br>Miles et al. (2009) |
| | Neurological studies | Cacioppo et al. (2014) |
| | Infant studies | Trainor and Cirelli (2015)<br>Cirelli (2018) |
| | Psychotherapy studies | Galbusera et al. (2019) |
| | Methodological review | Delaherche et al. (2012) |
| Interactional synchrony | Review in social sciences | Hoehl et al. (2021) |
| | Mother–infant studies | Isabella and Belsky (1991) |
| Behavioral synchrony | Studies on infant–mother interactions | Feldman (2012)<br>Bell (2020)<br>Davis et al. (2017) |
| | Experimental studies | Miles et al. (2010)<br>Miles et al. (2011) |
| | Brain studies | Wheatley et al. (2012) |
| | Couples | Sharon-David et al. (2019) |
| Mimicry | Experimental designs concentrating on automatic imitation of movements, gestures or facial expressions. | Chartrand and Lakin (2003) |
| Matching | Communication studies on synchrony | Jones and Wirtz (2007) |
| | Experimental design | Floyd and Erbert (2003) |
| Nonverbal synchrony | Psychotherapy research | Ramseyer and Tschacher (2014)<br>Printz et al. (2021)<br>Paulick et al. (2018a, 2018b)<br>Lutz et al. (2020) |
| | Experimental design | Tschacher et al. (2014) |
| Movement synchrony | Experimental designs | Lakens (2010)<br>Lakens and Stel (2011) |
| | Infant studies | Tunçgenç et al. (2015)<br>Cirelli et al. (2017) |
| | Psychotherapy related research | Nagaoka and Komori (2008)<br>Altmann et al. (2021) |
| Mirroring | Experimental research | Van Swol (2003)<br>Manusov (1982) |

| Concept | Article type | References |
|---|---|---|
| | Studies on postural mirroring | LaFrance (1985) |
| Congruence* | Studies on postural congruence in psychotherapy | Maurer and Tindall (1983) Trout and Rosenfeld (1980) |
| | Early studies on postural congruence | Scheflen (1964) Beattie and Beattie (1981) |
| Joint action | Experimental research | Michael et al. (2016) McEllin et al. (2020) |
| Chameleon effect | Experimental research | Chartrand and Bargh (1999) Castelli et al. (2009) Casasanto et al. (2020) |
| Attunement | Studies on nonverbal behavior in depression and in seasonal affective disorder | Geerts et al. (1996) Geerts et al. (2000) |
| Convergence | Studies on nonverbal behavior in psychiatric disorders and experimental designs | Geerts et al. (2009) Bruder et al. (2012) |
| Automatic imitation | Experimental designs in the stimulus-response compatibility effect paradigm in which the imitation of for instance hand movements is studied (cognitive sciences) | Heyes (2011) Hogeveen and Obhi (2013) for a review: Gracco et al. (2018) |
| Motor resonance/ motor mimicry | Experimental designs in relation to mirror neuron system, infancy studies | Cross and Iacoboni (2014) Hogeveen and Obhi (2012) Paulus et al. (2011) |

*Note*: The list is not complete. Other concepts have been used for synchrony, such as entrainment (Cross et al., 2019; Shockley et al., 2007) and social coordination (Oullier et al., 2008).

* The term *congruence* was proposed by Carl Rogers (1957) and means that the therapist needed to be in touch with his feelings to be able to create an authentic relationship with the client. Congruence has been used to study the similarities between different modalities of interaction (Hill et al., 1981).

It is not only the concepts that vary but also the research methods and how interpersonal coordination is defined or operationalized. As stated above, interpersonal coordination has been studied using the two main operationalizations: matching (or mimicry or mirroring) and interactional (or movement or nonverbal) synchrony (Bernieri & Rosenthal, 1991).

These two operationalizations are morphologically different. Matching of movements, which is most often called mimicry, refers to a situation in which a person implicitly imitates or mirrors the other person's postures, gestures, or movements (Chartrand & Lakin, 2013). It can be considered a string of consecutive actions (Vicaria & Dickens, 2016). Mimicry can happen in a mirror-like constellation (one person moves her right arm, and the other person moves his left arm) or in an anatomical constellation (both persons move their right arms) (Cornejo et al., 2018). In most studies, the definition of mimicry is broad, including both mirror-like and anatomical imitation. Mimicry is quite

straightforward since it has its equivalence in the real world; it is intrinsically understandable and relatable, even for a clinician. This was the form of interpersonal coordination that I was originally interested in, partly because research on mimicry is very extensive, and partly because I had experiences of it occurring in my own praxis. This was examined in the first two studies.

The other form, interactional or nonverbal synchrony, can be defined as the dynamic and temporal coupling of movement (Bernieri & Rosenthal, 1991). Synchrony is often depicted by automated movement extraction methods (such as a frame-differencing method or software that automatically detects body parts) and an algorithm to calculate synchrony. Movement synchrony is a more abstract concept, referring more to the rhythmic coupling of movement between participants. What it looks like in real life is less clear. To understand how this kind of synchrony is depicted, one must understand how it has been calculated. Different algorithms for calculating synchrony exist, and they result in different depictions of synchrony (cf. Schoenherr et al., 2019).

## 1.5   Research methods used to study interpersonal coordination

Interpersonal coordination has been studied by either experimental designs or naturalistic observations; the methods used vary for both paradigms. As I began developing a coding scheme, it was necessary for me to review the various methods used to study it. I will first describe how experimental designs have been used, and then review the different methods that have been used in natural observations. Because one of my objectives was to understand what the synchrony calculations depict as synchrony (what synchrony depicted using these calculations looks like in real life), I will also describe the synchrony algorithms that have been used.

### 1.5.1   Experimental designs

The various experimental designs all have in common a specifically designed setting in which all variables are controlled so that the relationship between the independent and the dependent variable can be found. Experimental designs seek to answer i) what impact interpersonal coordination has on different variables (an example would be how the relationship between the coordinated participants is impacted by the coordination) or ii) what kind of situations impact the amount of implicitly occurring coordination between participants.

Mimicry studies are experimental in general and answer both questions above: what consequences participants mimicking or not mimicking have on a variable of interest (for instance, asking if mimicking has an impact on how much participants like the other person) (Stel et al., 2010), and what situations impacted mimicry (for instance, how much participants implicitly mimicked others when they had a goal to affiliate with the other (Lakin & Chartrand, 2003), or when the other person belonged to an in- or outgroup (Yabar et al., 2006).

In experimental studies, interpersonal coordination can be divided into *planned coordination* and *emergent coordination.* An example of planned coordination is making participants in an experiment rock their chairs in synchrony (Valdesolo et al., 2010), or making confederates mimic the participant (Stel et al., 2010; for a review of planned coordination studies and their social effects, see Cross et al., 2019). An example of emergent synchrony is when participants start to implicitly coordinate with each other, without being instructed to do so. In experimental studies, some variable of interest is manipulated, and the emergent coordination between the participants is then calculated (Miles et al., 2010; Richardson et al., 2012).

Only a few experimental studies on implicit coordination exist in clinical contexts. They used pseudo-patients (e.g., students receiving counseling). Sharpley et al. (2001) studied the relationship between implicit emergent mimicry and evaluated rapport by having pseudo-patients rate their feelings of rapport during a counseling session. Maurer and Tindall (1983) studied the effects of postural matching on clients' perceptions of the counselor's empathy, in which the counselor either mirrored the client's postures or not. Two studies used outside judges to evaluate the situation. A forward lean and eye contact made by the counselor was related to how empathic the counselor was considered by the judges (Dowell & Berman, 2013). Trout and Rosenfeld (1980) discovered that when the therapist and pseudo-client had their limbs in congruent positions and leaned forward, the judges reported more rapport between the therapist and client. Even though judges evaluated the sessions, they were experimental in the sense that the therapy situation or observed material was manipulated to contain the nonverbal behaviors of interest.

### 1.5.2 Naturalistic observation

Naturalistic observation is used in applied studies in contexts such as psychotherapy. Observational studies always study the emergent or implicit coordination of movements between participants in a natural context, such as psychotherapy. All of the studies in this thesis concentrate on emergent and implicit coordination between participants. Observational studies differ from experimental designs in that variables are not controlled for since it is a natural situation that is observed. This means that it becomes more difficult to determine how different variables are interrelated.

Observation was the first method used to study nonverbal behavior (and interpersonal coordination) in psychotherapy. It is time-consuming and requires trained raters. To obtain reliability, it is vital to precisely define what is observed and how frequently the behavior is annotated (Cappella, 1997; Delaherche et al., 2012). Individual behaviors are usually coded (Davis & Hadiks, 1990, 1994), but even coordination of postures and gestures between client and therapist (Raingruber, 2001) has been observed. Studies differ in how frequently observations are annotated. Behaviors have been rated every second (cf. Bavelas et al., 1987), or within a certain time interval (for instance, gestures in 30-second intervals) (Davis & Hadiks, 1990, 1994), or only in real-time as they appear (for

instance, postures in Davis & Hadiks, 1990, 1994). Traditionally, a micro-analytic procedure has been used in which many different behaviors of interest have been coded within a certain time segment, but as this has proven to be very time-consuming, the judgment method was developed. In the judgment method, observers do not rate the frequency of the behaviors but instead make a judgment using a Likert scale on the occurrence of certain predefined behaviors or other qualities of the interaction from longer segments of interaction (for instance, evaluating the smoothness of the interaction) (Bernieri et al., 1988; Cappella, 1997).

Naturalistic observation is a versatile method, and many aspects of the interaction can be observed simultaneously; however, the more dimensions observed, the more time-consuming it becomes and the more prone it is to errors. Even though there are caveats with observational studies, I chose to start my studies using observation. This choice was grounded in my wish to see what actually happened in the couple therapy sessions and how interpersonal coordination unfolded in the nonverbal behavior between participants. By reading about the use of observation, it was clear to me from the beginning that observation required that I strive to control the unambiguity of the observation process and define the coding scheme as concretely and precisely as possible. Another aspect was that I found it important to choose the method for annotating, which required as little judgment as possible by the observers. This was why I chose a microanalytic coding strategy and not the judgment method.

### 1.5.3 Automated methods for extracting movement

As a solution to the excessive time requirement for naturalistic observation, computer-based automated methods have been developed to depict movement from videos. Automated methods can be divided into two main methods. In the first method, participants wear motion-capturing devices, while in the second method, movement is extracted from videos. Motion capturing devices could interfere with the natural course of psychotherapy; thus, methods of extracting movements from psychotherapy videos are usually used. There are two main methods for extracting movements: a machine-learning method in which the researcher teaches the computer to distinguish between different body parts (such as OpenPose), and frame differencing methods, which depict movement based on changes in pixels between consecutive video frames (Grammer et al., 1999). It is not yet possible to use machine-learning methods or artificial intelligence on confidential psychotherapy material because of unresolved ethical issues. It is unethical to consider storing identifiable psychotherapy material, such as videos, on a foreign server or in the cloud.

Frame-differencing methods have become very popular in psychotherapy because of their noninvasiveness. One of the most popular methods is Motion Energy Analysis (MEA), which has been used frequently in the context of psychotherapy (Altmann et al., 2019; Lutz et al., 2020; Paulick et al., 2018a, 2018b; Ramseyer, 2020; Ramseyer & Tschacher, 2011; Schoenherr et al., 2019), and was used in Study III. These automated methods produce time series of movement

energy (frame differencing methods) or 2D coordinate point data (machine learning using, for instance, OpenPose, cf. Fujiwara et al., 2021) from predefined regions of interest. After obtaining the time series of individuals' movements by either traditional observation or automated methods, different algorithms are used to calculate synchrony between participants.

### 1.5.4 Calculating synchrony

As one of my objectives was to understand what synchrony obtained by these methods looks like in real life, it was important for me to go into depth with how synchrony was calculated by the different algorithms. In the next section, I will describe the calculations in detail to understand what kind of synchrony is depicted using the various methods.

Synchrony can be calculated based on the frequency of nonverbal behaviors, which are then correlated to each other. Synchrony calculated this way has been used mainly in mother–infant research (Reyna & Pickler, 2009). Synchrony is calculated as an index based on certain observed behaviors, which means that synchrony depicts concrete occurrences of behaviors and is thus easy to understand. However, in psychotherapy studies, synchrony is usually calculated in the time domain, meaning that first, the movement of the participants is obtained as a time series of movement energy by each participant. Then, synchrony is calculated with specific algorithms that calculate it as the movement of two participants that occurs simultaneously or within a certain time lag. When using frame-differencing methods that depict the movement energy of each participant, movement refers to any kind of movement done by the participant.

Algorithms that assume a linear relationship between the participants, such as correlations or regressions, are common in synchrony calculations. Correlations are the most common approach in psychotherapy research (Paulick et al., 2018a, 2018b; Ramseyer & Tschacher, 2011, 2014), but regression has been suggested as well (Altmann, 2011). Synchrony can also be calculated using the concordance index, which is a mathematically different approach. It has been used mainly on physiological data in psychotherapy (Tourunen et al., 2020; Tschacher & Meier, 2020), and thus I will not go into it here.

For correlations, either global measures that calculate the correlation based on the entire time series or local measures that divide the time series into shorter windows or segments have been used (Schoenherr et al., 2019). Local measures, such as Windowed-Cross-Lagged Correlations (WCLCs), have been used in the majority of the studies since social interaction tends to be nonstationary, meaning that the means and variances and the leader–follower relationships change over time; this leads to the violation of the nonstationarity assumption in calculations that are based on the entire time series (global correlational calculations). Splitting the time series into smaller segments takes care of this by assuming local stationarity within each segment (Boker et al., 2002; Schoenherr et al., 2019).

The synchrony computation can be done using either nonoverlapping windows or rolling/sliding windows (Boker et al., 2002). Both nonoverlapping windows (Paulick et al., 2018a, 2018b; Ramseyer & Tschacher, 2011, 2014) and

rolling/sliding windows (Altmann et al., 2020; Lutz et al., 2020; Prinz et al., 2021) have been used in psychotherapy studies. Nonoverlapping windows were used in Study III, in which the calculation of synchrony is a bit more straightforward than using the rolling/sliding windows calculation. Nonoverlapping windows might have the disadvantage of not detecting synchrony in the splitting point between the two windows. However, comparisons of these two methods of calculating nonverbal synchrony do not exist.

Within each window, Pearson's correlations between the movement energy of the two time series are calculated for all possible predefined lags in steps related to the sampling rate (10 fps in Study III). The correlations are then aggregated within each window and finally across all windows, yielding one value for dyadic synchrony for one therapy session (or segment of the session). It is important to understand that the synchrony value is based on the aggregation of synchrony calculated in several smaller segments, which could be markedly different from one another, and the calculations are based on movement energy within each time series. In the algorithms, the correlations can be calculated using the absolute or nonabsolute values. In the majority of studies on nonverbal synchrony, absolute values have been used. Using the absolute values confounds two different kinds of synchronies: positive correlations or in-phase synchrony, during which both participants start moving more or less in synchrony with each other, and negative correlations or anti-phase synchrony, during which one of the participants starts to move more and the other starts to move less, or vice versa. This means that what is depicted as synchrony looks very different in real life when using either absolute or nonabsolute values of synchrony.

The parameters used in the study (the window size and the time lag) are decided by the researcher; there is no consensus on what parameters should be used. In psychotherapy studies, a window size of 60 seconds and a time lag of +/-5 seconds are the most common. The time lag refers to the maximum lag between the two behaviors, which are assumed to be synchronous. There is no standard time lag, but researchers have used a maximum lag from 0.5 seconds (Latif et al., 2014) up to +/-5 seconds (Ramseyer & Tschacher, 2011, 2014). This means that, using a +/-5 s time lag, synchrony is calculated within 10 seconds. When studies on emergent synchrony in psychotherapy are compared to mimicry studies, shorter time lags have typically been used in mimicry studies (usually 3–8 seconds) (Chartrand & Lakin, 2013). One important aspect of using any kind of synchrony algorithm is to understand how the different parameters affect the synchrony calculations. For instance, when choosing the parameters, it is important to be aware of counterbalancing the time lag to the window size to obtain enough calculation points for the correlations (Schoenherr et al., 2019).

Other methods for calculating synchrony also exist. The peak-picking algorithm estimates the lag between the peak cross-correlation and zero lag (Delaherche et al., 2012). Cross-recurrence analysis (Louwerse et al., 2012) does not assume a linear relationship between the time series but assesses the *recurrence points* in time, in which two systems show similar patterns of

movement (trajectories in the matrixes). Spectral methods, such as the Cross-Wavelet Coherence Analysis (Fujiwara & Daibo, 2016; Fujiwara et al., 2021; see also Delaherche et al., 2012), analyze the coherence (similarity) between two time series. Cross-Wavelet Coherence Analysis (CWCA) does not assume stationarity between the time series, and the time series are not cut into windows, but the predetermined wavelet can be multiscaled depending on the data (Fujiwara et al., 2021). CWCA gives values of both in-phase and anti-phase, such as they are defined in experimental movement research (but not in WCLC). That is, in-phase refers to a situation in which two persons are doing, for instance, a biceps curl at exactly the same tempo and frequency; the movements are performed in the exact same phase and are thus identical to each other. Anti-phase, on the other hand, refers to a situation during biceps curls when one person has his arm straight and the other has his arm bent. Coherence between the time series is calculated using absolute values (Fujiwara et al., 2021), as in most cross-correlation methods.

Schoenherr et al. (2019) studied the convergent validity of the different synchrony algorithms used in psychotherapy research. They discovered that nonverbal synchrony does not seem to be a unidimensional construct, but a multidimensional one; the different algorithms depict different kinds of synchrony. For instance, global calculations on the entire time series vs. calculations in window split time series measure different subdimensions of synchrony. The WCLCs used in Study III measure, according to Schoenherr et al. (2019), the strength of synchrony of the total interaction, whereas a frequency calculating WCLC (Altmann, 2011), as well as window cross-lagged regression and cross-recurrence quantification analysis, denotes the frequency of synchrony in an interaction. A third kind of synchrony is depicted when peak-picking algorithms are used; it identifies the strength of synchrony in the identified synchronization intervals (Schoenherr et al., 2019).

One important step is to establish whether the synchrony observed occurred above the chance level. Bernieri et al. (1988) suggested comparing the observed synchrony to pseudosynchrony data sets in which the timelines of the two participants were shuffled so that the pseudosynchrony video comprised two participants who did not actually interact. Videos of real synchrony and pseudosynchrony were observed, and the results were compared to obtain the real effects of synchrony. When calculating the synchrony from the time series of movement energy, a surrogate synchrony procedure is implemented; for example, the original data is shuffled in a randomized manner so that movements that never occurred at the same time in the first place are paired (see Moulder et al., 2018 for different methods). See Figure 1, in which the green graph depicts the real nonverbal synchrony cross-correlations as a function of the respective lags. The red graph is the average of all surrogate time series and represents pseudosynchronies. Synchrony is considered significant if genuine synchrony scores are two standard deviations above the pseudosynchrony scores (one-sided t-tests, $p < 0.05$) (Delaherche et al., 2012).

FIGURE 1    Difference between real and pseudosynchronies for one dyad
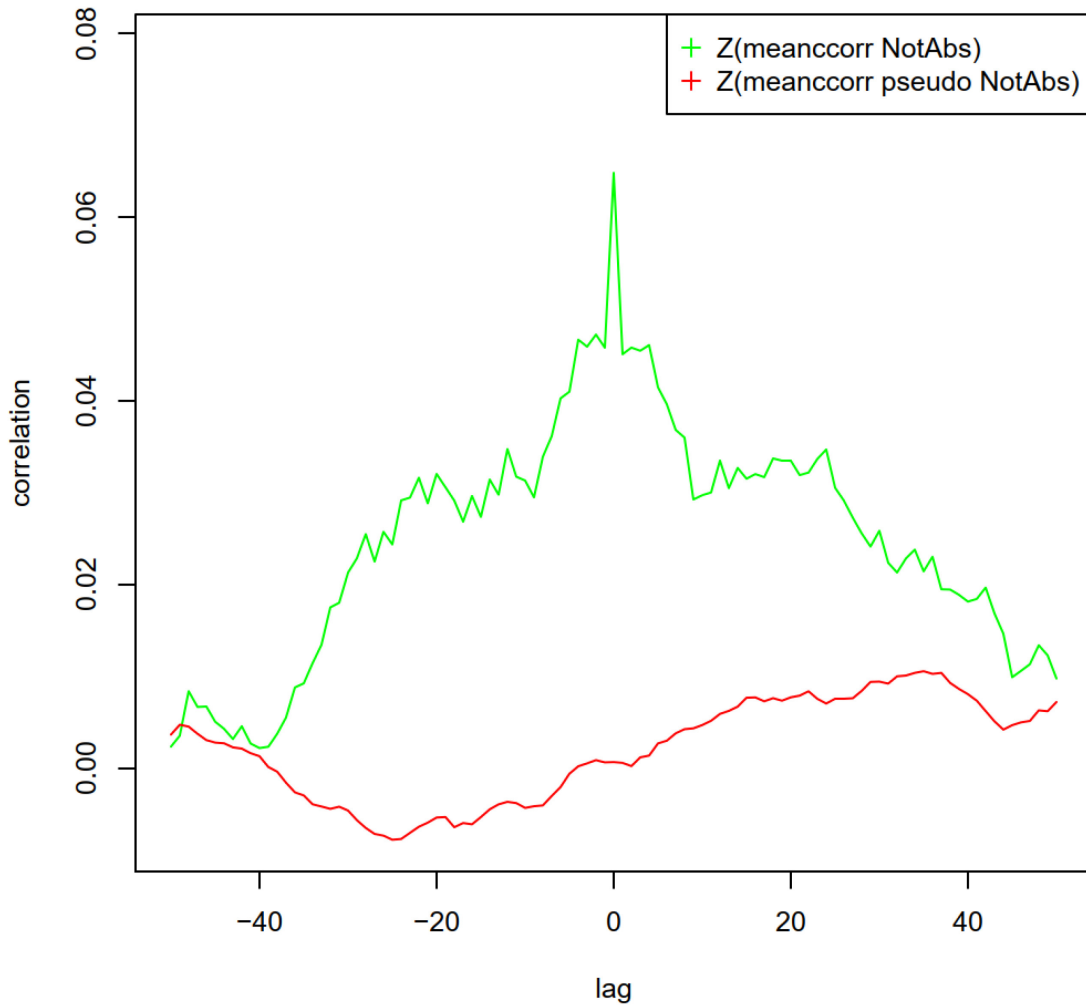


*Note.* The green line depicts the real nonverbal synchrony cross-correlations as a function of the respective lags. The red line is the average of all surrogate time series and represents pseudosynchronies.

One final point in the studies of nonverbal synchrony in psychotherapy is that in all of the studies, nonverbal synchrony was calculated from the first 15 minutes of the session (Altmann et al., 2019; Lutz et al., 2020; Paulick et al., 2018a, 2018b; Ramseyer, 2020; Ramseyer & Tschacher, 2011, 2014). This is based on two studies that calculated that synchrony within the first 15 minutes and found that it correlated with synchrony in the rest of the session (Paulick et al., 2018a; Ramseyer & Tschacher, 2011). In Study III, synchrony was calculated based on entire sessions, not just the first 15 minutes, because it has been suggested that synchrony changes as a function of time in psychotherapy sessions (Nagaoka & Komori, 2008).

### 1.5.5  Comparing manual and automated methods

Since both an observational method and an automated method were used in the studies presented here, comparing the two methods is important. The morphological level (i.e., what is defined as interpersonal coordination) is very different when comparing the observation of matching of postures and mimicking of movements with synchrony, as defined by frame-differencing methods. Synchrony calculated based on data from frame-differencing methods can be seen as a dynamic reciprocal adaptation of the temporal structure of behaviors, whereas mimicry (and matching) is a more static imitation of the movement or the exact physical appearance of the behaviors (Delaherche et al., 2012).

The methodological difficulty of using frame-differencing methods is that synchrony refers to any kind of simultaneously occurring movement in the regions of interest. This means that synchrony occurs despite the content of the movement. One person nodding and the other shaking his head is thus considered synchrony; synchrony also occurs when one of the participants does an adaptor movement (touches his face), and the other one nods. Delaherche et al. (2012) argued that synchrony calculated by the frame-differencing method could be just a co-occurrence of events without meaning. Partly because of this, the use of surrogate data calculations to assess whether synchrony occurred above chance level has been implemented (Moulder et al., 2018). This does not, however, answer the qualitative question of what kinds of movements were synchronized and whether synchrony was meaningful or not. This was why I started to develop my own coding scheme to depict interpersonal coordination, since I wanted to be completely sure that the coordination depicted would be ecologically valid, e.g., something that could be seen and experienced in real life.

More recently, Feniger-Schaal et al. (2021) studied whether movement depicted by MEA and synchrony calculated using WCLC with overlapping windows and a peak-picking algorithm were able to depict actual observed mimicry between participants as they played the Mirror Game. The Mirror Game is a common mimicry exercise in which the participants imitate each other's movement patterns. It is used in dance/movement therapy to enhance empathy (McGarry & Russo, 2011). They found a correlation between observations of mimicry and synchrony calculated by the algorithm.

Fujiwara compared several methods that depict nonverbal behavior and interpersonal coordination. His research group found a correlation between observation and a machine learning-based automated coding technique (OpenPose) of hand gestures and adaptors (Fujiwara & Daibo, 2016), but that observers rated more adaptors than the automated method depicted. When coordination of a broad range of behaviors (laughing together, gestural mirroring, postural mirroring, eye synchrony, head nods/shakes, verbal repetition and vocal synchrony, lower facial mimicry such as smiling or frowning, upper facial mimicry such as eyebrow synchrony, and synchrony of other temporal behaviors) was observed or depicted by a frame differencing method with synchrony calculated by different algorithms, Fujiwara et al. (2021) found that observer

ratings and WCLC synchrony were not significantly correlated but observation and CWCA synchrony were.

Fujiwara and Daibo (2022) compared matching and interactional synchrony using a machine learning technique (OpenPose) and found that matching and interpersonal synchrony were only weakly correlated. Importantly, the matching depicted by OpenPose was more precise than synchrony depicted by a frame-differencing method, since it calculated matching based on coordinates of the participants' body parts. Fujiwara and Daibo (2022) further studied how the coordination depicted were related to empathic accuracy and discovered that posture matching was positively associated with empathic accuracy, whereas interactional synchrony was negatively associated with thought accuracy in female dyads (more synchrony, less thought accuracy). This suggests that the two different kinds of interpersonal coordination differ from each other and could have distinguishable relationships with other variables as well.

Fujiwara et al. (2021) compared how the different synchrony algorithms (WCLC and CWCA) differentiated among the various levels of conversational involvement (low, high, and a control condition). WCLC separated high involvement from the control condition but did not differentiate between high involvement and low involvement, whereas CWCA differentiated all conditions. This could be due to the difference between the methods in that WCLC calculates synchrony in predefined windows (segments), whereas CWCA adjusts a fitted multiscale wavelength based on the data. Their comparison demonstrated that the synchrony algorithm used can have an impact on what kind of synchrony is depicted and on the relation of synchrony to other variables.

Fujiwara's research group's results are important, since they are the first to demonstrate that imitation of postures and movements and interactional synchrony are different kinds of synchrony that have separate and distinct connections to empathic accuracy. Their results also indicate that the different synchrony algorithms depict different kinds of synchrony, and that these different synchronies can have individual relations to other variables of interest.


## 1.6  Psychotherapy as a context


Nonverbal synchrony in psychotherapy is a growing area of research. Psychotherapy is a special form of interaction in which client and therapist work together to enable the client to work through and come to terms with difficulties in their lives. It is a professional relationship in which the roles of client and therapist are clearly defined, and the focus is on the client's life.

Traditionally, psychotherapy has been called the "talking cure" since the curative aspects of therapy have been thought to lie in the verbal dialogue between clients and therapists. The content of the psychotherapy session is influenced by the theoretical view of the therapist. The variables thought to facilitate change within the client differ among the various psychotherapy approaches. The two main pathways are insight (psychodynamic therapy) and

behavioral change (cognitive and behavioral therapies). The humanistic tradition (Rogers, 1958) emphasizes the relationship between the client and therapist as the curative ingredient in psychotherapy.

Psychotherapy research has concentrated on how effective psychotherapy is (outcome research) and what factors make psychotherapy efficient (process research). Outcome research has shown that psychotherapy is an effective form of treatment; the aggregate effect based on meta-analyses done over the years ranges from 0.75 to 0.85 (Imel & Wampold, 2015), showing therapy's strong efficacy. Differences between the efficacy of various therapy approaches have been difficult to find (Stiles et al., 1986; Wampold et al., 1997), probably because the various therapy approaches share factors that are curative in themselves.

Studying the psychotherapeutic process and the curative aspects of psychotherapy has revealed common factors in all psychotherapy approaches that contribute to the change process in psychotherapy. Some common factors have been put forward as vital for change to occur, such as the real relationship between client and therapist, the therapist's empathy, and the therapeutic alliance (cf. Cuijpers et al., 2019; Wampold, 2015). The therapeutic alliance, which refers to the collaborative and affective relationship between therapist and client, has been thoroughly studied and is thought to be one of the most important ingredients in successful therapy. Meta-analyses show that the alliance explains 7.5% of the variance in outcome (Horvath et al., 2011).

The classical definition of the therapeutic alliance comes from Bordin (1979), who defined it as the development of a bond (or a real relationship) between client and therapist and the agreement between client and therapist on the goals and the tasks of treatment. Recently, even embodied aspects of the therapeutic alliance have been emphasized. It has been suggested that the bond aspect of the therapeutic alliance is partly established by nonverbal synchrony (Koole & Tschacher, 2016). Body psychotherapist Soth (2006) suggested, based on his clinical experience, that the therapeutic alliance should be divided into a verbal and a nonverbal working alliance since there can be a discrepancy between how the therapist is able to form a working alliance in the two separate domains. In fact, earlier research has indicated that clients rate the sessions as better and the therapists as more facilitative when there is congruence in the therapist's verbal and nonverbal expressions of emotion (Hill et al., 1981).

These premises served as the starting points for the studies of this thesis. Nonverbal synchrony could be seen as an embodied marker of the therapeutic alliance (Koole & Tschacher, 2016) and as an important curative aspect of psychotherapy and the therapeutic relationship.

## 1.7   Couple therapy as a context

The context for the studies in this thesis is couple therapy, in which embodiment has been studied much less than in individual psychotherapy. Spouses come to couple therapy because of problems in their relationship. Couple distress has

detrimental consequences for the health of the spouses, leading to depression and adverse effects on cardiovascular, endocrine, immune, neurosensory, and other physiological systems (Kiekolt-Glaser & Newton, 2001).

Meta-analyses on the efficacy of couple therapy have reported a mean effect size of 0.84, indicating that the average person receiving treatment for couple distress was better off at termination than 80% of individuals in the no-treatment control group (Shadish & Baldwin, 2003). Similarly, as in individual psychotherapy, the difference between theoretical approaches in couple therapy has yet to be proven (Shadish & Baldwin, 2003; Snyder et al., 2006).

As in individual psychotherapy, the outcome in couple therapy has been related to common factors (Davis et al., 2012), such as motivated clients, therapists who are sufficiently active and interrupt destructive couple communication, but who at the same time are not overly active, so that couples can learn how to communicate effectively on their own (Blow et al., 2007), and of course, the therapeutic alliance (Davis et al., 2012; Symonds & Horvath, 2004).

What makes couple therapy different from individual psychotherapy is moving from a dyadic relationship to a multiperson setting. In individual psychotherapy, the client–therapist relationship is considered the healing component where changes should happen, but in couple therapy, the changes should happen in the relationship between spouses. In couple therapy with the spouses and one or two therapists, several kinds of relationships coexist: the relationship between the spouses, the relationship between the therapist and each spouse separately, and in the *Relational Mind* couple therapies, the collaborative relationship between two coworking therapists. These different kinds of relationships are also reflected in the different kinds of alliances that are formed in couple therapy (Pinsof & Catherall, 1986): i) the within-alliance between spouses, e.g., how the spouses agree on the tasks and goals of therapy and the strength of the therapeutic bond; and ii) the between-alliances, e.g., the alliance between the therapist and one of the spouses, and the alliance between the therapist and both spouses jointly (cf. Anderson & Johnson, 2010). The multiperson context brings yet another interesting dimension to the alliance, because one spouse can perceive their spouse's alliance with the therapist. With two co-therapists, the alliance patterns become even more complex.

In couple therapy, the different kinds of alliances have been differently related to the therapy outcome (Tilden et al., 2021). For instance, the spouses' joint alliance with the therapist and the other spouse's alliance with the therapist have been reported to be associated with the outcome (Tilden et al., 2021). Some research suggests that in couple therapy, it is not the actual strength of the alliance that is important, but that the therapist is able to balance the alliance between spouses (Sprenkle & Blow, 2004). When spouses agree on the strength of the alliance, the relationship between the alliance and the outcome becomes stronger (Symonds & Horvath, 2004). In couple therapy, split alliances can occur; in a split alliance, one spouse evaluates the alliance as strong, whereas the other spouse evaluates it as weaker. Split alliances have been associated with poorer

outcomes (Friedlander et al., 2018; Hughes et al., 2021; Symonds & Horvath, 2004) or dropout (Sotero & Relvas, 2021).

There are some indications of gender differences in how the alliance and outcome are related in couple therapy. The male client's alliance evaluations have been reported to be more important to the outcome than the female client's evaluation (Anker et al., 2010; Bourgeois et al., 1990; Friedlander et al., 2018; Glebova et al., 2011). Interestingly, when the female clients evaluated their partner's alliance with the therapist more positively, a better outcome for the therapy was more likely (Knobloch-Fedders et al., 2007). It might be that gender is not the real reason behind the differences, but rather the roles that the spouses have with each other or their attitudes toward therapy (who initiated therapy and their motivational level). Most often, gender is used in couple therapy studies as a separating variable since it is an easy way to distinguish between participants in couple therapy when the couple comprises a man and a woman. Same-sex couples are often excluded from the analysis (as in Bartle-Haring et al., 2012). There is less research on the therapeutic alliance in couple therapy for same-sex couples. It is presumable that some of the factors influencing couple therapy for heterosexual couples also influence couple therapy for same-sex couples, but it is also evident that there are differences in what aspects might be considered important by the couple (cf. Spitalnick & McNair, 2005).

Friedlander et al. (2005) created an observational method for observing alliances in family therapy: the System for Observing Family Therapy Alliance (SOFTA). In SOFTA, observers rate behavioral indicators of different factors in the session contributing to the alliance in family therapy. Matching of postures is included as nonverbal behavior in two dimensions: in the client's *emotional connection to the therapist* (as the client mirrors the therapist's body posture) and in the *shared sense of purpose within the family* (one family member mirrors another's posture). Emotional connection has been reported to be related to outcome and a shared sense of purpose to the alliance (Escudero et al., 2008). These results indicate that interpersonal coordination is important for the therapeutic alliance and outcome in couple therapy as well.

## 1.8   Embodiment and dialogism in psychotherapy

More recently, several authors have focused on the importance of considering nonverbal behavior in psychotherapy or clinical contexts (cf. Pally, 2001; Philippot et al., 2003). A corporeal turn has occurred, and the body has been reintroduced as something important to take into account (Sheets-Johnstone, 2009). Gallagher and Payne (2015) challenged traditional ways of thinking about clinical reasoning as something taking place in the therapist's head and pointed out that it is an embodied process that is manifested in the intersubjective field between client and therapist.

According to Daniel Stern (2004), psychotherapy is an intersubjective encounter, and we humans have an innate motivational force that drives us to

share our inner experiences with another person. He stressed that in psychotherapy, the implicit knowledge between client and therapist is formed through nonverbal behaviors, such as mutual gaze, a postural shift, a gesture, etc. (Stern, 2004). In Stern's view, humans have an innate intersubjective potential, and that through preverbal attunement with our caregiver, we start to understand other minds.

The *nativist view* of imitation (Farmer et al., 2018) claims that intersubjectivity is in our DNA and that mirror neurons facilitate our understanding of others. The claim is that we are from birth neurologically and biologically motivated to connect to other human beings because we are dependent on their care. Neonates participate in a preverbal dialogue with their caregiver, imitating and coordinating their behavior with them (Kugiumutzakis, 1999; Trevarthen, 1994, 1999, 2005; for a review, see Meltzoff & Brooks, 2007). This is seen as purposeful innate and preverbal intersubjectivity (Trevarthen & Aitken, 2001), proof that the newborn is an active agent in creating a relationship with the caregiver.

When we are in a relationship, there is much happening automatically in the implicit realm. Clients who are in psychotherapy often face difficulties in their relationships. The difficulties are often outside their awareness, yet influence the relationships. One way to describe these implicit, automatic ways of being with others was put forward by Lyons-Ruth (1999). She stated that early experiences form presymbolic representations of others and of how to be with them (Lyons-Ruth, 1999). Lyons-Ruth (1999) refers to these as procedural, relational, and implicit memories. These representations are activated in the therapeutic relationship (Lyons-Ruth, 1999; see also Soth, 2006). One of the therapist's tasks is not to get overly involved in the reactions but to provide the client with new corrective experiences of being in a relationship. When the context is couple therapy, these automatic, implicit procedural ways of relating to others are often manifested between spouses. It has been said that these relational representations have much more impact on the symbolic system than the symbolic system has on the implicit relational representations (cf. Lyons-Ruth, 1999). This poses challenges for the "talking cure" of psychotherapy and brings the body and the embodied therapeutic relationship into the center of psychotherapeutic change (Lyons-Ruth, 1999). Couple therapy is a fruitful context in which these implicit actions are enacted. The relationship between implicit procedural memories and interpersonal coordination has not yet been studied, but studies on mother–infant synchrony have shown that synchrony impacts the development of self-regulation, symbol use, and empathy across childhood and adolescence (Feldman, 2007). It thus seems highly likely that interpersonal coordination plays an important part in how we learn to relate to others.

Another way of conceptualizing how preverbal experiences shape us is presented in attachment theory (Bowlby, 1988). Attachment patterns can be seen as ways of relating to ourselves and the people around us. Attachment is a filter created by early memories through which one sees the world, oneself, and other

persons. Attachment patterns have been said to distort the encoding and decoding of nonverbal behavior (Noller, 2005). Nonverbal aspects of the therapist's attunement, e.g., matching of affect to the client, have been reported to have an impact on attachment patterns, whereas verbal aspects of attunement did not (Håvås et al., 2015). In couple therapy, understanding the spouses' attachment patterns can help the therapist understand why problems emerge in their relationship and why the spouses behave the way they do (Davila, 2003).

The important idea here is that intersubjectivity precedes subjectivity, and that these preverbal patterns of being in relationships are activated in the psychotherapeutic encounter. It seems that implicit imitation could be a rudimental form of intersubjectivity. My assumption is that research on interpersonal coordination is one way of trying to catch this kind of implicit intersubjective meeting.

Thus far, it seems that the embodied realm has been grossly underestimated in both psychotherapy practice and research. Leitan and Murray (2014) explored how the relationship between mind and body is explicated in the different psychotherapeutic approaches. They recognized three relationships: i) the dualistic position, in which the mind and body are seen as separate entities; ii) exclusivism, in which the psychotherapy approach concentrates solely on either mind or body; and iii) monism, in which mind and body are conceptualized as one holistic system, such that they are separate aspects of a single entity. A different stance is taken in each psychotherapeutic approach. In psychoanalysis and in different body therapy approaches, a monistic view is dominant; in cognitive psychotherapy, as well as in third-wave psychotherapies, a dualist conceptualization is dominant. Gregory Bateson, who inspired systemic therapies, saw mind and body in a monistic way as part of the same process (Bertrando & Gilli, 2008). Even though research on psychotherapy has concentrated solely on verbal dialogue, in family therapy practice, the mind and body are seen as intertwined and emotions are seen as developing in the realm between mind and body (Bertrando & Gilli, 2008). Thoughts influence emotions, but emotions are felt as bodily sensations.

Tantia (2014) posited that clinical intuition is embodied and present in gestures. Lyons-Ruth (1999) argued that the therapist can feel that something important just happened, even though it is not expressed verbally (Lyons-Ruth, 1999; see also Beebe & Lachmann, 1998). This similar moment is described by Stern et al. (1998), who stated that change in psychotherapy is facilitated by a *moment of meeting*, where the patient and therapist interact in ways that creates a new, implicit, intersubjective understanding of their relationship and permit a new "way-of-being-with-the-other".

One of the aims of the *Relational Mind* research project (Seikkula et al., 2015, 2018) was to combine information from different embodied modalities to obtain a fuller picture of verbal dialogue in combination with embodied information. In the project, both clients' and therapists' autonomic nervous system responses, such as electrodermal activity (EDA), heart rate, and respiration, were recorded in specific measurement sessions, usually the second and sixth sessions of

therapy. In the project, synchrony of participants' electrodermal activity (EDA) was studied (Karvonen et al., 2016; Tourunen et al., 2020), but individual participants' arousal level was combined with other modalities as well (Laitila et al., 2019, and Study II). EDA was used in Study II; it signals arousal that can be related to preparation of action or emotions that cause a tendency to act (Boucsein, 2012; Kreibig, 2010). In psychotherapy studies, arousal has been related to the therapist being empathic towards the client (Finset et al., 2011), to the therapist's taking initiative in the dialogue (Laitila et al., 2019), to moments of confrontation (Olson & Clairborn, 1990), and to identity blaming (Päivinen et al., 2016).

In the *Relational Mind* project, Stimulated Recall Interviews (SRI) (Kagan et al., 1963) were used after the measurement sessions. In the SRI, video clips from actual situations are shown after the situation to the participant, who is stimulated to recall certain events or thoughts she had in that particular situation (cf. Kykyri et al., in press). In the *Relational Mind* project, the researcher chose four clips from the session based on visible emotional expression from one or more participants, changes in the social interaction, or notable changes or indications of synchrony in EDA (Kykyri et al., 2017). The participants viewed the clips individually and were asked what thoughts, feelings, or bodily sensations they recalled having had at that time in the therapy session. In Study II, this information was used to gain a more complete understanding of the embodied reactions (EDA and posture and movement matching) in the session. The SRIs were previously used to study, for instance, verbal and nonverbal expression of emotions by client and therapist in psychotherapy (Hill et al., 1981), where the participants viewed 1-minute segments of the session and were asked questions about their emotions and the verbal and nonverbal channels of expression.

Before the start of the project, Seikkula (who was the principal investigator in *Relational Mind* during the years 2013–2018) had emphasized the embodied experience in psychotherapy, stating that clients and therapists often live in a joint embodied experience before it can be formulated into words (Seikkula, 2008). Seikkula (2011) is an advocate of dialogism and argues that humans are interconnected through dialogue. According to Seikkula (2011), dialogism is a way of life, not a therapeutic method. The essence of dialogism is that from birth, we are actively participating in dialogues with others. This is very nicely put by Mikael Bakhtin (1984): "*Life is by its very nature dialogic. To live means to participate in dialogue: to ask a question, to heed, to respond, to agree, and so forth. In this dialogue a person participates wholly and throughout his whole life: with his eyes, lips, hands, soul, spirit, with his whole body and deeds.*" (p. 293).

The dialogical view of psychotherapy emphasizes the coevolving processes of listening and understanding, and the importance of enabling all participants' points of view to be heard. The therapists do not have the right answers, but the goal of therapy is to generate a joint understanding of the situation; this stands in contrast to striving for consensus (Seikkula & Olson, 2003), which is the more traditional view of psychotherapy. The dialogical view of psychotherapy stresses dialogism, a polyphony of voices, and the importance of therapists being able to tolerate uncertainty (meaning that there is no right or wrong way of understanding a situation, just different points of view that coexist) and emotions.

According to the dialogical view, near relations take form in the mode of felt immediacy and in feelings that are felt in a preverbal form (Seikkula, 2008). The basis of the dialogical view lies in social constructionism and a holistic view of psychotherapy as an embodied practice. The importance of the embodied aspect of the dialogue is described by Seikkula and Trimble (2005) as follows: "*To support dialogical process, team members attend to how feelings are expressed by the many voices of the body: tears in the eye, constriction in the throat, changes in posture and facial expression.*" (p. 468). A similar view was put forward by Stern (2004), who stressed the intersubjectivity of our felt emotions and thoughts, which he saw as cocreated with others. In this way, Stern's view of intersubjectivity is largely dialogical.

The focus of the *Relational Mind* research project was to understand the participants' preverbal interconnectedness and the embodied practice of couple therapy. As I started to analyze the sessions, I began with the premise that interpersonal coordination can be seen as an embodied and nonverbal dialogue between participants. As one of the participants initiates the movement, the other one responds.

Other scholars have also stated that the embodied aspect of psychotherapy should be incorporated into professional practice (Green & Hopwood, 2015; Kinsella, 2015), clinical practice (Hauke & Kritikos, 2018; Philippot et al., 2003; Shaw, 2004), psychotherapy training (Gennaro et al., 2019), and psychotherapy research (Tschacher & Pfammatter, 2016). The embodied aspect of psychotherapy has also been suggested as a common factor (Tschacher & Pfammatter, 2016).

## 1.9   Nonverbal behavior in psychotherapy

The embodied side of psychotherapy is manifested through nonverbal behavior. Nonverbal behavior has always fascinated me because it is mostly outside of our awareness, but is relevant to many aspects of the clinical encounter: in diagnostics, in emotional and interactional regulation, in the therapeutic relationship, and in conveying empathy (Philippot et al., 2003). I consider nonverbal behavior one of the fundamental building blocks of the embodied side of interaction; as I am interested in the interpersonal coordination of specific nonverbal behaviors, I will now discuss research on nonverbal behavior in psychotherapy.

Research on nonverbal behavior in psychotherapy started in the 1960s with Ekman and Friesen (1969), who suggested that nonverbal behavior was a promising new source of information in psychotherapy research. They investigated the relationship between nonverbal behavior and psychopathology (Ekman & Friesen, 1974). By the 1990s, nonverbal behavior in psychotherapy was a growing research area. Hill and Stephany (1990) studied clients' head movements in therapy and reported that they were related to the client's feeling supported by the therapist. Both client and therapist related certain (horizontal)

head movements to therapeutic work, during which negative thoughts, behaviors, and feelings were expressed by the client.

Davis and Hadiks (1990, 1994) studied clients' and therapists' nonverbal behavior in several sessions from one therapy case using a coding scheme called Nonverbal Interaction and State Analysis (NISA) that they developed for observing nonverbal behaviors of client and therapist in psychotherapy. First, they studied the client's nonverbal behaviors separately and discovered that when the client shifted from superficial discussion to actively exploring her internal reactions, her bodily positions became more open and oriented toward the therapist (Davis & Hadiks, 1990). As they examined the therapist's nonverbal behaviors, they included the client's nonverbal behavior in the analyses and found a strong correlation between the client's and therapist's postures (Davis & Hadiks, 1994). They concluded that body movement patterns are physical manifestations of intrapsychic and relational processes.

Hall, Harrigan, and Rosenthal (1995) published a review on nonverbal behavior in clinical interactions, including psychotherapy and medical settings. They stated that "*Nonverbal communication is characterized by great subtlety, a fact that brings interesting methodological challenges, both because the phenomena are difficult to describe and because interactants are often unaware of their own and others' nonverbal behavior.*" (p. 22). They also introduced the provocative idea that the influence of nonverbal behavior is reciprocal and that both clients and therapists were influenced by each other's nonverbal behavior. It was provocative in the sense that, at that time, it was commonly thought that the clinician's task was to be neutral. Taking the therapists' nonverbal behavior into consideration, Taber (1997) published a review of therapists' nonverbal behavior, concluding that "*therapists must have a thorough understanding of their nonverbal behavior and how it may help the development of rapport with the client.*" (p. 37). Taber emphasized that therapists should show empathy and understanding by nonverbal means such as facial expressions, eye contact, and movements.

Troisi (1999) created an Ethological Coding System for Interviews (ECSI) for coding the nonverbal behavior of clients in psychiatric interviews. With ECSI, different nonverbal behavior patterns have been related to affiliation, submission, prosociality, flight, etc. Specific patterns of nonverbal behavior have been reported in depression (Bouhuys, 2003; Troisi, 1999; Troisi & Moles, 1999), schizophrenia (Kring & Earnst, 2003; Troisi, 1999), anxiety (Reinecke et al., 2020), and autism (Avikainen et al., 2003; McGee & Morrier, 2003). Differences in nonverbal behavior between schizophrenics, depressive and manic clients have been reported (Annen et al., 2012). It is stressed that these distinguishable nonverbal behavior patterns are observed implicitly in clinical encounters, and that they are important tools used in diagnostics.

A more recent meta-analysis (Henry et al., 2012) on nonverbal behavior in clinical encounters concluded that clinician warmth and listening to the client were related to the clients' satisfaction with the treatment (effect size 0.31), but that no specific nonverbal behaviors were related to the outcome of treatment. In all reviews and meta-analyses on nonverbal behavior, the conclusion is always threefold: First, research in nonverbal behavior has not been enhanced much in

recent decades (Hall et al., 1995; Henry et al., 2012); second, the mutual influence of clinicians (or therapists) and clients needs to be taken into account when studying nonverbal behavior; and third, nonverbal behavior is important and needs to be considered in clinical contexts and education.

One of the main reasons for the difficulties in researching nonverbal behavior is that nonverbal behaviors are not deterministic; their meaning changes depending on the context, the culture, and the persons involved. Some nonverbal behaviors convey information about emotions, some are communicational, and others express mental states or attitudes. The same nonverbal behavior can have different meanings in different situations. Interpreting the meaning of nonverbal behavior is thus a complex task. Because of this, and the various research methodologies and operationalizations of nonverbal behavior, it becomes difficult to compare studies, and the results cannot be aggregated into a larger pool of evidence that could help in developing a theory of nonverbal behavior in the clinical context.

## 1.10 Posture matching in psychotherapy

Before I was given the opportunity to join the *Relational Mind* research project, I planned to study posture matching in my own private practice. There were two reasons for this: I found it occurring repeatedly in my practice, and posture matching has been studied to some extent. Some of the earliest studies on nonverbal behavior in psychotherapy reported posture matching (Charny, 1966; Scheflen, 1964). Posture matching occurs when two people imitate each other's postures. Different concepts have been used, such as postural congruence, posture mirroring, posture matching, and posture synchrony. I will use posture matching, because matching in the word used by Bernieri and Rosenthal (1991), and matching does not imply that the imitated postures are mirror images.

Scheflen (1964) was among the first to study postural congruence (as he called it) in psychotherapy and family therapy. According to Scheflen, postural congruence was a manifestation of mutual identification and occurred when the participants in similar postures shared a similar view on the topic discussed. However, he also cautioned against interpretations that were too blunt, since he thought that there might be other underlying motives behind postural congruence. He found, for instance, that postural congruence could take place during an argument, and thus was a means of bonding to the other person while the relationship was under threat.

Charny (1966) studied matching of postures in a single psychotherapy session and reported that in a situation in which there was rapport and relatedness between client and therapist, they were in congruent postures. Maurer and Tindall (1983) reported that posture matching was related to the counselor's empathy; as counselors imitated the clients' postures, they were perceived to be more empathic.

Like Charny (1966), Sharpley et al. (2001) recently reported on rapport in relation to posture matching. They found different kinds of posture matching in moments of the sessions in which the clients evaluated being in rapport with the therapist. In moments of high rapport, there was more posture matching of the torsos. Qualitative inspection demonstrated that posture matching also lasted longer in situations in which there was high rapport between interactants.

As I was developing the coding scheme, it became important to clearly define what was meant by posture matching. Would I define posture matching as one behavior, where all the body parts had to match each other, or would I include partial posture matching like Sharpley et al. (2001), who divided posture matching into different categories based on the imitated body parts? I also needed to decide whether I would include mirrored or anatomical posture imitations. *Mirroring of postures* refers to a situation in which the two participants are sitting face-to-face, and the right arm of one and the left arm of the other are in the same posture. *Anatomical imitation* refers to a situation in which the two participants are sitting face-to-face, and both participants' right arms are in the same posture. Studies in the psychotherapeutic context have suggested that there is no felt difference between the two types (Raingruber, 2001; Scheflen, 1964); however, in other contexts, differences between the two forms of imitation have been reported.

To imitate in a mirror-like way rather than anatomically seems to be a spontaneous tendency in children and adults (Dunphy-Lelii, 2014; Erjavec & Horne, 2008). In interactions between babies and strangers, the babies tend to mirror imitate the adults, whereas the adults tend to imitate the babies anatomically (Cuadros et al., 2019). Mirroring has been put forward as a faster and more automatic form of imitation, whereas anatomical coordination appears to be more delayed in time and is associated with cognitive perspective taking (Avikainen et al., 2003; Erjavec & Horne, 2008; Pierpaoli et al., 2014; Ubaldi et al., 2015). Imitative coordination between friends is predominantly mirror-like, whereas anatomical mirroring is seen between strangers (Cornejo et al., 2018). These differences suggest that mirror-like imitation between friends is more emotional, whereas anatomical imitation that occurs between strangers occurs during more intellectual interactions (Cornejo et al., 2018). Individuals diagnosed with autism spectrum disorders show higher error rates in mirror-like imitations (Avikainen et al., 2003). This also supports the notion that mirror imitation is involved in affectively guided interactions and could be related to empathic deficiencies in autistic individuals (for a discussion on the topic, see Harmsen, 2019).

The two types of imitation have been put forward as two different strategies for understanding the actions and intentions of others (Sudo et al., 2012). Based on the research cited above and Davis and Hadiks' (1994) finding that posture matching occurred between client and therapist, and research in psychotherapy stating that both mirror-like and anatomical imitations were felt as important (Raingruber, 2001), I decided to include posture matching of both forms in the ONS coding scheme developed in Study I.

## 1.11 Mimicry in psychotherapy

Research on mimicry in psychotherapy is scarce, but postures (as described in the section above), gestures, facial expressions, and manner of speaking have been studied. Raingruber (2001) studied nonverbal manifestations of rapport between psychotherapist and client and reported that mimicking of both postures and gestures occurred in meaningful moments of therapy. The mimicry was implicit and involved a responsive reaction during interaction. Another study found that general practitioners mimicked their client's postures and gestures more often than psychiatrists (Davidsen & Fogtmann Fosgerau, 2015). Mimicry was interpreted as a form of implicit mentalization, e.g., being aware of and understanding the mental processes of oneself and others (cf. Fonagy & Lyuten, 2009)

Changes in mimicry of facial expressions, emotions, postures, and gestures were studied from psychotherapy videos in which the clients suffered from depression and obsessive-compulsive disorder (Kämpf et al., 2021). The clients mimicked the therapists less than the therapists mimicked them. Furthermore, the clients' amount of mimicking remained quite stable across therapy, whereas the therapists' amount of mimicry changed.

Facial expressions in relation to emotion regulation have also been studied (Bänninger-Huber, 1992). The Facial Action Coding System (FACS), created by Ekman and Friesen (1976), was used to detect prototypical affective micro sequences (PAMS) between client and therapist. In PAMS, the client strives to regulate her emotions by smiling to the therapist as a means of requesting that the therapist resonate with her or mimic her smile. Mimicry was found to strengthen the working alliance (Bänninger-Huber & Widmer, 1999); however, the researchers concluded that it is important for the therapist to be aware of what she is mimicking, so as not to strengthen, for instance, the patient's defensive strategies. A study on the changes in attunement of verbal and nonverbal behavior (speaking effort and encouragement) during interviews with depressed patients found that when the verbal and nonverbal attunement between therapist and client decreased during the course of the 20-minute interview, the more persistent the client's depression was 10 weeks later (Geerts et al., 1996). All of these studies demonstrate that mimicry in psychotherapy has been of some interest over the years.

## 1.12 Nonverbal synchrony in psychotherapy

Interpersonal coordination (called synchrony) of observed nonverbal behaviors was first studied by Condon and Ogston (1967), who found interpersonal coordination in a psychotherapeutic interview: when the mother spoke, the father and their son coordinated their nonverbal behavior to her. Koss and Rosenthal (1997) studied interpersonal coordination between doctors and clients

using observation, where trained judges evaluated the interaction based on simultaneous movement, tempo similarity, posture mirroring, and coordination and smoothness. They found that interpersonal coordination was related to clients' positive evaluations of the interaction. It was not until recently that additional research on interpersonal coordination in psychotherapy was conducted.

In psychotherapy research, interpersonal coordination of movements has been called *nonverbal synchrony*. Research on nonverbal synchrony in psychotherapy began to emerge after the pivotal studies by Ramseyer and Tschacher (2008, 2011, 2014). Nonverbal synchrony (e.g., interactional synchrony of movement energy) between client and therapist has been replicated in many studies (Altmann et al., 2019; Deres-Cohen et al., 2022; Lutz et al., 2020; Paulick et al., 2018a, 2018b). More synchrony between the client and therapist has been related to a stronger therapeutic alliance and to a better outcome for the client (fewer symptoms at the end of therapy) (Ramseyer & Tschacher, 2011). Interestingly, more head movement synchrony has been related to a better outcome of therapy, whereas more body movement synchrony has been related to the clients evaluating the sessions as better (Ramseyer & Tschacher, 2014).

After reading the seminal paper (Ramseyer & Tschacher, 2011) on nonverbal synchrony in psychotherapy, I was interested in what their depicted synchrony was. As I began my thesis around that time, I thought that their operationalization was too nonspecific or vague for my own purposes. I aimed to pinpoint synchrony at the exact moment it happened in the session, and to combine the information of synchrony with information from other modalities (EDA and verbal dialogue). At that time, my main concern was that using a frame-differencing method for movement extraction and calculating synchrony based on that meant synchrony would lose its meaning along the way. I was opposed to the fact that head movement synchrony could be one person shaking his head and the other one nodding; I thought this kind of synchrony would not be clinically relevant. This led me to develop the ONS method based on matching and mimicking.

Research on nonverbal synchrony in psychotherapy has increased immensely since the initial papers, and several aspects in relation to nonverbal synchrony in psychotherapy have been studied. Studies have revealed that the relationship between the amount of synchrony and outcome variables is not as straightforward as early research has indicated. A high amount of synchrony has not always been positive and has, for instance, been related to nonimproving clients (Paulick et al., 2018a), to sessions that therapists evaluated to be of lower quality (Ramseyer, 2020), and has even been reported as a marker of a confrontational alliance rupture (Deres-Cohen et al., 2021), e.g., a deterioration in the alliance, seen as a disagreement between client and therapist (Safran et al., 1990). A low amount of synchrony at the beginning of therapy has been related to nonimproving clients dropping out of therapy (Paulick et al., 2018a; Schoenherr et al., 2019), but also to faster improvement and a better outcome for clients who suffer from interpersonal difficulties (Lutz et al., 2020). Lutz et al.

(2020) assumed that some clients benefited from the therapist taking a more distant stance at the beginning of therapy, which was reflected in the therapist not synchronizing with the client. This could be in line with Lyons-Ruth's (1999) suggestion that the therapist need not be overly involved with the patient's reactions in order for new corrective experiences to be possible. It has been suggested that a medium level of synchrony would be most beneficial (Paulick et al., 2018a).

The appropriate amount of imitation has also been stressed in mimicry (outside the context of psychotherapy); an inappropriate amount of mimicking has been related to feelings of suspicion (Leander et al., 2012). Leander et al. (2012) propose that there are implicit standards for nonverbal behavior, that are highly dependent on the context: mimicry can be appropriate in one moment but seem inappropriate in the next.

The relationship between the therapist's interventions and nonverbal synchrony has been investigated in several studies. When therapists helped patients come to terms with past situations, there was more synchrony in the sessions, whereas in sessions in which the therapist helped patients become aware of their own resources and positive aspects, less synchrony occurred (Prinz et al., 2021). Interestingly, when therapists were supportive and empathic, there was more synchrony in the subsequent session (Deres-Cohen et al., 2022).

The relationship between the client's diagnosis and nonverbal synchrony has also been studied. It has been reported that patients with more symptoms at the beginning and end of therapy are less synchronized to the therapist (Ramseyer, 2020), as well as clients suffering from depression and anxiety (Altmann et al., 2021). However, the results are not clear because another study reported that depressive patients had less synchrony with the therapists at the beginning of therapy compared to patients with anxiety; this difference disappeared by the end of therapy (Paulick et al., 2018b). Yet another study reported that, as patients with social anxiety disorders were synchronized to the therapist, they reported fewer interpersonal problems at the end of therapy (Altmann et al., 2019). The differences found might be related to the differences in the study designs and measures used.

As for attachment styles, patients with higher attachment avoidance have been reported to synchronize more slowly with the therapist (Schoenherr et al., 2021). Feniger-Schaal et al. (2016) discovered that participants with a secure attachment mimicked others less in the Mirror Game than insecurely attached participants did.

Wiltshire (2020) conducted a meta-analysis on synchrony in psychotherapy and concluded that nonverbal (movement) synchrony was associated with psychotherapy outcome and the therapeutic alliance, whereas physiological synchrony was likewise associated with alliance but also with empathy. Wiltshire called for more research on nonverbal synchrony in the therapeutic process, using an idiographic perspective (e.g., including several sessions from the same case). Ramseyer (2020) did just that and reported that the relationship between

session-level outcome and nonverbal synchrony was weaker than in nomothetic studies (using one session per therapy case).

Cohen et al. (2021) compared the relationship between nonverbal synchrony and therapeutic alliance in the same therapy process (idiographic perspective) or between therapy processes (nomothetic perspective) and found that nonverbal synchrony and therapeutic alliance were associated only within and not between therapy cases. When the client and therapist evaluated the alliance as stronger, there was more synchrony in that particular dyad. Prinz et al. (2021) also found associations between nonverbal synchrony and therapeutic interventions only at the within-dyad level (within the therapy process). This could suggest that, when studying the relationship between nonverbal synchrony in detail, there are some specific properties of nonverbal synchrony within each dyad that can impact the results.

In conclusion, nonverbal synchrony between patient and therapist has repeatedly been reported in research, and it has an impact on therapeutic alliance and outcome. However, the relationship between nonverbal synchrony, client improvement, client diagnostics, and therapeutic interventions has given somewhat inconsistent results. I find it puzzling that none of these articles have commented on what nonverbal synchrony depicted with these automated methods looks like in real life. It is assumed that all studies, albeit using different synchrony calculation algorithms and parameters, depict the same thing.

## 1.13 Interpersonal coordination in couple therapy

Interpersonal coordination and nonverbal synchrony between the spouses and the therapist(s) has, to my knowledge, not been studied in couple therapy before the studies presented here. The *Relational Mind* project was the first to study synchrony in couple therapy (Seikkula et al., 2015, 2018), especially synchrony of the sympathetic nervous system (Karvonen et al., 2016; Karvonen, 2017) and its relationship to therapeutic alliance and outcome (Tourunen et al., 2020). At the beginning of therapy, sympathetic nervous system synchrony was lowest between spouses, intermediate between client and therapist, and strongest between co-therapists (Karvonen et al., 2016). Toward the end of therapy, the spouses' sympathetic nervous system synchrony increased (Tourunen et al., 2020).

The interpersonal coordination of nonverbal behaviors and nonverbal synchrony between participants was studied in the three studies presented here. The coding scheme developed in Study I was also used in a microanalytic case study on alliance formations (Kykyri et al., 2019), which studied how the therapeutic alliance was established multimodally through mimicry, sympathetic nervous system responses, and verbal discourse. Physiological synchrony and mimicry were observed not only between those who participated in the dialogue but also between the listeners. The SRIs revealed that participants who matched each other's postures or mimicked each other's movements often

shared a similar view of what had happened in the session, which was in line with Scheflen's (1964) early discoveries.

De Roten et al. (1999) studied nonverbal behavior (but not synchrony) in couple therapy. Specifically, they studied how body positioning in couple therapy was related to the therapeutic alliance. Body positioning refers to how participants include or exclude other participants by their orientation toward others. In the study, body formations (e.g., the patterns of subsequent body positionings) appeared much more predictable when the alliance was good: A triadic body formation (in which all participants were included) occurred over a longer period of time, a transitory disengagement phase occurred, and then the participants returned to the triadic body formation. Triads with weaker alliances had less predictable patterns of inclusion and exclusion. Interpersonal coordination in couple therapy is an understudied area, and more research is needed.

## 1.14 Interpersonal coordination between spouses

Some of the earliest research on interpersonal coordination was conducted on courtship behavior in dyads of the opposite sex, but no relationship between nonverbal synchrony and interest in the other person was found (Grammer et al., 1998, 1999). Interpersonal coordination between spouses has not been studied much, but there are some indications that coordination between spouses could be related to spouses' satisfaction with their relationship. Couples (N = 20) who were satisfied with their relationship coordinated more with each other in their level of immediacy behaviors, such as gaze, body openness and position, distance, and touching, which are said to regulate the distance between interactants (Julien et al., 2000). Nonverbal synchrony has been suggested as a stable indicator of spouses' satisfaction with their relationship and an indicator of emotional intimacy (N = 116 couples) (Garcia, 2021).

Spouses' experiences of being in synchrony were examined in a qualitative study on dance movement therapy (Engelhard, 2018). When couples (N = 9) experienced being in synchrony, most of the spouses reported that it felt pleasant and made them feel more creative, whereas when they were not synchronized, it made them feel lonely and detached. Comparing couples (N = 10) and strangers, couples who had been in a romantic relationship for at least one year did not synchronize with each other faster than strangers, but if the couple reported having good-quality interactions, they detected synchrony between themselves faster than strangers did (Preissmann et al., 2016). Synchronized imaginary walking led to higher levels of rapport and intimacy between spouses (N = 124 participants), and imaginary breathing in synchrony with one's spouse (N = 117) was related to rapport and sexual desire, which were mediated by feelings of closeness (Sharon-David et al., 2019).

Gottmann created the Specific Affect Coding System (SPAFF) for the purpose of systematically observing affective behavior in the context of marital

conflict (Coan & Gottmann, 2007). SPAFF does not study interpersonal coordination per se but is a multimodal coding scheme that concentrates on verbal content, facial behaviors, and tone of voice. However, within SPAFF, mimicking (or mirroring, as they call it) is mentioned as a marker of empathy (in the category "Affection," which depicts behavior that expresses genuine caring and concern and offers comfort), the function of which is to facilitate closeness and bonding.

These studies suggest that interpersonal coordination between spouses could be related to their satisfaction in their relationship, and that the same positive aspects that have been related to interpersonal coordination in general (Mogan et al., 2017; Vicaria & Dickens, 2016) apply to spouses, too. In the studies in this dissertation, interpersonal coordination was examined in the context of couple therapy to which spouses come when facing an impasse in their relationship, indicating that at least one of them is not satisfied with their relationship. Thus, it could be hypothesized that there might not be a large amount of interpersonal coordination between them.

## 1.15 Research aims and questions

The embodied level of psychotherapy has gained more attention in recent years from both researchers and clinicians, who have underlined its importance in the psychotherapeutic encounter (Gallagher & Payne, 2015; Koole & Tschacher, 2016; Philippot et al., 2003; Soth, 2006). The main aim of this dissertation was to study interpersonal coordination in couple therapy and how it is related to the therapeutic alliance, to other modalities of interaction, and to the spouses' wellbeing and therapy outcome.

To gain a comprehensive understanding of the function of interpersonal coordination in couple therapy, various research designs were used, including a microanalytic approach (Study II), a case study of one couple therapy process of nine sessions (Study I), and a study exploring the relationship between nonverbal synchrony, therapeutic alliance, and outcome in 29 couple therapy sessions (Study III).

The main aim of Study I was to develop a coding scheme to discover what types of implicit imitation (matching/mimicry) occurred between participants in couple therapy. This was done using observation. A qualitative and idiographic perspective was adopted, and one couple therapy process of nine sessions was observed in full. As mimicry has been related to positive consequences for relationships (Chartrand & Lakin, 2013), and posture matching to rapport (Sharpley et al., 2001), it was assumed that interpersonal coordination would be related to the therapeutic alliance. The research questions were: i) What kinds of implicit imitation (matching/mimicry) occur between participants in couple therapy? ii) How are the observed implicit imitation patterns related to the participants' evaluations of the therapeutic alliance?

Study II was a qualitative and multimodal microanalytic investigation of the relationship between the verbal dialogue and the embodied reactions (matching by the method developed in Study I and EDA arousal) of each participant in four important moments in one couple therapy session. In line with Cromby's (2012) suggestion that research methodologies in the social sciences need to become more multifaceted and include data sources other than spoken dialogue, new qualitative studies focusing on the multimodal interaction between participants in psychotherapy have been undertaken (Davidsen & Fogtmann Fosgerau, 2015; Kykyri et al., 2019; Laitila et al., 2019). Study II was inspired by these important preexisting studies on the subject. The aim was to integrate information from the different modalities (verbal dialogue, matching and mimicry, and arousal levels operationalized as skin conductance responses) to gain a fuller understanding of what meaning the participants' embodied reactions had in relation to the dialogue and the therapeutic process. We were particularly interested in finding out whether the different modalities told the same or a different story of the same moment in couple therapy. The study strived to enhance the clinical understanding of multimodal interaction in couple therapy. The research question was how the information from the different modalities (verbal and embodied) was interrelated—did the different modalities of information tell the same or a different story in four significant moments of therapy?

The main aim of Study III was to examine nonverbal synchrony on a larger sample of couple therapy sessions from the *Relational Mind* data set (29 sessions from 11 couple therapies) and its relationships to the clients' wellbeing, therapeutic alliance, and therapy outcome. An automated method to depict synchrony was used. The movement of each participant was extracted by MEA (Ramseyer & Tschacher, 2011), which is widely used in psychotherapy studies, and synchrony was computed using a WCLC algorithm with nonoverlapping windows (SUSY; Tschacher & Haken, 2019). It was hypothesized that nonverbal synchrony would be related to therapeutic alliance and outcome, as previous studies in individual psychotherapy have demonstrated (Ramseyer & Tschacher, 2011, 2014). The reason for using the automated method to depict synchrony was the author's interest in familiarizing herself with the popular method and the need to establish whether synchrony occurred above chance level. The research questions were: i) Does synchrony of head and body movements occur above chance level in couple therapy? ii) Is there a difference in head and body synchrony between the different kinds of dyads (client–client, client–therapist, and therapist–therapist) in couple therapy? iii) Are the nonverbal synchrony patterns in the sessions related to the wellbeing of the clients and to the therapeutic alliance evaluated by both spouses and the co-therapists?

The different research designs, with their associated levels of explanation (moment and session level, psychotherapy process level, and larger sample level), and the two different methods of depicting interpersonal coordination (matching and nonverbal synchrony), gave a broad picture of the function of interpersonal coordination in couple therapy.

# 2 METHODS

The couple therapy data from the research project *Relational Mind in Events of Change in Multiactor Therapeutic Dialogues* were used in all studies. The data were gathered at the Psychotherapy Training and Research Center of the University of Jyväskylä in 2013–2016. The research project was funded by the Academy of Finland. The research design and procedures were reviewed by the Human Sciences Ethics Committee at the University of Jyväskylä.

## 2.1 The *Relational Mind* and the dialogical perspective on psychotherapy

The main aim of the *Relational Mind* research project was to study embodied attunement and synchronization in couple therapy. Attunement was studied as synchrony in the autonomic nervous system (ANS) between participants in couple therapy. The research group emphasized the multidimensionality of dialogue between the participants, happening simultaneously in different modalities: the verbal dialogue and the autonomous nervous system (Seikkula et al., 2015). The name *Relational Mind* stems from a dialogical approach to the human mind and to life in general, where dialogue is understood as more than the conversation between people but involves the entire intersubjective field and how we are interconnected with each other at multiple levels (Dufva, 1998).

## 2.2 The *Relational Mind* research design

The *Relational Mind* research design was developed before the studies of this thesis were planned. Couple therapy with two therapists present was studied. The therapy was not manualized, but contained systemic and dialogical influences. In therapy, no bodily-based interventions were used; the treatment

concentrated on the verbal domain. All sessions were recorded with six cameras. Four cameras recorded each participant's face, and two cameras captured the entire body of the participants: one focused on the two clients and the other on the two therapists. For all research presented here, the videos showing the full bodies of the participants were used; they were edited to appear on the same screen. In some of the sessions, usually the second and the sixth sessions, all participants wore ANS recording devices: heart rate monitors (Firstbeat Bodyguard, Firstbeat Technologies, Jyväskylä, Finland) and skin conductance electrodes (Ag/AgC1, Ambu® Neuroline 710, Ballerup, Denmark), which were attached to the participant's nondominant palm below the first and fourth digits. A respiration belt (a fabric belt by BrainVision BP-BM-10, Brain Products, Gilching, Germany) was attached outside the clothes on the lower chest area. The EDA and respiration data were recorded using an amplifier (BrainProducts Brainamp ExG 16, Brain Products, Gilching, Germany) and a data acquisition program (BrainVision Recorder, Brain Products, Gilching, Germany). The sampling frequency was 1000 Hz. Skin conductance (SC) was determined using 0.5 V constant voltage (GSR sensor, Brain Products, Gilching, Germany). For more detailed information, see Karvonen (2017). Heart rate and respiration data were not used in the studies presented here.

After the measurement sessions, all participants were interviewed individually using the SRI (Kagan et al., 1963) paradigm, for which the researcher had chosen four 2–4 minute episodes from the actual session based on visible emotional expression, a notable change in interaction, or visible synchrony between the participants in their ANS measurements (EDA, respiration). For more details on the SRI procedure in the *Relational Mind* project, see Kykyri et al. (in press).

Before each session, the clients filled out an ultra-brief outcome measurement questionnaire, the Outcome Rating Scale (ORS; Miller et al., 2003), which depicts the clients' wellbeing on four items: general sense of wellbeing (Overall), personal wellbeing (Individual), wellbeing in relation to one's family and close relationships (Interpersonal), and wellbeing in relation to one's work or school and friendships (Social). The maximum score is 40 (10 points for each item), and the clinical cutoff score is 25 (Duncan & Miller, 2008). One study on couple therapy in Finland reported that the ORS had an internal consistency ranging from .77 to .89 among patients and from .87 to .96 among spouses (Kuhlman et al., 2013a).

After each session, all participants (i.e., clients and therapists) filled out the Session Rating Scale (SRS; Duncan et al., 2003), which is an ultrabrief questionnaire used to evaluate the therapeutic alliance in the session. It comprises four items depicting four aspects of alliance. The "Relationship" scale consists of "*I felt/did not feel heard, understood, and respected*," and the "Goals and Topics" scale consists of "*We worked on or talked about/did not work or talk about what I wanted to work on or talk about*." The "Approach or Method" scale requires rating the session based on whether "*The therapist's approach is/is not a good fit for me*." The fourth question rates the "Overall session" with the statement "*There*

*was something missing in the session today*" versus "*Overall, today's session was right for me.*" The maximum score is 40, where 39–40 is considered a good therapeutic alliance, 35–38 a fair alliance, and scores of 34 or below a poor alliance (Duncan & Miller, 2008). The clinical cutoff score for the SRS is 36 (Miller & Bargmann, 2012). In a study including the SRS, a Finnish couple therapy setting reported that the internal consistency (Cronbach's alpha, investigated for the first five sessions) for the SRS ranged from .79 to .91 among the patients, from .88 to .99 among the spouses, and from .72 to .91 among the therapists (Kuhlman et al., 2013b). The SRS questionnaire was not adapted specifically to the multiperson setting of couple therapy, the clients evaluated both therapists jointly, and the therapists evaluated both spouses.

To evaluate the outcome of therapy, the Clinical Outcomes in Routine Evaluation—Outcome Measure (CORE-OM) questionnaire (Barkham et al., 2001; Evans et al., 2002) was administered to the clients at the beginning of the therapy, at the end of therapy, and at a 6-month follow-up. The CORE-OM is an outcome measurement questionnaire that comprises 34 phrases with five levels of agreement or disagreement in four domains: subjective wellbeing, problems/symptoms (depression, anxiety, physical aspects, and effects of trauma), functioning (general functioning, social aspects, and close relationships), and risk to self or others (Barkham et al., 2001; Evans et al., 2002). Higher values represent more symptoms. The CORE-OM was validated in Finland and found to have good or acceptable internal consistency and strong convergent validity (Honkalampi et al., 2017). The validation process reported a clinical cutoff score in the Finnish population to be 9.5 points, which is comparable to the UK cutoff (10 points). The CORE-OM is best used for evaluating the change process in psychotherapy.

### 2.2.1 Participants

The *Relational Mind* data comprised 12 couple therapy cases. The cases were recruited via local collaborators, and some clients were referred to the project from a local crisis center. In half of the cases (*N* = 6), one of the spouses was the initiator, four cases were referred by a crisis center or another psychotherapist, and two cases sought help together. Most couples sought help to improve their relationship. Intimate partner violence occurred in three cases, which represented the proportion of intimate partner violence in the Finnish population fairly well (for results on intimate partner violence against women, see FRA, 2014, and for intimate partner violence against men, see Heiskanen & Ruuskanen, 2010). The perpetrators had gone to individual counseling or group meetings and were assessed for suitability for couple therapy before attending it, and the spouses had committed to nonviolence during therapy.

In all cases, two therapists worked as co-therapists. Half of the co-therapist dyads had previously worked together. Working in pairs is common practice at the Psychotherapy Training and Research Center of the University of Jyväskylä. Ten therapists worked with the couples, meaning that some therapists worked on more than one case (number of cases per therapist: *Min* = 1, *Max* = 3). Six of

the 10 therapists were female. The male therapists had, on average, more clinical experience (female therapists, $M$ = 22 years; male therapists, $M$ = 35 years).

### 2.2.2 Study I

All usable videos (sessions 2–10) from one couple therapy case were used. The first therapy session was omitted because the full-body video did not present all participants. The couple therapy case was chosen partly because one of the sessions was analyzed by the research group from different modalities, and the results were presented at a conference, and partly because the data were available when the development of the coding scheme started. The conference presentation resulted in a publication (Kykyri et al., 2019). Consequently, the development of the ONS coding scheme began by analyzing all the sessions from this case. During the analysis, sessions from other couples were also observed; however, the results were not included in Study I. This was decided because one couple therapy process was already observed completely, and the observational data would not have been balanced if it would have had included nine sessions from one couple therapy process and fewer couple therapy sessions from other cases.

The spouses had come to therapy because of loyalty issues in their relationship and intimate partner violence. The male client had been going to group meetings for perpetrators, and their group leader had suggested couple therapy. The wife was pregnant at the beginning of the therapy process, and the child was born in the middle of it. The clients were 36 and 42 years old. The co-therapists were both male, 60 and 63 years old, and experienced family therapists.

### 2.2.3 Study II

One measurement session from one couple therapy case was studied; the couple was not the same as in Study I. The couple therapy case was analyzed by the coauthors of Study II from different perspectives (the dialogue and the sympathetic nervous system responses, SRIs, and nonverbal synchrony), and the results were presented at a conference. This was the starting point of Study II.

The couple came to therapy because of feelings of disconnectedness and difficulties communicating with each other. The female client had suffered from postpartum depression and had been undergoing individual therapy. The couple was referred to couple therapy by the female client's therapist. The clients were 41 and 42 years old. The co-therapists were both male, 57 and 60 years old, and experienced family therapists (a different co-therapist dyad than in Study I).

### 2.2.4 Study III

The overall *Relational Mind* data set comprised 12 couple therapy cases, but of these, 11 couple therapy cases were selected for Study III. One couple therapy case was omitted because one of the clients suffered from compulsive movement patterns, distorting the movement data (the client frequently touched objects and played with them in her hands, so the movement patterns were very unusual).

Of the 11 couple therapy cases, 29 sessions (out of 69 sessions) were used. Forty sessions had to be omitted because inadequate video recordings meant that movement could not be depicted from all participants' regions of interest (because of disrupting elements in the videos, such as the presence of a baby (N = 6), or because not all participants were visible in the video).

Ten couples comprised male and female clients, and one couple comprised two female clients. Seven couples were married (out of which one was a registered partnership), three were living together, and one couple lived separately. The female clients were between 27 and 54 years old (*M* = 41), and the male clients were between 34 and 61 years old (*M* = 44). The mean duration of psychotherapy was six sessions, but the duration varied between cases (*Min* = 4, *Max* = 10). The clients' education ranged from primary education to a doctor's degree. The majority of the clients were employed.

Nine therapists worked with the couples; of these, five were female, and four were male. The combination of co-therapist dyads varied, but one dyad worked with two cases. Nine (out of the 11) co-therapist dyads were of the opposite gender, and two co-therapist dyads were of the same gender (both male). The therapists were between 31 and 62 years old (female therapists were 31–62 years old, and male therapists were 54–63 years old). All but one therapist had over 10 years of experience in clinical work, and six of the nine were experienced family therapists with advanced degrees.

## 2.3   Methods used to study interpersonal coordination

One of the objectives of this thesis was to study interpersonal coordination using two different methods. In Study I, a coding scheme for depicting implicit imitation of nonverbal behavior in psychotherapy was developed. ONS (Observing Nonverbal Synchrony) is a coding system for rating the matching of postures and movements between participants. The other method, MEA (Motion Energy Analysis), is an automated frame-differencing method to depict movement (Ramseyer & Tschacher, 2011) and a WCLC algorithm was used to compute dyadic synchrony (SUSY; Tschacher & Haken, 2019, https://embodiment.ch). Interpersonal coordination was operationalized differently in the two methods.

### 2.3.1   ONS

I developed the ONS coding scheme in Study I. The motivation for developing a new coding scheme arose from my interest in looking at specific instances of interpersonal coordination, specifically implicit imitation or matching of postures and movements, which preexisting methods did not depict. I started the development by watching the video recordings of couple therapy sessions from the case analyzed in Study I. The videos were edited to show the full bodies of all participants in a couple therapy session in a split screen format. I watched the videos without sound so that the spoken dialogue would not interfere with my

interpretations. Other sessions from other couple therapy cases were also observed (but these were omitted from Study I for the sake of clarity).

The coding scheme comprised two main categories: posture and movement matching, which were considered separately because of temporal differences. Posture matching lasted some time, whereas movement matching (mimicry) was a short "point event" with no duration (the definition came from the Noldus Observer program, which was used for the annotation). Posture matching was defined as two or more participants sharing an identical posture with their arms, legs, and torso; more specifically, the participants' hands and arms had to be in a similar position in relation to their legs and the armchairs, and their hands needed to be in a similar configuration (for instance, hands folded and hands with fingers touching each other were not considered posture matching). Changes in posture were not included in the coding scheme, but posture matching was only coded when two (or more) participants were in the identical posture. For posture matching, both mirror and anatomical (congruent) postures were included since earlier research has indicated that the felt difference between these two is not important in psychotherapy (Raingruber, 2001). Furthermore, if only mirror images had been included, this would have led to a very complex coding scheme and posed difficulties in observing posture matching between three or four persons. Movement matching was defined as two or more participants making a similar movement with their head, torso, arms, hands, or legs within 3 seconds. The lag used in mimicry studies varies between 3 and 8 seconds (Chartrand & Lakin, 2013). A lag of three seconds was chosen since it has been found that shorter intervals are felt by the participants as belonging together (Bailenson et al., 2004; Bailenson & Yee, 2005). In addition, we spoke with Markku Penttonen, a senior researcher in neuroscience, with whom we discussed that the brain perceives movement in milliseconds, and the execution of motor movement occurs in milliseconds as well (cf. Wittmann, 2016). We also discussed what the timespan could be when one feels the other's movement within oneself. Based on the discussion, I chose a shorter time lag of 3 seconds.

Posture and movement matching were observed between two, three, or four persons, resulting in a subject structure of dyads, triads, and one tetrad. For both categories of matching, the order in which the behavior occurred was coded. For posture matching, this meant coding who took the other's posture, and who left the shared posture. For movement matching, it was observed whether the movement was simultaneous, or which of the participants followed the other.

In this thesis, the terms *posture matching* and *movement matching* are used, but the coding scheme was named *Observing Nonverbal Synchrony*, and in the published article the terms *posture synchrony* and *movement synchrony* were chosen. The terminology used to study interpersonal coordination is inconsistent in the literature, and synchrony was chosen in the article because of its broader use (compared to matching).

The coding scheme in its simple form is presented in Table 2. A more detailed scheme is available from the author. The coding scheme was used in Studies I and II.

TABLE 2        Coding scheme for Observing Nonverbal Synchrony (ONS)

| Behavior | Operational definition |
| --- | --- |
| Posture matching | Two or more participants being in a similar posture with their arms and legs, for instance, both arms on the armchairs with both palms facing a similar direction. |
| Head movement matching | Two or more participants making the same head movement within a 3-second interval, such as nodding. The peak of the movements (chin up) needed to happen within 3 seconds. |
| Arm movement matching | Two or more participants making the same movement with their arms (from the shoulder to the hand). The peak of the movement occurred within a 3-second interval, for instance, touching their face with their hands (adaptor movement). |
| Torso movement matching | Two or more participants making the same movement with their torsos, for instance, leaning to one side or stretching their torsos. |
| Hand movement matching | Two or more participants making the same movement with their hands within a 3-second interval, such as tapping with their fingers. |
| Leg movement matching | Two or more participants making the same movement with their legs within a 3-second interval, for instance, crossing their legs. |
| Other movement matching | Two or more participants making a similar movement within a 3-second interval that did not fit into the aforementioned categories; for instance, two participants leaning forward to pick something up. |

To establish interrater reliability of the coding scheme, four undergraduate students observed and scored sessions individually. First, they were taught to use the coding scheme and the Noldus Observer program (versions 11.5 and 12.5). Then, all raters observed one session individually, and the results were compared with the author. Disagreements were discussed, and the coding scheme was further elaborated upon. After this, the four raters observed and scored two sessions individually (two raters observed two of the same sessions and the other two raters observed two other sessions), as described in Table 3. During the development of the coding scheme, disagreements about coding were discussed, and the definitions of what was considered matching were clarified. This was needed for the development of the coding scheme.

TABLE 3        Observed sessions by raters

|  | Rater 1 | Rater 2 | Rater 3 | Rater 4 | Rater 5 |
| --- | --- | --- | --- | --- | --- |
| Sessions | 2–10 | 3, 10 | 3, 10 | 6, 10 | 6, 10 |

Note. Session 10 was observed by four raters, session 3 by two raters, and session 6 by two raters.

The interrater reliability was calculated with Noldus Observer version 12.5, which calculates pairwise reliability based on the frequency and sequence of the behaviors observed in time intervals of 1 s. The overall index of concordance was

0.85, the percentage of agreement was 84.5%, and Cohen's kappa was 0.84 ($p <$ 0.001). Cohen's kappa max was 0.95 and Pearson's r was 0.99 ($p < 0.001$). The prevalence index (which states the degree to which a particular event occurs more in one group of subjects than in another event) was 0.9. The interrater reliability was nearly perfect (Landis & Koch, 1977).

### 2.3.2 MEA and SUSY

MEA (Ramseyer & Tschacher, 2011) is a frame-differencing method designed to quantify movements from video recordings. It extracts movement by calculating gray-scale pixel changes between consecutive frames. The changes are calculated within the regions of interest (ROIs), which are manually defined on the video screen. In the couple therapy videos, eight ROIs were designated: head and body ROIs for each participant in the session. The ROIs of each participant were manually checked before the actual analysis to ensure that no overlapping of movement from one participant to another participant's ROI occurred. The videos were first converted to 10 frames per second, and the threshold for pixel changes was set to 15 (the default). MEA created timelines of movement energy for each ROI for the entire therapy session. Spurious peaks at the beginning of the recording lasting less than one second were removed.

Synchrony between the different participants' ROIs was calculated using the SUSY procedure (Tschacher & Haken, 2019). SUSY is a WCLC method that divides the time series into nonoverlapping window segments. A size of 30 seconds was chosen for this study, although 60 seconds is the most common in psychotherapy studies. The selection was based on preliminary synchrony calculations on the time series, which showed that the 30-second window was best suited for distinguishing real synchrony from pseudosynchrony in a multiperson setting. In each window (segment), cross-correlations were calculated in time lags of +/- 5 seconds by shifting one of the time series stepwise in 0.1-second steps in relation to the other one. The cross-correlations were standardized using Fisher's Z. The cross-correlations were then aggregated to a mean Z value of nonverbal synchrony for all lags separately in each segment. The mean Z value of nonverbal synchrony for the entire therapy session was then calculated by averaging the mean Z values of all segments. The mean Z value was obtained for each dyad for each session. The mean Z value can be computed using the absolute values from the cross-correlations (by converting negative values into positive ones), or the nonabsolute values of the cross-correlations. The nonabsolute Z-values enabled distinguishing between in-phase synchrony (positive Z values) and anti-phase synchrony (negative Z values). In-phase synchrony refers to both participants' movement energy rising or falling simultaneously or in succession, and anti-phase synchrony refers to one person moving more and the other person moving less. Most previously published studies used absolute values. However, I wanted to use the nonabsolute values of synchrony in this study to obtain a more elaborate picture of what kind of synchrony occurred between the dyads in a multiperson setting.

To establish whether the empirically found synchrony occurred above chance, SUSY creates a randomized synchrony data set, i.e., pseudosynchrony, by shuffling the windows/segments of the timelines, and coupling windows that never occurred at the same time in real life. The synchrony computation was then performed on these pseudopairs in the same manner as the original data. The empirically collected synchrony was compared to the pseudosynchrony to calculate the effect size for the real synchrony. The effect size of nonabsolute nonverbal synchrony was calculated as follows:

$$ES_{noabs} = (Z_{noabs} - Z_{noabs-pseudo}) / SD(Z_{noabs-pseudo}).$$

Contrary to earlier research that calculated synchrony from parts of the session, synchrony was calculated based on the movement time series from entire psychotherapy sessions. Because of this huge amount of data, the web-based algorithm did not manage to calculate the synchronies; thus, Wolfgang Tschacher performed SUSY calculations on the data.

## 2.4   Analyses and methods in each study

### 2.4.1   Study I

In this study, both qualitative and quantitative methods were used. The observed frequencies of the posture and movement matching were qualitatively triangulated with the participants' evaluations of the alliance as measured with the ultrabrief version of the Session Rating Scale (Duncan et al., 2003), which each participant filled in after every session. The association between the frequencies of matching and alliance ratings was calculated using bootstrapped nonparametric correlations bootstrapped with 95% confidence intervals. The subscales (Relationship, Goals and Topics, Approach or Method, and Overall) and the sum of the subscales were used, but the quantitative results were only published as an appendix in the article.

The differences in the frequency of posture and movement matching between sessions were calculated using General Estimated Equations (GEE) with a nonparametric Poisson log-linear model. GEE is an extension of the general linear model and is suited for calculating data from a repeated measure design in which the cases are not independent (Wang, 2014). All statistical analyses were performed using IBM Statistics version 24.

### 2.4.2   Study II

This qualitative study integrated information from the dialogue, the arousal level (skin conductance responses) of each participant, and the frequencies of posture and movement matching between participants in the session. Moreover,

information from SRIs was used to shed light on the inner thoughts and emotions that the participants recalled having experienced in the session.

The dialogue was investigated with the Dialogical Investigations in Happenings of Change (DIHC) (Seikkula et al., 2011), and the analysis was performed by Aarno Laitila and Berta Vall. In DIHC, the therapy session was first divided into topical episodes (TE) based on the theme that was spoken of. The length of the TEs varied from 139 to 441 seconds. Second, the quality of the conversation was rated as either dialogical or monological, and the dominance of who was speaking the most (quantitative dominance), who regulated the topics spoken of (semantic dominance), and who regulated the turns (interactional dominance) were determined. Third, the dialogue was analyzed with the Narrative Process Coding System (Angus et al., 1999; Angus et al., 2013; Laitila et al., 2005), which classifies the dialogue into three different modes based on its qualities: (i) what was talked about (External mode, i.e., accounts and descriptions of events that could be both real and imaginary), (ii) descriptions of experiences and feelings (Internal mode), and (iii) reflecting on meanings or meaning making (Reflexive mode).

The EDA of the participants was recorded with two skin conductance electrodes attached to the palm of their nondominant hand (for more information, see the Methods section above). Skin conductance responses (SCR) were phasic changes in EDA that represented rapid sympathetic nervous system activation in response to internal or external stimuli. These responses are automatic and cannot usually be controlled voluntarily. The SCRs were extracted with the LEDALAB program package written in Matlab (Benedek & Kaernbach, 2010). The SCRs for each participant were resampled into 1 Hz and standardized (the session mean was subtracted from the raw scores and divided by the standard deviation) to obtain comparable values for each participant. In this way, the changes in the participants' arousal were compared to their own average arousal during the session. The SCRs were then averaged for each TE for each participant. The extraction method was used in a case study conducted by Laitila et al. (2019). The arousal level of each participant during the TEs was the average SCR amplitude within it.

In this case study, the arousal levels (i.e., the average SCRs) were used qualitatively, meaning that we assigned meanings to the different arousal levels as follows: An SCR value near 0 indicated the average level of the participant's arousal in the session. SCRs between 0.1 and 0.3 indicated some arousal, SCRs above 0.3 indicated high arousal, and SCRs below zero meant lower arousal than the mean of the participant in the session. SCRs between -0.1 and -0.3 indicated low arousal, and SCRs below -0.3 indicated very low arousal.

Nonverbal (i.e., posture, and movement) matching between participants in the session was depicted using the ONS coding scheme. I observed the matching using the Noldus Observer program (version 12.5).

The integration of the information from all modalities was done by myself, Aarno Laitila, and Berta Vall. The integration began with successive inspections of the dialogue, the participants' average SCRs, and posture and movement

matching in each TE. After this, the analysis was undertaken from another perspective, namely, the information the individual participants recalled in the SRIs when they watched four clips the researcher had selected from the session. The individually enclosed information in the SRIs of the participant's inner thoughts and feelings was used to understand what happened in the session in the dialogue (DICH), the electrodermal activity (SCR), and nonverbal matching patterns. The integrative and multimodal analysis aimed to combine information from all the modalities focused on the four significant moments, i.e., the video clips shown to the participants in the SRIs.

### 2.4.3 Study III

Movement was extracted using MEA (Ramseyer & Tschacher, 2011) on 29 therapy sessions, of which 17 were measurement sessions and 12 were regular sessions from 11 couple therapy cases. Dyadic synchrony was calculated using SUSY (Tschacher & Haken, 2019). Head and body movement synchrony was calculated in six dyads: client–client, therapist–therapist, and four client–therapist dyads. SUSY yielded effect sizes for each dyadic synchrony. The significance of each dyadic effect size was calculated using one-sample t-tests. The hierarchical structure of the data was checked by calculating the ICCs in Mplus. Cohen's $d$ was calculated to obtain the overall effect size for the sample of sessions. Cohen's $d$ was calculated as follows: The difference between the mean $Z_{noabs}$ (the mean of all empirically found cross correlations) of all sessions and the mean $Z_{noabs-pseudo}$ (the mean of the surrogate data set cross correlations) was divided by the standard deviation of the $Z_{noabs-pseudo}$ (the standard deviation of the surrogate data set).

Because of the hierarchical structure of the data (sessions within cases), complex models in Mplus were used since they took into account the hierarchical structure of the data using maximum likelihood as an estimator, correcting the p-values. This calculates correlational relations for hierarchical data. Complex models were used i) to compare means between participants for individual movement, ii) to compare the amount of individual movement and synchrony between the different dyad types (client–client, therapist–therapist, and client–therapist), and iii) to calculate the relation between the dyadic synchrony values and the outcome measurements (ORS, SRS). As there was a large portion of missing data in CORE-OM, complex models were not used, but Spearman's rank order correlations were calculated in SPSS version 26 with one aggregated synchrony value per dyad per case (the mean from different sessions of that case) and the correlation to CORE-OM scores. Since the data set was very small (N = 29), the results should be considered exploratory.

## 2.5   Overview of the methods in the original studies

An overview of the studies (participants, data and method) is shown in Table 4.

TABLE 4    Overview of the original studies

|  | Participants | Data | Method |
|---|---|---|---|
| Study I | 1 couple therapy case, comprising 9 sessions. | Observations of posture and movement matching by ONS Alliance evaluations of the session with the SRS filled out by each participant | Triangulation of the matching patterns and each participants' evaluations of the alliance (nonparametric correlations were also calculated). Differences between sessions were calculated using GEE. |
| Study II | 1 couple therapy session (measurement session) | Observations of posture and movement matching by ONS Inspection of the verbal dialogue with DIHC Inspection of the participants' individual arousal level with SCR SRI as information on what the participants recalled from the session | Qualitative integration of the dialogue, skin conductance responses, and posture and movement matching for the four important moments (and the entire session). Qualitative analysis of the individual participants' thoughts and emotions during the session (as recalled in the SRI), and their relation to the dialogue in the session, the skin conductance responses, and the posture and movement matching. |
| Study III | 11 couple therapy cases, 29 sessions (17 measurement sessions and 12 regular sessions) | MEA (movement energy time series for each participant's head and body) & SUSY (dyadic synchrony calculations for 6 dyads) ORS (clients' wellbeing) SRS (alliance by all participants') CORE-OM | Cohen's *d*. T-tests. Intraclass correlations (Mplus). Complex methods suited for correlational analysis of hierarchical data (Mplus). Spearman's rank-order correlations (CORE-OM). |

# 3  RESULTS

## 3.1  Study I: Studying nonverbal synchrony in couple therapy — observing implicit posture and movement synchrony

In this study, one couple therapy process of nine sessions was studied. The aim was twofold: first, to develop a coding scheme for implicit imitation of nonverbal behaviors, and second, to qualitatively inspect the association between the observed nonverbal matching patterns and the participants' evaluations of the alliance. In the article, the term *synchrony* was used, whereas here, the term *matching* is chosen for conceptual clarity.

Matching was defined as the implicit imitation of physically identical postures and movements. This resulted in two principal categories: posture matching and movement matching. These two categories differed from each other in their temporal structure. Posture matching was a state event with a duration during which two or more participants sat in the same posture until one participant changed posture. Movement matching was a shorter event, in which two or more participants implicitly imitated each other's body movements within 3 seconds. Movement matching was divided into head, arm, torso, leg, and hand movement matching, and a category named *other*, which included physically similar movements that were functional, for instance, reaching out for tissues. For simplicity, the overall amount of movement matching was used in this study. The leader–follower structure for posture and movement matching was also coded but was not used.

The coding categories were defined based on the physical appearance of the movements to reduce the rater's need for excessive judgment. Five raters observed four sessions, and excellent reliability was established. I observed all sessions in full.

Even though I did not know what was talked about in the session, it was obvious that there were various kinds of sessions that differed in their emotional atmosphere and most likely in the topics discussed. As might be expected, the sessions differed from each other in the amount of posture and movement matching as well (the differences in the amount of all posture matching and all

movement matching per session are shown in Table 5). More posture matching was found in sessions 2 and 9, and less in session 3. More movement matching was found in session 10 and less in sessions 2 and 6, which were measurement sessions in which the participants wore measurement equipment that restricted the movement of their nondominant hand). One interesting finding was that there was less movement synchrony in the measurement sessions, which might be related to the participants wearing measurement equipment that restricted the movement of their nondominant arm. Table 6 shows the descriptive statistics of the overall posture and movement matching for all nine sessions.

Different participants matched each other in different sessions. All frequencies of posture and movement matching in each subject group per session are shown in Table 7. The subject group refers to all possible dyadic, triadic, and tetradic participant combinations (therapist–therapist, therapist 1–spouse A, therapist 1–spouse B, therapist 2–spouse A, therapist 2–spouse B, therapist 1 and both spouses [A and B], therapist 2 and both spouses [A and B], both therapists [1 and 2] and spouse A, both therapists [1 and 2] and spouse B, and all participants [therapists 1 and 2, spouses A and B]).

TABLE 5　　Differences between posture and movement matching in the nine sessions calculated with GEE

| Session | Posture N | Posture Pearson Residual | Movement N | Movement Pearson Residual |
|---|---|---|---|---|
| 2 | 44 | 2,506* | 55 | -4.023* |
| 3 | 13 | -3.133* | 109 | 1.547 |
| 4 | 22 | -1.496 | 82 | -1.238 |
| 5 | 30 | -0.040 | 102 | 0.825 |
| 6 | 23 | -1.314 | 62 | -3.301* |
| 7 | 32 | 0.323 | 77 | -1.753 |
| 8 | 33 | 0.505 | 97 | 0.309 |
| 9 | 47 | 3.052* | 111 | 1.753 |
| 10 | 28 | -0.404 | 151 | 5.879* |

*Note.* * Significant values (Pearson's Residuals over +/-2): sessions 2 and 6 were measurement sessions.

TABLE 6　　Descriptive statistics of posture and movement synchrony in the nine sessions

| Posture matching | | |
|---|---|---|
| | M | 30.22 |
| | SD | 10.63 |
| | Min | 13 |
| | Max | 37 |
| **Movement matching** | | |
| | M | 93.78 |
| | SD | 29.30 |
| | Min | 55 |
| | Max | 152 |

Note. Movement matching is the sum of all movement categories.
Min and max = the minimum and maximum amounts in any of the sessions.

TABLE 7    Posture and movement synchrony per subject group during nine sessions

| | T1T2 | T1A | T1B | T2A | T2B | AB | T1T2A | T1T2B | T1AB | T2AB | T1T2AB |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Posture* | | | | | | | | | | | |
| M | 4.22 | .00 | 6.22 | 11.44 | 5.44 | 2.22 | .00 | .22 | .00 | .44 | .00 |
| SD | 6.20 | .00 | 4.41 | 8.23 | 5.23 | 2.28 | .00 | .44 | .00 | .73 | .00 |
| Min | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Max | 20 | 0 | 16 | 22 | 16 | 6 | 0 | 1 | 0 | 2 | 0 |
| Sum | 38 | 0 | 56 | 103 | 49 | 20 | 0 | 2 | 0 | 4 | 0 |
| All (272) | 14% | 0% | 21% | 38% | 18% | 7% | 0% | 1% | 0% | 1% | 0% |
| *Movement* | | | | | | | | | | | |
| M | 30.44 | 6.89 | 9.33 | 22.11 | 19.67 | 6.22 | 1.56 | 1.89 | 2.78 | 1.56 | 1.33 |
| SD | 12.3 | 3.3 | 3.61 | 13.08 | 4.64 | 4.79 | 1.67 | 2.26 | 2.17 | 2.83 | 1.73 |
| Min | 12 | 2 | 2 | 6 | 3 | 1 | 0 | 0 | 0 | 0 | 0 |
| Max | 52 | 13 | 14 | 41 | 18 | 14 | 5 | 6 | 6 | 9 | 5 |
| Sum | 274 | 62 | 84 | 199 | 87 | 56 | 14 | 17 | 25 | 14 | 12 |
| All (844) | 32% | 7% | 10% | 24% | 10% | 7% | 2% | 2% | 3% | 2% | 1% |

*Note. N* = 9 sessions; T1 = therapist 1, T2 therapist 2, A = female client, and B = male client.

The second aim was to qualitatively inspect the relationship between nonverbal matching patterns and evaluations of the therapeutic alliance using triangulation. The therapeutic alliance was not very strong throughout the entire therapy process. A value below 36 points has been considered a cause for concern (Miller & Bargmann, 2012), since it indicates difficulties in the working alliance that could affect the outcome of therapy. Only two sessions (5 and 9) were evaluated by all participants to be 36 or more. In the first session (which was not observed), the therapeutic alliance was very poor.

While studying the nonverbal matching patterns in the entire therapy process, the sixth session stood out. It was a measurement session, and there was less movement matching compared to the other sessions (Table 5). Before this session, the participants had evaluated the alliance to be getting stronger, but in this session, all participants except the female client evaluated the alliance to be below 36 (see Figure 2). Most of the posture and movement matching occurred between the female client and therapist 2, and it seemed that there was some kind of "split matching" occurring in the sixth session. Sometimes, a split alliance occurs in couple therapy. This means that one spouse has a strong alliance with the therapist but the other spouse does not (Friedlander et al., 2018; Pinsof & Catherall, 1986). A split alliance was not observed based on the self-evaluation reports, but it could have been related to the fact that the spouses evaluated the alliance to both therapists as a team, and similarly the therapists evaluated the alliance in relation to both spouses simultaneously. Because of this, a split alliance could not be detected with the questionnaires. Koole and Tschacher (2016)

suggested that nonverbal synchrony could be an important marker of an alliance, but split alliances have not been investigated in relation to nonverbal synchrony.

Another indication supporting the notion of split in nonverbal matching that could be considered a marker of a split alliance was the finding that after the female client started having more posture matching with therapist 2, she evaluated the alliance to be slightly stronger. In contrast, both the male client and therapist 1 evaluated most of the sessions in which there was more movement matching between the female client and therapist 2 as weaker in the alliance. Clearly, two different dyads were starting to form. Interestingly, the male client and therapist 1 evaluated the therapeutic alliance in a similar fashion after session 6, whereas the other participants' evaluations diverged (see Figure 2).

FIGURE 2    Alliance evaluations (SRS) of each participant by session
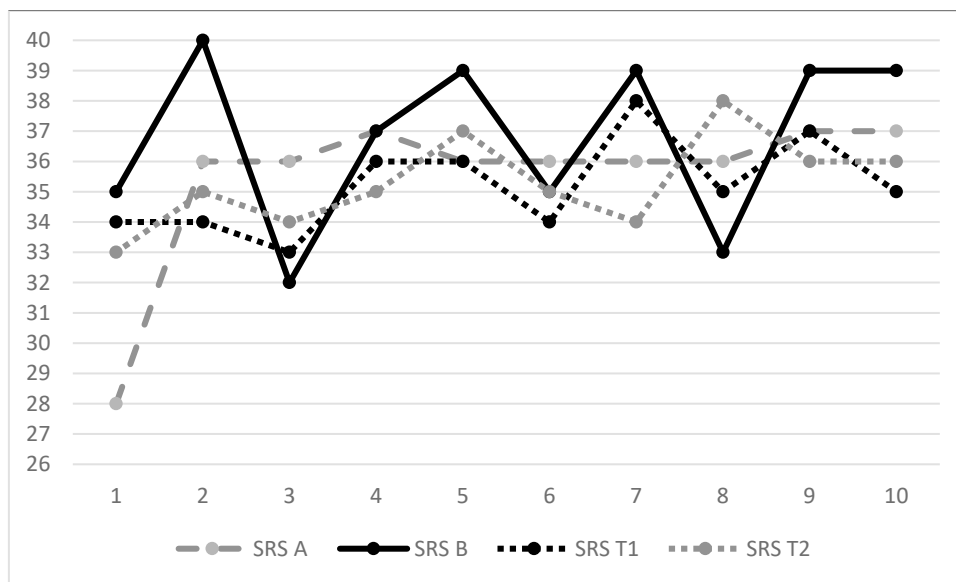


*Note.* A = female client, B = male client, T1 = therapist 1, T2 = therapist 2.

Another major pattern discovered using triangulation was that the co-therapists matched each other more after sessions in which the alliance had been evaluated as weak. This occurred especially in sessions 2 (posture) and 7 (movement). One interpretation could be that as the alliance was evaluated as weak, the therapists were implicitly more active in the succeeding session to establish a nonverbal rapport. Studies relating interpersonal coordination or synchrony to previous or succeeding sessions are rare. Deres-Cohen et al. (2022) discovered that when the therapist was supporting and empathic, there was more nonverbal synchrony in the succeeding session.

For the first version of the article sent to review, the clients' wellbeing scores were also included in the quantitative results, but they were omitted from the published article based on the reviewers' recommendations. The results of the clients' wellbeing scores in this case were nevertheless interesting, and will be briefly touched upon here. The spouses evaluated their wellbeing at the beginning of each session with ORS, a brief outcome rating scale (Miller et al.,

2003). In this case, no trend for their wellbeing improving in the course of therapy was discerned, and a similar trend was observed in their CORE-OM 6-month follow-up. These observations point to this couple therapy case not having a positive outcome. Interestingly, the spouses' wellbeing evaluations were also intertwined, meaning that both rated their wellbeing similarly before each session, alternating from better to poorer.

In conclusion, the findings of Study I suggest that more research should be conducted on interpersonal coordination or matching of postures and movements in relation not only to alliance in the session that just happened, but also in relation to previous and subsequent sessions as well. It might be that a spit alliance could coincide with or be preceded by a "split matching pattern." It would also be important to study both good- and poor-outcome couple therapies to see whether there are differences in interpersonal coordination patterns. Finally, the results indicate that the co-therapists implicitly used nonverbal matching between themselves as a tool for strengthening the alliance.

## 3.2   Study II: Significant moments in a couple therapy session: Towards the integration of different modalities of analysis

This microanalytic study of one couple therapy session concentrated on four significant moments in the session. The aim was to integrate information from three modalities of psychotherapy—verbal dialogue, nonverbal matching between participants, and the arousal level of each participant—to gain a fuller understanding of the embodied dialogues in couple therapy. Significant moments in the session were defined as instances in which something interesting happened in the psychotherapeutic process. Four significant moments were chosen from one measurement session by a researcher based on the theme, notable emotional expressions, or synchrony between participants' electrodermal arousal levels (for more information, see Kykyri et al., in press).

After the session, all participants were individually interviewed using the SRI, in which they viewed video clips of the significant moments and were asked to recall their thoughts, feelings, and bodily sensations that they remembered having at that moment in the session. In this study, information from the SRIs was used to shed light on the participants' personal experiences during the session and to decipher the meaning of the embodied reactions in relation to the verbal dialogue and the therapeutic process.

Even though we concentrated on four significant moments of therapy, we began our analysis of the entire session to get a picture of what was happening in it. The therapy session was divided into 19 TEs using the DIHC (see Table 8). As the focus of this thesis is on nonverbal matching, I will emphasize nonverbal matching when reporting the findings, even though this was not done in the published article. Throughout the therapy session, the therapists were most actively involved in nonverbal matching. Most of the posture matching (5/9) and

movement matching (49/81) occurred between them. (In Study I, most of the movement matching occurred between the co-therapists as well.) The therapists were most actively matched to other participants' movements (therapist 1 = 81 times, therapist 2 = 71 times), whereas the spouses were less matched to others (female client = 42 times, male client = 26 times). See Table 9 for the overall amount of matching in the subject groups.

TABLE 8    Division of the session into Topical Episodes (TEs) in chronological order

| TE | Content | TE | Content |
|---|---|---|---|
| 1 | Wife's return, relation to daughter | 11 | Ideal mother vs. mother-as-she-is |
| 2 | Husband doubts about job | 12 | *Reason for therapy—disconnection (SRI 1)* |
| 3 | Aside (relating) to wife's trip abroad | 13 | What was different before child? |
| 4 | Argument about where to live | *14* | *The conversation here and now (SRI 2)* |
| 5 | Job man, living in another city | 15 | Man holding back in therapy & life |
| 6 | Both work oriented | *16* | *Reasons for disconnecting (SRI 3)* |
| 7 | Evaluation of consequences of move | *17* | *Not "natural mother"—guilt (SRI 4)* |
| 8 | How would it be without Eva? | *18* | *Acceptance of others (SRI 4)* |
| 9 | Father–child relationship; third wheel | 19 | Role models |
| 10 | Positions as parents | | |

*Note.* The clips chosen for the SRIs occurred in TEs 12, 14, 16, and 17–18 (**bold and italic**). The names of the TEs have been published in Laitila et al. (2019).

TABLE 9    Frequency of posture and movement matching per subject group in one session

| | T1T2 | T1A | T1B | T2A | T2B | AB | T1T2A | T1T2B | T1AB | T2AB | T1T2AB |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *Posture* | 9 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 |
| *Movement* | 54 | 14 | 8 | 9 | 1 | 13 | 2 | 1 | 0 | 1 | 3 |

*Note. N* = 1 session; T1 = therapist 1, T2 therapist 2, A = female client, and B = male client.

In TE 11, something interesting happened in terms of nonverbal matching. During this TE, both spouses were highly matched to each other in their postures (N = 1) and movements (N = 4), which was not very common in the session. This was the only posture matching in the entire session between spouses. This couple had come to therapy because of a feeling of disconnection, which they hoped to repair. After TE 11, in which the spouses had matched each other's postures, the male client started to talk about his feelings for the first time in the session.

Interestingly, all the significant moments (SRI clips) were chosen from the end of the therapy session and after TE 11, as the topics covered the reason behind the couple's need for therapy (e.g., their disconnection after the birth of their child).

There was no posture matching in the significant moments, even though posture matching occurred in other parts of the session. This could be seen as indicating that, in significant moments, there was no clear rapport established between the two participants, since posture matching has been related to rapport (Sharpley et al., 2021). Toward the end of the therapy session, all participants were involved in the movement matching until a significant moment during TE 17, at which point all movement matching suddenly stopped for a moment.

As we studied the four significant moments, we assumed that some patterns between the verbal dialogue and the embodied reactions would be discovered. However, the relationship between the different modalities appeared complex, and there were no recurring patterns of verbal and embodied reactions during the significant moments. The main finding was that the three modalities (dialogue, nonverbal matching, and physiological arousal) seemed to tell a different story about the same situation. For instance, based on previous research, we assumed that arousal levels and emotional content would be related to each other (Kreibig, 2010), but no such patterns were found. This indicated that the arousal level was context-dependent and individual for each client, varying from one significant moment to another. This was in line with previous studies relating arousal to many different variables in therapy, such as confrontation (Olson & Clairborn, 1990), identity blaming (Päivinen et al., 2016), and therapists taking initiative in the dialogue (Laitila et al., 2019). One example of the individuality of arousal levels was seen in the last significant moment, when the male client and one of the therapists were highly aroused. The reason for the male client's arousal was not clarified in the SRIs, but the therapist's arousal was related to his having to end the session prematurely due to his own scheduling difficulties. The reasons behind the arousal levels seemed to be individual, and sometimes presumably outside the participants' awareness, or at least they did not disclose the reasons behind them.

One assumption based on previous studies on individual psychotherapy (Burgoon et al., 1992) and group therapy (Burgoon et al., 1993) was that arousal level is related to nonverbal behavior. We assumed that displacement behaviors (touching the face) in particular would be related to arousal levels since they have been described as a sign of stress (Troisi, 2002). However, no consistent patterns were discovered. For one of the therapists, his involvement in implicitly imitating displacement movements coincided with him being less aroused.

A recurrent theme both in the therapy session and in one of the therapist's SRIs was that the male client was seen as holding back his feelings. This interpretation might well be based on the dialogue (as he was talking less about his emotions) as well as on the implicit nonverbal matching, since he did not mimic others as much as the others did. Furthermore, both therapists stated in their SRIs that they were especially interested in the female client's point of view, and one of the therapists was even irritated by the male client not showing any emotions.

This couple had become disconnected after their child was born because the female client had suffered from postpartum depression, while the male client had really enjoyed becoming a father. The male client revealed more of his feelings in the SRI than in the therapy session, as he stated that he was feeling sad because of

their disconnection and that he had felt guilty of enjoying fatherhood while his wife was depressed. One of the therapists even remarked on the spouses' inequality in emotional expressiveness by hypothesizing that the female client was showing so much emotion as a means of protecting the male client so that he would not have to show his.

The main findings of Study II were that the relationships among different modalities proved to be complex and that in the significant moments when there was therapeutic work done concerning the main issue of therapy, e.g., the disconnection between the spouses, posture matching did not occur. The matching patterns were in congruence with the female client's comment that the male client was holding back since he did not mimic others as much as they did.

## 3.3 Study III: Nonverbal synchrony in couple therapy linked to clients' wellbeing and the therapeutic alliance

The main aim was to study whether there was significant nonverbal synchrony (movement synchrony) in the *Relational Mind* couple therapy data, and how the nonverbal synchrony patterns and the clients' wellbeing (ORS), the therapeutic alliance (SRS), and therapy outcome (CORE-OM) were related.

MEA was used in 29 sessions. The measurement sessions (N = 17) were overly represented in the data set (all sessions N = 69, all measurement sessions N = 19 from the 11 couples). This was due to an outside researcher managing the video recordings in these sessions. In the regular sessions, the therapists used the video cameras, and they were not able to check that all participants were visible in the recordings as the therapy sessions had started.

The overall effect size for nonverbal synchrony for all the sessions was 1.36, exceeding Cohen's (1988) convention for a large effect ($d > 0.8$). Significant dyadic synchrony was found in all sessions and between most of the dyads (97% of all the dyadic nonverbal synchrony effect sizes). The majority (N = 7/9) of the nonsignificant synchronies were anti-phase synchronies. One-third of the nonsignificant synchronies (N = 3) were head movement synchronies between spouses in different cases, and the other nonsignificant synchronies always occurred between participants of the same sex. This contradicted earlier findings stating that there was more synchrony in same-sex dyads than in dyads of the opposite sex (Grammer et al., 1998), and seminal studies on nonverbal synchrony in psychotherapy used only same-sex dyads (Ramseyer & Tschacher, 2011, 2014) for this reason.

Some interesting findings were related to the synchrony between the co-therapists. All synchronies between them were in-phase, meaning that both therapists started to move more or less together, whereas in-phase and anti-phase synchronies alternated in all other dyads. This could be related to the therapists' professional role and highlight the implicit and embodied side of coworking. Another finding was that there was more head and body synchrony between the

co-therapists than between spouses or in client–therapist dyads. This demonstrated that the co-therapists' relationship differed from the relationship in the other dyads.

When comparing measurement sessions to regular sessions, head synchrony between the co-therapists decreased in the measurement sessions, whereas synchrony in the other dyads was not affected. It could be that wearing the measurement equipment was exciting and novel for the co-therapists, possibly making them more aware of their own embodied reactions (this was a topic that was sometimes mentioned by therapists in the *Relational Mind* research meetings), and thus affected their coworking style, but not how they synchronized to the spouses.

Comparing amounts of individual movement revealed that female clients moved their heads more than male clients, which replicates findings from individual psychotherapy (Ramseyer & Tschacher, 2014). Male therapists moved their heads more than female therapists, which again was the opposite of previous findings (Ramseyer & Tschacher, 2014). Clients moved their heads more than therapists, a finding that was not seen in individual psychotherapy (Ramseyer & Tschacher, 2014). Head movements were usually related to talking (e.g., nodding while talking or listening), whereas body movements were either talk-related gesturing or posture shifts, which could be related to turn-taking or be unrelated to the dialogue and more a sign of uneasiness. In the *Relational Mind* couple therapy cases, the clients moved their bodies more than the therapists did.

The relationships among the nonverbal synchrony patterns and the clients' wellbeing, therapeutic alliance, and therapy outcome were interesting. The clients evaluated their wellbeing at the beginning of each session using the ORS. This meant that the wellbeing of the clients could affect the subsequent nonverbal synchrony patterns in the sessions. The mean of the clients' wellbeing was related to the mean of body synchronies across the entire data set ($\beta = 0.537$, $p = 0.004$). All significant results are shown in Table 10. It is noteworthy that, when investigating the wellbeing of both spouses separately, both spouses' ORS were related to head and body synchrony between the male client and the female therapist. In addition synchrony between themselves and the therapist of the opposite gender was significant. For the male clients' wellbeing head and body synchrony between the co-therapists was significant as well.

TABLE 20    Significant correlations between nonverbal synchrony patterns and clients' wellbeing (ORS)

| Dyadic nonverbal synchrony | Clients' wellbeing (ORS) |
| --- | --- |
| Mean of body synchrony in the complete data set | Mean of both clients' wellbeing |
| Head and body synchrony between male client and female therapist | Female client Male client |
| Body synchrony between female client and male therapist | Female client |
| Head synchrony between female client and female therapist | Male client |
| Head and body synchrony between the co-therapists | Male client |

*Note.* The statistical values can be seen in the published article (original paper III).

The SRS alliance evaluation form was given to all participants after each session. Several significant relationships between the alliance and the dyadic nonverbal synchrony patterns were found. For the co-therapists, the mean of head or body synchrony between all participants was related to their alliance evaluations (head: $\beta = 0.305$, $p = 0.005$; body: $\beta = 0.369$, $p = 0.023$), whereas for the clients, only the mean of body synchrony was related to their evaluations of the alliance (head: $\beta = 0.284$, $p = 0.076$, body: $\beta = 0.532$, $p < 0.001$). However, when the associations were investigated by separating them by gender, differences emerged. Both female and male clients' alliance evaluations were related to the mean of body synchrony (female clients' $\beta = 0.467$, $p = 0.003$; male clients' $\beta = 0.449$, $p = 0.012$), but not to the mean of head synchrony (female clients' $\beta = 0.158$, $p = 0.371$; male clients' $\beta = 0.239$, $p = 0.119$). For therapists, only the female therapists' alliance was related to both head ($\beta = 0.316$, $p = 0.004$) and body ($\beta = 0.365$, $p = 0.025$) synchronies, whereas for male therapists, no significant relations were found (body $\beta = 0.198$, $p = 0.121$, head $\beta = 0.136$, $p = 0.076$).

Another interesting difference between clients and therapists was found. For both female and male clients, nonverbal synchrony in dyads of the opposite gender was related to their alliance evaluations, whereas for therapists, nonverbal synchrony in dyads of the same gender was significant. All significant correlations are shown in Table 11.

TABLE 31    Significant correlations between nonverbal synchrony patterns and all
participants' alliance evaluations (SRS)

| Dyadic nonverbal synchrony | Alliance evaluations (SRS) |
|---|---|
| Mean of body synchrony in the complete data set | Mean of both clients' alliance evaluations |
| | Mean of both therapists' alliance evaluations |
| | Female clients |
| | Male clients |
| | Female therapist |
| Mean of head synchrony in the complete data set | Mean of both therapists' alliance evaluations |
| | Female therapists |
| Body synchrony between female client and male therapist | Female client |
| | Male client |
| Head synchrony between male client and female therapist | Male client |
| Body synchrony between male client and female therapist | Female client |
| Head synchrony between spouses | Female client (negative relation) |
| | Female therapist (positive relation) |
| Body synchrony between female therapist and male therapist | Female client |
| Head and body synchrony between male client and male therapist | Female therapist |
| Body synchrony between female client and female therapist | Male therapist |

| Dyadic nonverbal synchrony | Alliance evaluations (SRS) |
|---|---|
| Head synchrony between female therapist and male therapist | Male therapist |

Note. The statistical values can be seen in the published article (original paper III).

A multiperson setting differs from a dyadic setting in that one can either participate in nonverbal synchrony or observe it occurring between other participants. For the wellbeing of the clients, no relations were found concerning nonverbal synchrony in which they participated or observed. However, for the alliance, it turned out to be important. For female clients, the synchronies they observed were related to their evaluations of the alliance (observed: $\beta$ = 0.315, $p$ = 0.046, participated $\beta$ = 0.043, $p$ = 0.831). However, for the male clients, the opposite pattern was found; only synchronies in which they participated were related to their alliance evaluations (participated $\beta$ = 0.341, $p$ = 0.027, observed $\beta$ = 0.329, $p$ = 0.066). The same relationship was found for the male therapist (participated $\beta$ = 0.172, $p$ = 0.032, observed $\beta$ = 0.193, $p$ = 0.101). However, for the female therapists, no significant relationships were found (participated $\beta$ = 0.259, $p$ = 0.291, observed $\beta$ = 0.269, $p$ = 0.051).

The relationship between nonverbal synchrony and the outcome was measured using the CORE-OM, but in over half of the cases ($N$ = 6), there was missing data, resulting in highly exploratory results; these should be read with caution. For the CORE-OM, the change scores from the beginning to the end of therapy, from the beginning to the six-month follow-up, and from the end to the six-month follow-up were used to indicate the outcome of therapy. The male clients' change scores from the beginning to the six-month follow-up were significantly correlated with the mean of all head synchronies ($r$(4) = 0.829, $p$ = 0.0042).

When inspecting the relationship between the changes and the dyadic synchrony patterns, only a few relations were found; interestingly, all the significant synchronies occurred between participants of the opposite gender. The mean of both clients' change from the beginning to the end of therapy was significantly correlated with body synchrony between the male client and the female therapist ($r$(4) = 0.886, $p$ = 0.0019). The female clients' changes from beginning to end were significantly related to body synchrony between the male client and the female therapist ($r$(4) = 0.829, $p$ = 0.0041), and the female clients' changes after the therapy ended (end to six months) were significantly related to head synchrony between the female client and the male therapist ($r$(4) = 1.000). For the male clients, no significant relations were found between their change scores and nonverbal synchrony patterns.

The results on the relationship between nonverbal synchrony, clients' wellbeing, therapeutic alliance, and therapy outcome were studied for the first time in the context of couple therapy. It could be concluded that significant relationships were found, but the relationships were more complicated when involving multiple participants.

# 4 DISCUSSION

In all the studies, I have tried to grasp something of the embodied connection between participants in couple therapy. I have used two methods to depict interpersonal coordination and three study designs, ranging from qualitative to quantitative and from the microanalytic level to the sample level. The studies produced various kinds of information on interpersonal coordination in couple therapy.

## 4.1 Findings and their implications

In the following sections, the main findings of the three studies are presented, arranged according to the theme of the findings, not study by study. In this way, I aimed to integrate the information from the separate studies. I will also discuss the general methodology used to research interpersonal coordination, as well as the specific methodologies used in the studies. Finally, I review the limitations of the studies, describe future research directions, and address the clinical relevance of the findings.

## 4.2 Interpersonal coordination in couple therapy

Interpersonal coordination was studied using two different methods depicting morphologically different coordination. The qualitative studies concentrated on implicit imitation (matching) of postures and movements between participants, which occurred mainly in dyads but could also occur between three or four participants. Triadic or tetradic synchrony has not been examined in prior studies. The qualitative studies did not establish whether matching happened above chance level, but the quantitative study showed that the effect of nonverbal

synchrony in the entire sample was large (Cohen's *d* = 1.36), and significant synchrony occurred in all sessions and between the majority of dyads.

## 4.3   Interpersonal coordination between spouses was scarce

Synchrony between spouses has been related to satisfaction with their relationship (Garcia, 2021; Julien et al., 2000) and a higher level of intimacy (Sharon-David et al., 2019). Couples coming to therapy are usually unsatisfied with some aspects of their relationship. Thus, it seemed reasonable to assume that nonverbal synchrony between spouses would not be very common.

In the quantitative study (III), significant synchrony between spouses was found in all sessions, but one-third (N = 3/9) of the nonsignificant synchronies were head movement synchronies occurring between spouses. Head movements were often related to talking or listening (a qualitative observation from Study I), and, according to Stivers (2008), signaled an interest in the topic. It could be that, in some cases, the lack of significant head movement synchrony between spouses indicated differences of opinion. A previous study found that head movement synchrony between spouses was higher in nonconflict situations than during conflicts (Hammal et al., 2014). However, the couples in that study had a history of intimate partner violence, which meant that the results only applied to one of the couples with nonsignificant head movement synchrony. One aspect to note here is that the clients moved their heads significantly more than the therapists, which gives more weight to the situation of less head movement synchrony between spouses.

When studying one therapy process (Study I), only 7% of all posture matching and 7% of all movement matching occurred between spouses. Movement matching occurred between spouses in all sessions, whereas posture matching did not. Posture matching between spouses has not been studied much, but in SOFTA (which depicts alliance in family therapy), posture matching between family members is seen as reflecting a *shared sense of purpose within the family* (Friedlander et al., 2006), and Scheflen (1964) related it to similar views within a family. It seems reasonable to assume that spouses seeking help for difficulties in their relationships did not feel a shared sense of purpose, which could have been related to a lack of matching between them.

When studying nonverbal matching at the session level (Study II), posture matching between spouses occurred only once during the session. Interestingly, however, after the posture matching, the male client started to talk about his feelings for the first time in the session. One tentative hypothesis could be that nonverbal matching between the spouses acted as an embodied means of repairing the breach between them, and as the couple connected on the embodied level, the male client felt more secure in the situation and was able to talk about his emotions. Movement matching between spouses was quite frequent in the session (movement N = 13), which possibly reflected the fact that the spouses were very dialogical, talking to each other and regulating the dialogue.

Synchrony between spouses ought to be something that couple therapists look for as a marker of the couple's satisfaction with their relationship. Satisfaction with the relationship was unfortunately not assessed in the *Relational Mind* research project; thus, we do not have information about this part. In the quantitative study (III), head movement synchrony between spouses was related to both female clients' and female therapists' evaluations of the alliance, but in opposite ways. For female clients, head movement synchrony between spouses was negatively related to their alliance evaluations, whereas for female therapists, the relationship was positive. The alliance evaluations naturally do not assess the spouses' satisfaction in their relationship but how good the therapy session felt. It is interesting that for the female clients, head movement synchrony between spouses turned out to be something negative. This finding implies that more research is needed on synchrony between spouses in couple therapy to be able to make any inferences about how it is related to spouses' satisfaction with their relationship.

## 4.4 Co-therapists' coordination related to their professional roles

Co-therapy is common in training facilities but rarer in other contexts (cf. Sotero & Relvas, 2021). At the Psychotherapy Training and Research Center at the University of Jyväskylä, couple therapy is always conducted with two therapists in each session. The training facility has strong roots in systemic and dialogical family therapy. Co-therapy enables a dialogical way of working (Seikkula, 2011), fostering a polyphony of voices to be present at the therapy session by, for instance, the co-therapists engaging in dialogue in front of the spouses (Hornova, 2020). Co-therapy has been reported to be as effective as using one therapist (Hendrix et al., 2001).

Most of the co-therapist dyads working on the *Relational Mind* cases were of mixed gender, but both cases studied in the qualitative studies coincidentally comprised male therapists. These were the only two cases with two male therapists. Prior studies have indicated that there is no difference in the outcome or clients' satisfaction in couple therapy if the co-therapist team is of the same or mixed gender (Hendrix et al., 2001; Youngberg & Ward, 2018). The co-therapist dyads were assigned based on the schedules of the therapists and clients, and the compositions of the dyads were not balanced. The dyads were not equal in their experience of working together either. Half of the co-therapist dyads had not worked together previously. However, a previous study found that the experience of co-therapists working together did not affect the outcome of therapy (Hendrix et al., 2001).

The presence of a co-therapist dyad made it possible to study interpersonal coordination between two professionals sharing a similar role in the situation. This has not been previously studied. Before starting the study, I assumed that the co-therapists would be similar to the other types of dyads in their patterns of interpersonal coordination. The assumption was based on the dialogical

approach adopted in therapy, which stresses the equality of therapists and clients. However, the co-therapists' coordination patterns differed from those of all other dyads. This was particularly evident in Study III, in which synchrony between the co-therapists was always significant, whereas this was not the case for any of the other dyads. Furthermore, all of the co-therapists' head synchronies and most of their body synchronies (25/29) were in-phase synchronies. Butler (2015) divided synchrony into two different forms: synchronizing with another person and synchronizing with an outside event. One interpretation could be that the co-therapists were involved in both kinds of synchrony. They were synchronized to the participants in their nonverbal behaviors; however, when they were synchronized to each other, they were also synchronized in a manner that could be described as if they were looking at an "outside event"—the story of the couple. It is clear from the nonverbal synchrony patterns that nonverbal synchrony between co-therapists differed from synchrony in the other types of dyads, which means that it had to be related to the therapists' professional roles in the situation.

In the two qualitative studies, there was also more posture and movement matching between co-therapists than in any other dyad. At the therapy process level (Study I), the majority of all movement matching occurred between the co-therapists in six sessions out of nine. At the beginning of the therapy process (sessions 2–5), the co-therapists frequently matched their postures, and there was a high amount of matching between them in sessions 2 (posture) and 7 (movement). The similarity with these sessions is that the alliance was evaluated as weak in the previous sessions. Some previous research has related a high amount of synchrony to dysfunctional situations. High synchrony has been found in sessions in which the therapists evaluated there to be less progress (Ramseyer, 2020), to situations in which there was a confrontational alliance rupture (Deres-Cohen et al., 2021), and to nonimproving patients (Paulick et al., 2018a); however, there are fewer studies on how nonverbal synchrony in one session affects the subsequent sessions. Only one previous study related the therapist's empathic and supportive stance to more synchrony in the subsequent session (Deres-Cohen et al., 2022). These results, together with the results from Study I, suggest that nonverbal synchrony (and matching) can have longer-lasting effects in the psychotherapy process than most studies have assumed. One interpretation of the function based on Study I could be that, after the weaker alliance evaluations, the co-therapists worked nonverbally and implicitly in the subsequent session to establish a comfortable atmosphere, where they concentrated on listening to the couple's narrative and implicitly signaled rapport between themselves (something posture matching has been related to in Sharpley et al., 2001). It is important to note that the bulk of the co-therapists' movement matching happened for head movements, e.g., nods, which were related to either talking or listening. When I observed the videos, I noticed that some of the head movement matching occurred as one of the therapists was talking, and the other therapists seemed to nod in agreement. Others occurred as one of the spouses was talking, and the co-therapists listened together. Head

movement synchrony has been related in psychotherapy to the therapist gathering information (Inoue et al., 2021) and confirming the clients' responses (Inoue et al., 2011, 2021), and in other contexts to empathy between speaker and listener (Yokozuka et al., 2018), to having prior knowledge about the subject (Thepsoonthorn et al., 2016), and to an interest in the topic (Stivers, 2008). The therapists' head movement coordination in couple therapy could be related to any of the reasons that previous studies have reported.

At the session level (Study II), head movement matching between the co-therapists was also very frequent. When the therapists were interviewed after the sessions, it confirmed that their head nods were related to their interest in the topic being discussed and expressed a wish for the client to keep talking (as in Stivers, 2008); empathy for the client's situation was also mentioned (as in Yokozuka et al., 2018). Therapist's empathy is an important variable in psychotherapy. A meta-analysis reported that empathy is a moderately strong predictor of therapy outcome (Elliot et al., 2018). This could imply that head movements are very important in psychotherapy.

At the session level, there was more posture and movement matching between co-therapists at the beginning of the session when the participants discussed and reflected on external events compared to the middle of the session. This could be interpreted as the therapists gathering information (Inoue et al., 2021). In the article, we interpreted posture matching between the co-therapists (which occurred only in the beginning and the middle of the session) as them preparing for more therapeutic work to be done because there was more posture matching between the co-therapists before the spouses started talking about difficult issues.

Thus, it seemed that there were different kinds of phases, both at the level of the entire therapy process and within a therapy session, that implicitly required different kinds of coordination from the co-therapists. Tickle-Degnen and Gavett (2003) developed a theoretical model of how nonverbal behavior, which is related to the therapeutic relationship, changes during a psychotherapy process. They stressed that nonverbal behavior has different functions in different phases of building the therapeutic relationship. Even though the model concentrates on the relationship between client and therapist in individual psychotherapy, it seems reasonable to assume that the same is true for couple therapy and between co-therapists. The results obtained in the two qualitative studies of this thesis also point to a similar conclusion, both at the session level and at the therapy process level.

It is important to note that, as there was usually strong coordination between the co-therapists, a lack of coordination between them could mark something important happening. In Study I, all nonverbal matching between co-therapists stopped in session 6, in which the alliance was compromised. In Study II, there was no posture matching between the co-therapists during the significant moments of therapy (which were chosen for the SRIs), and in an especially intense moment in the session, during which the female client

disclosed feelings of guilt for not having been a natural mother, all movement matching between co-therapists stopped.

Contrary to my preliminary assumptions, the co-therapists were highly coordinated during the sessions. Dialogical polyphony was not present in the nonverbal coordination patterns between co-therapists (Hornova, 2020; Seikkula, 2011). Previous studies have suggested that working as co-therapists has two major functions: The therapists need to intersubjectively construct a therapeutic mind between the co-therapists while simultaneously facilitating a curative relationship with the clients (Jordaan, 2017). In line with these thoughts were the findings in Study I and III that coordination between the co-therapists was related to the male clients' alliance evaluations. The function of implicit embodied work between the co-therapists in couple therapy requires further investigation.

## 4.5 Interpersonal coordination, the therapeutic alliance, and outcome in couple therapy

Nonverbal synchrony has been related to both alliance and outcome in individual psychotherapy (Ramseyer & Tschacher, 2011, 2014), and while alliance and outcome have been associated in couple therapy (Symonds & Horvath, 2004), the way in which nonverbal synchrony is related to them is a novel area of research.

In couple therapy, the relationship between interpersonal coordination and the therapeutic alliance is more complex due to the presence of several people. First, the context enables coordination to occur between six dyads of three different types (the spouses, the co-therapists, and the four client–therapist dyads). With the ONS coding scheme, four triadic matching combinations were possible, and even matching between all four participants. Second, alliance is more multifaceted in couple therapy because there are different types of alliances present: the within-alliance between spouses and the between-alliance between therapist and a client, and also the alliance between therapist and both spouses as a team (cf. Anderson & Johnson, 2010). Unfortunately, we were not able to distinguish between the different types of alliances because in the *Relational Mind* data, the therapeutic alliance was evaluated by the spouses in relation to both therapists jointly (and vice versa). The self-reports enabled us to grasp how the different participants evaluated the alliance in the sessions in general and whether there were disagreements between participants on the strength of the alliance.

Significant associations between the dyadic nonverbal synchrony patterns and the participants' evaluations of the therapeutic alliance in couple therapy were found in Study III. The mean of body (but not head) synchrony was related to the clients' session-wise alliance evaluations, which replicated previous findings from individual psychotherapy (Ramseyer & Tschacher, 2014). However, contrary to previous findings (Ramseyer & Tschacher, 2011) for therapists, both the mean of head and the mean of body movement synchrony were related to their alliance

evaluations. When separating the relationships based on gender, more multifaceted associations were found (see the section below on gender differences).

The qualitative study (I) provided more insight into the relationship between nonverbal matching and the therapeutic alliance at the level of an entire therapy process. When reading the results, it is important to bear in mind that the couple had a history of intimate partner violence, where the male client had been participating in group treatment for perpetrators, and the group leader had suggested couple therapy for the spouses. Intimate partner violence has been demonstrated to affect nonverbal synchrony patterns by attenuating head movement synchrony between spouses during arguments (Hammal et al., 2014), so it could have affected the nonverbal matching patterns and the alliance evaluations as well.

Throughout therapy, the participants evaluated the alliance to be occasionally poor (below the cutoff point of 36, which should raise concern) (Miller & Bargmann, 2012). The wellbeing of the clients did not improve during the psychotherapy, and the outcome scores indicated that the therapy did not have a good outcome. However, some research suggests that in couple therapy, the strength of the alliance is not as important as the therapist's ability to balance the alliance between the spouses (Sprenkle & Blow, 2004). In theory, the presence of two therapists made it possible for the co-therapists to balance the therapeutic alliance.

The nonverbal matching patterns seemed to be tied together with the alliance evaluations. During the therapy process, there was nonverbal matching between all dyads at the beginning of the therapy, but as the alliance evaluations improved toward session 5, there was more matching in all dyads and even matching in all possible triads. However, in session 6, where all but the female client evaluated the alliance to be below the cutoff point, there was significantly less movement matching. More importantly, most of the posture (22/23) and movement matching (33/62) in that session occurred between the female client and therapist 2. After this session, the other participants (the male client and therapist 1) evaluated the therapeutic alliance in a similar fashion in the remaining sessions (7–10), whereas the two other participants' evaluations diverged. Even though the presence of two therapists could help in balancing the alliance and the nonverbal matching patterns so that all participants would be equally involved, it might also lead to a formation of two distinct dyads coordinating, something that Scheflen (1964) observed within family therapy, and which seemed to happen in this couple therapy process.

This split in the nonverbal matching patterns (the majority of matching occurred between the female client and therapist 2) and the split of the alliance evaluations (the two other participants evaluated the alliance similarly) seemed to coincide. Another fact supporting this assumption was that in sessions where there was more movement matching between the female client and therapist 2, the male client and therapist 1 evaluated the alliance to be weaker. Clearly, two different dyads started to form during the therapy process, which could have been a precursor to a split alliance. A split in the nonverbal matching patterns could be a

subtle indicator of a split alliance evolving in a multiperson situation, which would be in line with Koole's and Tschacher's (2016) suggestion that nonverbal synchrony could be considered a marker of the therapeutic alliance. Arguing against a strong split between participants and in the alliance was the fact that, toward the end of the therapy process, several dyadic, triadic, and tetradic matching occurred, including all the dyads and participants.

Based on the two studies (on multiple case levels and on one therapy process level), interpersonal coordination (both matching and nonverbal synchrony) was related to the alliance. In the multiperson context, the relationship between matching or nonverbal synchrony and the therapeutic alliance became more complex, and different participants were differently influenced by the patterns. In conclusion, I suggest that matching and nonverbal synchrony gave implicit signals to others about the relationship between participants, thereby influencing the alliance.

## 4.6  Gender differences in the relationship between interpersonal coordination, the clients' wellbeing, and the therapeutic alliance

When interpersonal coordination was studied in a multiperson situation, it was necessary to choose a variable to differentiate between participants. Gender is often used as the differentiating variable in couple therapy. Another possibility would have been to separate the spouses by marking who took the initiative for therapy. However, in the *Relational Mind* data, some of the couples were referred to therapy by other professionals, and in some cases, the spouses sought help together. The choice of gender as the variable does not imply that the differences found were caused by gender, as other factors could lie behind the differences (cf. Friedlander et al., 2018). Previous research on nonverbal synchrony has mainly used dyads of the same gender, because they have been reported to move more in comparison to participants of the opposite gender (Grammer et al., 1998). Movement synchrony between dyads of the opposite gender has been studied only in relation to courtship behavior among strangers (Grammer et al., 1998, 1999), a context that does not seem to apply to couple therapy to which spouses are coming because of difficulties in their relationship.

Gender differences in how the nonverbal synchrony patterns were related to the wellbeing of the clients, and to the alliance evaluations of all participants were examined in Study III. The wellbeing of both male and female clients was related to the mean of body synchrony among all dyads in the *Relational Mind* data set. The wellbeing of the clients was assessed before each session, which means that their wellbeing affected the subsequent nonverbal synchrony patterns in the session. When separating the results based on gender, differences were found. The male clients' wellbeing was associated with synchrony of both head and body movements between the co-therapists, as well as body synchrony between the

male client and the female therapist (Figure 3), which means that as the male client was feeling better, there was more synchrony between the co-therapists and body synchrony between himself and the female therapist. The female clients' wellbeing was related to synchrony between dyads of the opposite gender (see Figure 3).

FIGURE 3    Clients' wellbeing (ORS) and significant nonverbal synchrony patterns
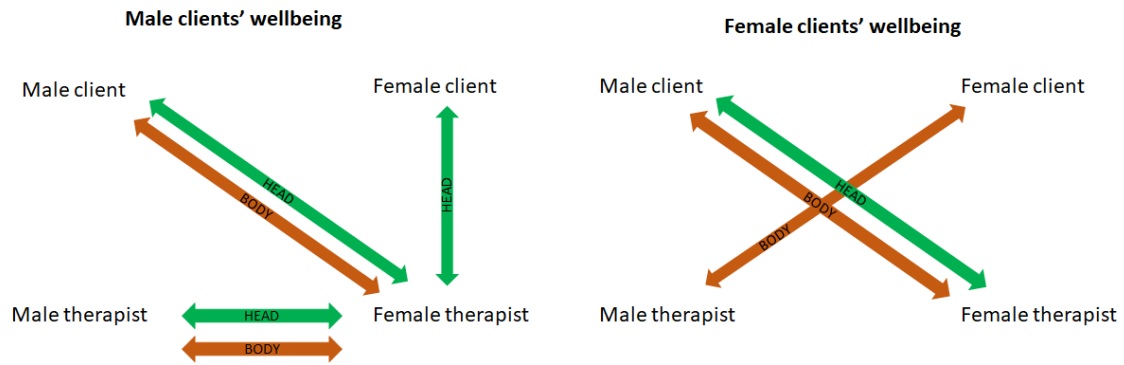


As for the alliance, separating the results based on gender revealed that both male and female clients' evaluations were related to body synchrony among all dyads, which is in line with the general finding that both clients' alliance evaluations were related to body synchrony. However, differences were found for therapists. As the general finding was that the therapists' alliance evaluations were related to both head and body synchrony between all dyads, the separation based on gender revealed that only the female therapists' alliance evaluations were related to both head and body synchrony between all participants; for the male therapists, no significant results were found.

Most interestingly, the gendered results revealed that both clients' alliance evaluations were related to synchrony in opposite dyads, whereas the therapists' alliance evaluations were related to nonverbal synchrony in same-gender dyads (Figures 4 and 5). For the clients, both their wellbeing and their alliance evaluations were related to synchrony in client-therapist dyads of the opposite gender (see also Figure 3).

FIGURE 4    Clients' alliance evaluations and significant nonverbal synchrony patterns
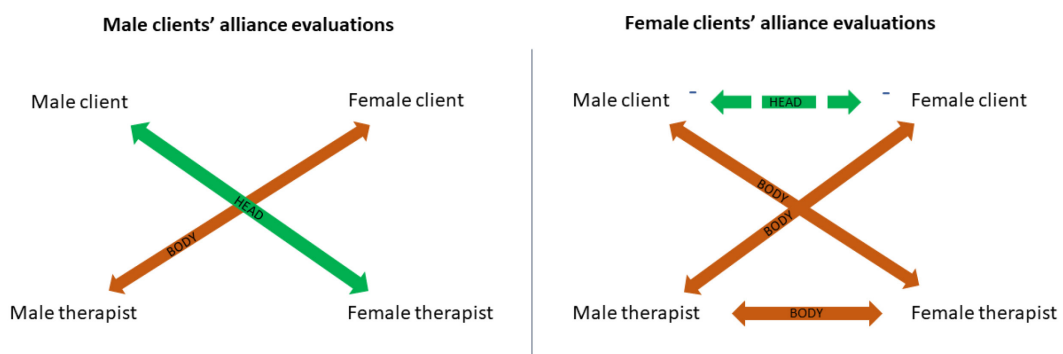
FIGURE 5    Therapists' alliance evaluations and significant nonverbal synchrony patterns
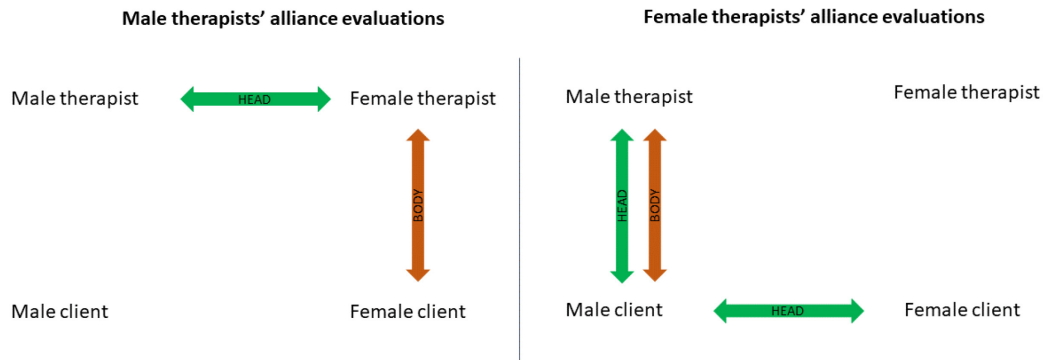


It is difficult to interpret the findings. Presumably, there were moderators between nonverbal synchrony and alliance evaluations, which impacted the results. Gender differences in couple therapy have previously been reported in relation to different kinds of behaviors influencing spouses' alliance evaluations (Anker et al., 2010; Glebova et al., 2011; Knobloch-Fedders et al., 2004, 2007; Symonds & Horvath, 2004; Thomas et al., 2005; Werner-Wilson et al., 2003). For instance, female clients did not like to be challenged by their spouses, whereas male clients did (Thomas et al., 2005), female clients scored higher in the bond aspect of the alliance, and female therapists seemed to be better able to create a bond with the clients (Werner-Wilson et al., 2003). The finding in Study III that the nonverbal synchrony patterns were related to the female but not to the male therapists' alliance evaluations seems to be in line with the finding that female therapists were better at developing the bond aspect of the alliance. At least for female therapists, nonverbal synchrony patterns were associated with their alliance evaluations, and it has been suggested that nonverbal synchrony is related to the bond aspect of the alliance (Koole & Tschacher, 2016). As previous gender differences have been reported, it was not surprising that we also found it in relation to nonverbal synchrony and alliance patterns. As I did not have any insight into what topics were discussed during the sessions, it was impossible to discern what could lie behind the significant associations. This could very well be an interesting avenue for future research. Nevertheless, it seems important that the patterns related to the alliance differed depending on who the participant was, specifically that the therapists' and clients' significant associations distinctly differed from each other.

For female clients, head movement synchrony between spouses was negatively related to their alliance evaluations, whereas the same synchrony was positively related to the alliance evaluated by the female therapists. It was interesting to ponder what might lie behind these contradictory findings. The female therapists' positive association was easier to interpret since synchrony between spouses could indicate how satisfied they were with their relationship (Garcia, 2021; Julien et al., 2000). The negative association between head movement synchrony between spouses and female clients' alliance evaluations was more puzzling. When considering head movement synchrony, it could

implicitly be thought of as two persons nodding together, which could be interpreted as agreement. However, as head movement synchrony was operationalized by the automated frame-differencing method and the synchrony computation algorithm, synchronized head movements could include any kind of movement, even movements that differed from one another; this meant that the interpretation of agreement was not valid. Thus, I searched for previous studies on the negative effects of synchrony, of which only a few exist. Nonverbal synchrony has been related to blurring boundaries between individuals (Paladino et al., 2010) and to decreased self-regulation of affect (Galbusera et al., 2019). Synchrony in couple therapy could thus be related to a common issue identified as a difficulty between spouses, namely, that their relationship has diffuse boundaries or is enmeshed (term originated from Minuchin, 1974; cf. Simon, 2015). This means that spouses have difficulty regulating their boundaries by simultaneously making compromises while retaining their autonomy. It could be that, in our sample, the female clients' negative association between head movement synchrony between spouses and the alliance might reflect their need to be seen and heard as individuals and not as part of the couple system. The negative aspect of nonverbal synchrony is a larger issue that is starting to be addressed in psychotherapy research (cf. Lutz et al., 2020; Paulick et al., 2018a; Ramseyer, 2020; Schoenherr et al., 2019).

When comparing male and female therapists, one finding was that, for male, but not female, therapists head synchrony between the co-therapists was positively related to the alliance. One study has suggested that the gender of the co-therapists is not an important factor in couple therapy (Youngberg & Ward, 2018). As in the previous findings on gender differences, I do not believe that the reason is gender. One explanation could be that the male therapists in our data were more experienced family therapists, which might have implicitly caused them to recognize the importance of the co-therapists' collaboration for the alliance. Head nods and head movement synchrony between the co-therapists signaled the way the co-therapists worked together, as they nodded while listening to the clients and as they listened to the other therapist talking.

In Study I, which focused on one therapy process, the gender differences might be related to the properties of that specific couple therapy case and are not generalizable. However, differences were found. In this couple therapy process, the female client evaluated the therapeutic alliance in a steady fashion throughout the therapy, and it seemed that the matching patterns did not affect her alliance evaluations. When inspecting the correlations between her alliance evaluations and the matching patterns, no significant relations were found (see Appendix 2, Study I). In this case, one aspect that could have influenced the matching and the alliance patterns was the fact that all other participants were male (two male therapists and the male client). For the male client, posture matching between the co-therapists was also significantly related to his alliance evaluations and even all its subscales (relationship, goals and topics, approach and method, overall).

I stress the importance of interpreting differences based on gender with care. Often, studies on gender differences have found more similarities than differences between genders (Thomas et al., 2005). As I stated earlier, the differences between genders might not be related to gender at all but to other underlying factors, such as the client's satisfaction in the relationship, trust issues, motivation, capacity for developing an alliance with the therapists, etc. (cf. Friedlander et al., 2018). These variables were not studied in the *Relational Mind* project.

## 4.7 Observing others coordinate is important for the alliance in a multiperson context

The presence of multiple participants in couple therapy made it possible to study how observing or participating in nonverbal synchrony affected the alliance evaluations (in Study III). Significant but diverse relationships were found for both clients and therapists. The female clients evaluated the alliance to be stronger when they observed others synchronize. However, male clients and therapists evaluated the alliance as stronger when they themselves were synchronized to others. For female therapists, no relationships were found.

These findings seem to be in line with previous studies on the relationship between the therapeutic alliance and outcome in couple therapy, which have demonstrated that both alliance between oneself and the therapist and the other spouse and the therapist are related to the outcome (Tilden et al., 2021). Moreover, studies on differences between genders have found that when female clients rated their partner's alliance with the therapist more positively, a successful outcome was more likely (Knobloch-Fedders et al., 2007), whereas the male client's alliance evaluations were more strongly related to the outcome (Anker et al., 2010; Bourgeois et al., 1990; Glebova et al., 2011; Symonds & Horvath, 2004). Both these findings and the findings in Study III indicate that it is important for the female client to see the male client being synchronized and having a strong alliance with the therapist. One tentative interpretation could be that the female and male clients differed in what they hoped to achieve in couple therapy. For the female client, synchrony between their spouse and the therapists could have implicitly signaled the spouse's involvement in the couple therapy process.

The importance of observing others coordinate was also seen in the qualitative therapy process in Study (I). However, in that case, the male client and one of the (male) therapists evaluated the alliance to be weaker when the female client and the other (male) therapist were matched each other. There seemed to form two different dyads, one coordinating and the other evaluating the alliance to be weaker. In a multiperson context, observing others coordinate could serve as important information about the relationships and alliance patterns formed. Scheflen (1964) noted that in family therapy, when one child mirrored one parent's posture and the other child mirrored the other parent's

posture, the family dynamics were reflected in that the coordinated parties often shared a similar view or role within the family.

Experimental studies have reported that even 5-year-old children inferred affiliative and status relations from watching others imitate. They considered the one who imitated to be of a lower status and the one that was imitated to be someone that the imitator liked (Over & Carpenter, 2015; Powell & Spelke, 2018; for a review, see Over, 2020). Kavanagh and Winkielman (2016) suggested that imitation is actually a social learning process by which one learns how to behave in one's in-group. We mimic those that we see as providing a good example, and as we mimic, we are motivated to converge with the other's attitudes, choices, and values. Kavanagh and Winkielman (2016) concluded that powerful people are mimicked more, and that mimicry is a sign of group affiliation.

Observing others coordinate and coordinating with others seem to have different meanings. As a psychotherapist, I find that there is an implicit difference in being included in the coordination versus observing others coordinate and suspect that these different coordination patterns would feel very different and implicitly impact one's experience of the situation. Being coordinated with others could make one feel included in the session, whereas observing others coordinate could be felt either as being left out or as seeing the others being actively engaged in the therapy process. Couple therapy is a complex situation in which different participants' motivations and attitudes toward therapy affect their interpretations of what happens in the session. One example of this occurred in Study II, as one of the spouses said to her husband, "I hope [the therapists] will pick you next time," by which she meant that she hoped the therapists would focus more on her husband than on her in the next session.

It is important to caution here that these results are the first exploratory findings in the couple therapy context with multiple participants present, and all results should be replicated with a larger sample. More research is needed to study the relationship between observing and participating in interpersonal coordination, especially on the possible moderating factors contributing to gender differences.


## 4.8 Context dependency of interpersonal coordination


The microanalytic study was best suited to demonstrate the context dependency and individual variation in nonverbal matching and the embodied variables in general. In Study II, we aimed to combine information from different modalities, but this proved to be a difficult task and revealed important epistemological issues. As I am an empiricist, my naïve assumption was that the information from the different modalities would reveal specific aspects of how attunement was achieved in a couple therapy session, and that by combining the information from the different modalities, clear patterns would emerge.

The embodied reactions (nonverbal matching and SCRs) proved to be highly individual and context dependent, and our preliminary hypotheses were not confirmed. For instance, in contrast to earlier research stating that arousal is related to the preparation of action or emotions (Boucsein, 2012; Kreibig, 2010), arousal was not particularly high in moments of intensive emotion or at significant moments of therapy. Different participants reacted to the moments in individual ways that were not always predictable. The meaning of the embodied variables changed depending on the situation in which they occurred. There were many overlapping variables in the session at both the individual and systemic levels (between spouses and between one of the spouses and one of the therapists), which could have influenced the participants' embodied reactions. For instance, the implicit procedural memories of how to be with others (Lyons-Ruth, 1999) and the spouses' relationships and their systemic and implicit reactions toward each other (Shimmerlik, 2008) probably affected how they reacted emotionally in the session. We found that the meaning and emotional valence in relation to the topic diverged between the spouses as well as how they reacted in the session. The role of being either a client or a therapist in the situation particularly affected nonverbal matching patterns. In this session, the therapists more actively matched with the spouses than vice versa. The male client was less coordinated with the others than the female client. These findings were compatible with a previous study indicating that the role one has in a situation and what one concentrates on implicitly impacts the tendency to mirror others (Davidsen & Fogtmann Fosgerau, 2015).

The use of the SRIs that were individually conducted after the session added even more complexity to the analysis process. Contrary to our hypotheses that the information would help clarify the participants' embodied reactions in the session, the information only partly did that, and a large part of the embodied reactions remained an enigma. There were several possible reasons for this. One was that the therapists used the SRIs to reflect on the therapeutic process and did not necessarily comment on their own embodied reactions. The spouses were more eager to comment on their responses and thoughts during the therapy session. However, the spouses also used the SRIs to reflect on the issues discussed in the session. It might also be that the therapists and the clients in this specific case were not aware of their implicit embodied reactions, and thus did not disclose them in the interviews. This is an important epistemological question that needs to be addressed. How is it possible to obtain reliable information about embodied reactions when they are so often implicit in nature?

As my main interest was in nonverbal matching between the participants, an important finding was that matching was not very prominent in the four significant moments of couple therapy. During the significant moments, topics were discussed that were emotionally loaded and thematically important but difficult, such as the disconnection between spouses. It was naïve to assume patterned nonverbal matching within them, because, for instance, mimicry has been related to social bonding (Chartrand & Lakin, 2013) and posture matching, which has been related to rapport (Sharpley et al., 2001) or likemindedness

(Scheflen, 1964), did not occur in any of the significant moments; movement matching was also scarce. Most compellingly, all matching between the participants ceased at an emotionally intensive moment. As previous studies in this thesis mainly linked nonverbal synchrony and matching to the alliance, this study indicated that nonverbal matching did not happen in emotionally intensive and ambivalent moments of therapy. In these situations, bonding between the participants was probably not the most important task at hand, and thus nonverbal matching was not prominent.

One important aspect to consider was whether the lack of matching indicated that the therapy process did not progress or even hindered it. A previous study related lower synchrony to withdrawal ruptures (e.g., a deterioration in the alliance where the client withdraws from the collaboration) (Deres-Cohen et al., 2021). In this couple therapy case, the male client coordinated less with others, and was not very eager to share his emotions in the session, which might reflect withdrawal or a defensive strategy. The couple had come to couple therapy because of feeling disconnected. It became evident through the male client's SRIs, that the reason for his withdrawal was that he did not want to express his feelings of happiness of becoming a father, as his wife had suffered from post-partum depression. This is a good example of how the context, and the individual thoughts the participant has, can influence the tendency to coordinate with others.

The topics discussed during the significant moments were, however, central to the spouses' difficulties: three of the four significant moments that were studied, centered on the spouses' feelings of disconnectedness and the reasons behind these feelings. The lack of nonverbal matching within these moments suggests that when important therapeutic work was done, matching was not needed. It might also be that the lack of matching reflected the spouses' feelings of disconnectedness; hence, no patterned relationships were found among the dialogue, arousal levels, and nonverbal matching.

In contrast to the findings from Studies I and III, this study demonstrated that the co-therapists responded individually in the same situation, and matching between them was not as prevalent as one could have assumed based on the other studies. It is not uncommon for co-working therapists to have diverging views on what is important to address in therapy (cf. Kykyri et al., 2019).

The most important contribution of this study to my understanding of the function of nonverbal matching and the other embodied reactions was that it demonstrated the individuality and context dependency of the embodied reactions in couple therapy and showed the difficulties of conducting empirical research on the embodied aspects of couple therapy (for further discussion, see Nyman-Salonen et al., 2022). Studies with a larger sample lose this facet when studying interpersonal coordination and provide a simplified picture of the meaning of the embodied variables.

## 4.9   Methodological considerations

My interest in understanding how the different methods operationalized the interpersonal coordination of nonverbal behaviors led me to use two different methods. I suspect that the methods to study interpersonal coordination are often chosen based on their availability and not on how coordination is operationalized, and my concern has been that researchers are not aware of what kind of coordination or synchrony is depicted by the method they use.

When developing the coding scheme, I defined or operationalized interpersonal coordination as an implicit imitation of similar nonverbal behavior. Previous research on posture matching and mimicry helped me make theoretically informed decisions on what behaviors to include or exclude from the coding scheme. In contrast, when automated methods are used, the operationalization of synchrony depends on the synchrony calculation algorithm one chooses, since different synchrony algorithms depict different kinds of synchrony (Schoenherr et al., 2019). The choice of using the WCLC synchrony algorithm (the SUSY algorithm) (Tschacher & Haken, 2019) was obvious because it was used in the first pivotal studies in psychotherapy.

As I gained an understanding of how synchrony was calculated with SUSY, I understood that the synchrony value researchers have used most often confounded two very different kinds of synchrony: a situation in which both synchronized participants started to move more in succession (a positive correlation or in-phase synchrony), and a situation in which one of the participants started to move more and the other moved less (a negative correlation or anti-phase synchrony). SUSY gives the researcher an opportunity to use another value for synchrony, the nonabsolute value, which separates the two kinds of synchrony described above. I found that the nonabsolute values depicted synchrony that more accurately described what happened in the session and provided a more detailed picture of how the participants in a multiperson situation synchronized with each other. For me, the nonabsolute value was more clinically relevant since I have been interested in what synchrony looks like in real life. I considered a situation in which two of the participants in couple therapy started to move more together as a situation in which both were actively engaged, whereas a situation in which one participant started to move more and the other one less could signal, for instance, turn-taking between the synchronized participants. I am very thankful that I was encouraged to use nonabsolute values.

Another issue that affected what the depicted interpersonal coordination looked like was the parameters that the researcher chose when using the methods. In the observational method ONS, I wanted to make theoretically informed choices with regard to, for instance, the time lag in which two behaviors were considered as belonging together, so I relied on preexisting information about the time lag from mimicry studies. Unfortunately, although there were a vast number of studies in mimicry, no clear guidelines existed on what time lag

should be used. Three seconds was chosen based on my observations of the sessions, during which nonverbal behaviors occurring within three seconds felt implicitly as belonging together; in addition, my choice was based on a previous study (Bailenson & Yee, 2005) and a discussion with Markku Penttonen. Three seconds is, of course, an arbitrary cutoff point that could be criticized. The downside of choosing a time lag in an observational method is that, after it has been chosen, it cannot be changed. When using automated methods, the parameters can be changed very easily, which makes the research process more flexible. However, it also results in less consistency in the research field regarding the parameters that the researchers have chosen. The choices sometimes seem arbitrary, or at least, the researchers do not justify their choices of parameters in their articles. In SUSY, when a researcher chooses a time lag of +/-5 seconds within a 60-second window (which are the most common parameters), it is thus assumed that the two participants' movements are still experienced as synchrony, even if they are as much as ten seconds apart. Research on mimicry has suggested that the time range in which behaviors are felt as synchrony is only four seconds (Bailenson et al., 2004). In Study III, the "standard" time lag of +/-5 seconds was chosen, but with a shorter window than commonly used (30 seconds). This was based on trying out different parameters on the data. The shorter window seemed to better depict synchrony in a multiperson situation.

When comparing the aspects of how time-consuming the methods were, it is, of course, true that observing the therapy session was more time-consuming than using the automated methods. Nevertheless, I found both methods to be quite time-consuming, but in different ways. Observing the sessions required concentration and time and trained raters. An observational method is prone to errors due to a lack of concentration by the raters, and the task of developing an unambiguous coding scheme and teaching it to the raters is not easy. I was lucky to find excellent students who were interested in learning this method. I only understood their importance when I later worked with other raters and discerned that their motivation to master the method was not the same as that of the students who had worked on Study I.

Automated methods are often classified as less time-consuming, but I did not find it so. This was probably because I had to learn how to use the method. Extracting the movement energy from the sessions was, of course, faster than observing the sessions, but there was much work that had to be done prior to the extraction process, especially because I used prerecorded videos that had not been recorded for the purpose of using motion detection software on them. First, I had to go through all the recorded videos in the *Relational Mind* data set and select the videos that were usable based on their lightning and outlook (that all participants were visible on the screen). Second, for the videos of each session, the ROIs were manually drawn on the screen. It was important to check the recording from the entire session so that the drawn ROIs included only the participant's behavior and not someone else's movements. After this, the extraction commenced. For the extraction to be as reliable as possible, the

extraction process was performed at a slower speed to obtain data of better quality.

A timewise comparison of both methods revealed that observing a 90-minute session took four to eight hours, whereas the movement extraction of one session took approximately two to three hours. The extraction process took longer, since I chose to use data from the entire session instead of the most commonly used 15 minutes from the beginning of the session.

The use of the two methods resulted in very different knowledge for me as a researcher about the content of the sessions. The observational process gave me insight into the atmosphere of the sessions, how the participants used their bodies, and what their individual nonverbal behavior looked like. This implicit insight was something that I could use when interpreting the results. This could, of course, be seen as a weakness, since the atmosphere might have affected the observational process. Using automated methods did not require that the researcher be familiar with the content of the sessions, other than to control for possible flaws in the data that could have affected the extraction process.

One important aspect of the research process was the selection of the statistical method. The weakness of the observational method ONS is that it does not include a pseudosynchrony calculation process. This means that it did not establish whether synchrony happened above chance level, which was, of course, one important aspect of SUSY (Tschacher & Haken, 2019). The choice of possible statistical methods was also limited in Study I because the observational method provided categorical data and because the data set was very small. In Study I, I first adopted a quantitative approach, but the reviewers from the journal convinced me to convert it to a qualitative study on the relationship between nonverbal matching and alliance because of the issues described above. For Study III, the choice of statistical methods was not straightforward either, because the data set was small and partially interdependent (many sessions from one couple therapy case, and the same therapists were involved in different cases), which had to be taken into account.

After using both methods, I still find that observation is the best option when a researcher is interested in a specific behavior, such as studying nodding or adaptor gestures, or, as in my case, implicit imitation of similar nonverbal behaviors (for a discussion, see Fujiwara et al., 2021). The automated method, which was faster to employ, could not distinguish between different kinds of behaviors. This leads to a highly important point. The different methods depict different kinds of interpersonal coordination, and thus, it is logical that they probably have differing relationships with other variables of interest, such as the alliance or empathy. Previous research has demonstrated that coordination depicted by observational methods and computer-based methods correlate to some extent (Feniger & Schaal, 2021; Fujiwara et al., 2021; Fujiwara & Daibo, 2016), but even though they correlate, differences in how the different synchronies distinguished between, for instance, conversational involvement (Fujiwara et al., 2021) or empathic accuracy (Fujiwara & Daibo, 2022) have been

found. Thus, it is important not to assume that similar relationships will be found when interpersonal coordination is depicted using different methods.

Another broader methodological consideration was that I used three very different research designs, including a microanalytic study of four significant moments in one session, one therapy process of nine sessions, and the entire usable data set comprising 11 couple therapy cases and 29 sessions. I find that this broad way of using different designs taught me which research questions could be answered with which specific design, and what kinds of results could be obtained by them.

The microanalytic study revealed the extent to which nonverbal matching and arousal patterns were related to the context in which they occurred and the individual's stance toward the topic discussed. The research process was largely dependent on how we (myself, Berta Vall, and Aarno Laitila) as researchers interpreted the meaning of the embodied variables (for a thorough discussion on studying embodied variables, see Nyman-Salonen et al., 2022). Scheflen (1966) made an important point about this issue in his comment about Charny, who studied postures in 1966: "He [Charny] uses the social relationship as a context to determine the meaning of individual behavior." (p. 297). The quote describes the core aspects of the qualitative analysis of nonverbal synchrony (or matching): the interpretations are influenced by the context, which in this case was a couple therapy session and the factors related to it. Such factors included, for instance, how the therapy process was progressing, how the participants were involved in the dialogue, and the content of the discussion. In addition, systemic issues emerged from nonverbal matching patterns. For instance, nonverbal matching was interpreted differently based on whether the spouses were coordinated with each other or whether a therapist and a client coordinated.

Overall, the microanalytic study (II) revealed the complexity of interpreting the meaning of the data obtained from the different modalities in a multiperson context, such as couple therapy. In couple therapy, systemic issues regarding the relationships among the participants were important, but individual stances regarding the issues the participants discussed also influenced the data from the embodied variables. In therapy in general the clients' emotions, defenses, and implicit ways of being in relationships (Lyons-Ruth, 1999), influences how they behave, and their embodied reactions.

The therapy process study (I) gave me both the experience of developing a coding scheme and insight into how nonverbal matching was altered in different sessions that had different atmospheres (and most likely different themes). I found it fascinating to observe different sessions and familiarize myself with the nonverbal matching patterns between participants. I suspect that the qualitative triangulation of the nonverbal matching patterns and the alliance evaluations were informed by the implicit impressions I formed when observing the sessions. The idiographic design, concentrating on one psychotherapy process and including several sessions with the same participants, has its place in understanding the change process in psychotherapy.

The automated methods in Study III brought me back to my roots as a researcher. In my Master's thesis, I concentrated on experimental research in cognitive psychology. The use of quantitative methods reminded me of how much the researcher's choices during the research process impact the results (for instance, in the choices of the threshold of the extraction of movement in MEA, when selecting the time lag or the window size, and when choosing to use the nonabsolute values of the synchrony calculations).

I found that the differing research designs complemented one another and provided me a broad understanding of the interpersonal coordination of nonverbal behavior in couple therapy. By using two different methods on the data, I was able to establish that nonverbal synchrony occurred above chance (Study III) and that both kinds of interpersonal coordination (matching and movement synchrony) were related to the therapeutic alliance in couple therapy. I find, in accordance with Ramseyer & Tschacher (2008), that it is highly plausible that these two kinds of synchronies (matching and movement synchrony) are both present and intertwined in real interactions in psychotherapy.

## 4.10 Limitations

The limitations of this research can be classified into two major areas: methodological limitations and philosophical questions regarding the assumptions made about how the mind and body are connected.

### 4.10.1 Methodological limitations

The entire research field on nonverbal behavior suffers from methodological problems. One of the root causes is that there is no coherent theory binding all the studies in a meaningful way (Harrigan et al., 2008). Meta-analyses on research on nonverbal behavior are scarce and often include only a small number of studies, partly because the methodologies in the studies cannot be compared (cf. Hall et al., 2019 on nonverbal communication; Henry et al., 2012 on clinical interactions; Lorié et al., 2017 on cultural differences in nonverbal behavior). The reason behind this diversity is that different researchers concentrate on their own research and make up their own methodologies to study nonverbal behavior (cf. Renier et al., 2021). I contributed to this caveat by developing my own coding scheme instead of using an existing method. I did this because I could not find a method that depicted the interpersonal coordination of implicit imitation (matching).

There are limitations to the way I developed the coding scheme. First, I enjoy working by myself, and in hindsight, it would have been wise to interview experienced psychotherapists as well as researchers during the developmental process. I might have missed important aspects that I should have considered during the process, and on the other hand I might have gained important information from others, that could have informed my choices of what to

operationalize as interpersonal coordination, and how to annotate it. I observed all sessions myself, but as I developed the coding scheme, I was aware that other raters would later observe the same video material; thus, I aimed to be as consistent in my observations as possible. Even though I enjoy working alone and still see it as a possible limitation, I am glad about the reliability work done together with the students. I consider this one of the most important facets of the process. Discussing the coding scheme with the raters helped me clarify many behaviors in which the coding proved to be ambiguous.

In hindsight, I would change some of the technical details in the coding scheme. First, I would change its subject structure, which is currently dyadic, triadic, or tetradic. I would make the individual participants subjects, which would have made it easier to develop a shuffled pseudosynchrony data set (Bernieri et al., 1988); this is necessary to establish that synchrony occurs above chance level. The methodologies created by Louwerse et al. (2012) and Julien et al. (2000) to calculate synchrony and pseudosynchrony on categorical data could be used, and I am currently working on this. Second, I would change some properties of the variables in the Noldus Observer program, which would make it easier to extract the data from the program in a form more suitable for statistical calculations.

One final note regarding the observational method is that the concepts of posture and movement synchrony were used in the study, which were probably not the most accurate concept to use. In hindsight, posture and movement mirroring (used in Kykyri et al., 2019) or matching could have been more accurate terms for describing implicit imitation depicted with ONS. On the other hand, mirroring could be interpreted as the explicit mirroring of another person, which was something I did not want to study.

In the microanalytic study, the interpretations based on the information from the different modalities can always be disputed. Some of the difficulties were already discussed in the previous section. In my interpretations, I tried to remain true to preexisting theoretical knowledge about what the different modalities could stand for, and we worked as a team with the coauthors to ensure the reliability of our interpretations and conclusions.

As for the use of the automated methods in Study III, some points of concern could be raised. First, there were many unusable videos in the *Relational Mind* data because of problems with overlapping participants in the videos. In many sessions, different participants' movements would overlap with another participant's ROIs, which made it impossible to use the sessions for calculating synchrony. The ROIs were not standardized in size (see Schoenherr et al., 2019), which reduced the comparability of the movement energy in the different ROIs. Reliability was based on drawing the ROIs as equal as possible in size during the extraction. Second, the researcher's selection of the parameters used in the synchrony calculations naturally influenced the outcome (Schoenherr et al., 2019). I chose to calculate synchrony in 30-second windows, even though 60-second segments have been used the most because a 60-second window did not appear to be the best size to depict synchrony in a multiperson situation when the output

scores were examined. With 60-second windows, the stationarity assumption did not seem to apply. This was probably due to the more complex structure of turn-taking in a multiperson situation, as well as the complexity of the dialogue (who talked, who responded, and which participants were actively involved in the dialogue). The artificial split of the session into 60-second segments seemed to cut the time series in a way that did not do justice to the dialogical structure of the sessions.

Third, I chose to use the nonabsolute effect sizes to depict synchrony, whereas the majority of research until now has used absolute values. My concern for the ecological validity of the synchrony depicted led to this decision, as described earlier. I found it interesting to separate in-phase and anti-phase synchrony and was intrigued by the finding that synchrony between the co-therapists was always in-phase and that the majority of the nonsignificant effect sizes were anti-phase synchrony. If absolute values had been used, this information would have been missing. An interesting detail was that the nonsignificant synchronies demonstrated a pattern: all nonsignificant in-phase synchronies occurred in mixed-gender dyads, whereas the nonsignificant anti-phase synchronies occurred in same-gender dyads. As the absolute values have been used in most of the studies, the synchrony depicted in them is, in my opinion, not ecologically valid or clinically informative.

I find that the concepts in-phase and anti-phase used in the SUSY algorithm are not the best to describe the synchrony depicted since their meaning is different from research in movement sciences. In the context of movement sciences, in-phase refers to a situation in which both participants are making a similar movement at the same pace and are in the exact same phase of the movement (for instance, both have bent elbows during a biceps curl), and anti-phase synchrony refers to the participants being in the opposite phase of the movement but still moving at the same pace (one has her arm bent, and the other's arm is straight during biceps curls). In the SUSY algorithm, nonverbal synchrony in-phase means that both participants' movement energy rises or declines similarly, and anti-phase means the opposite. The concepts of positive or negative synchrony or correlation could be more informative.

Fourth, in preexisting studies, nonverbal synchrony was examined in the first 15 minutes of the sessions, whereas I chose to study the entire session. The use of the first 15 minutes has been justified by two studies (Paulick et al., 2018a; Ramseyer & Tschacher, 2011). As a clinician, I felt that the first 15 minutes of a session do not represent the entire session, at least in the couple therapy context. Analyzing the entire session was also supported by the possibility of using the movement data in relation to other modalities, such as speech turns or EDA synchronies (which were calculated on the entire time series of the sessions), which was done in a recent publication (Tourunen et al., 2022).

Finally, using SUSY only enabled calculating dyadic synchrony; it is debatable whether it is the best possible option in a multiperson situation. The multivariate form of SUSY (Meier & Tschacher, 2021) was, however, not available when the study began.

One concern relating to the ecological validity of research on interpersonal coordination in general is the assumption that more coordination is always better. During interactions, there are always two tendencies that exist simultaneously: to adapt or synchronize with each other or to separate or withdraw from the interaction (Delaherche et al., 2012; Mayo & Gordon, 2020). These tendencies act together, but to date, all studies have concentrated on coordination or synchronization, and methodologies for studying separation have not been developed. In couple therapy, it might be important to be able to withdraw, for instance, if the relationship has become too enmeshed (Simon, 2015). The coding scheme I developed did address this issue since it marked who imitated the other person and who withdrew from the shared posture, but these aspects have not been included in Studies I and II. In psychotherapy, these issues are important because interpersonal coordination has not been found to be beneficial in all situations; for instance, clients with eating disorders have been found to dislike the person who mimicked them (Erwin et al., 2022).

Moreover, most of the methods do not consider that interpersonal coordination can occur in different modalities, meaning that the interactants can be coordinated in one modality but not in the other. For instance, they might adapt to each other's use of words but not gestures. Interpersonal coordination can thus have a compensatory role, occurring in one modality but not in another, in order for the interaction to proceed smoothly (Dale et al., 2020). In addition, people can coordinate with each other crossmodally, meaning that one participant talks with an energetic voice and the other person starts to gesture more vividly (see Stern, 2004). The methods used to date do not take these dynamics into account.

A final important caveat in the studies was that there might be several confounding or moderating variables affecting the relationship between interpersonal coordination (matching and nonverbal synchrony), alliance, and outcome. This could be related to the heterogeneity of the *Relational Mind* data, in which the clients' motivation to come to therapy was not assessed, nor their satisfaction in their marriage. Most importantly, one-third of the couples referred to the project had a history of interpersonal violence, which is a particular condition that most plausibly affected the interpersonal coordination patterns. One study reported nonverbal synchrony patterns to alter for couples suffering from intimate partner violence (Hammal et al., 2014). When considering the co-therapists their gender combination varied as well as their experiences of couple therapy and co-working. The choice of couples analyzed for Studies I and III could thus be criticized: in Study I, the entire data set was from a couple with a history of interpersonal violence, and in Study III, one-third of the couples had a history of interpersonal violence. It is thus important to interpret the results cautiously, and generalizations should be avoided. In the future, a more homogenous sample of couples should be analyzed to confirm the results. Another difficulty in interpreting the results in regard to the alliance stemmed from the fact that in the research project, the spouses evaluated the alliance to both therapists simultaneously (and vice versa), which made it impossible to

discern between patterns of split alliances or differences in the alliance in relation to one of the therapists (or clients).

Another aspect was that the mental health of the clients was not, but should have been, assessed in the *Relational Mind* data. This is important to consider since nonverbal behavior has been reported to alter during, for instance, depression (Bouhyus, 2003; Troisi, 1999; Troisi & Moles, 1999), and nonverbal synchrony to be different when suffering from anxiety (Asher et al., 2020; Paulick et al., 2018b) or depression (Paulick et al., 2018b). It might be that the couple therapy case analyzed for Study II, in which the female client had suffered from postpartum depression, could also have affected the posture and movement matching patterns. The reasons for choosing the couple therapy cases to analyze were mostly practical—either the data were available for analysis (Study I), the analysis was done in a joint language with the other co-authors of the article (Study II), or it was stressed to include as much data as possible for the statistical calculations (Study III). It is also highly probable that many of the aspects affecting nonverbal synchrony will be discovered in the future. However, all of these aspects most probably affected the interpersonal coordination patterns found in the couple therapy cases.

Research on nonverbal behavior faces many difficulties. As I observed the sessions, I noted that the nonverbal behavior of each participant was very individual, meaning that the participants did not use their bodies in similar ways. Through observation, I became familiar with each participant's individual ways of interacting nonverbally. For instance, in Study I, one of the co-therapists was very responsive in his nonverbal behavior, showing fast changes in his gestures and movements in relation to the other participants, whereas the other co-therapist was more rigid, made larger and clearer bodily movements, and gestured only when he was speaking. This individuality poses methodological challenges when studying nonverbal behavior and synchrony. For instance, when one person makes a very small movement and the other one makes a very large but similar movement because of the persons' individual ways of using their bodies, can it be considered as synchrony?

### 4.10.2 Mind and body in psychotherapy research

One philosophical question that each researcher should address when studying the embodied aspects of psychotherapy deals with assumptions about how the mind and body are connected. I chose to address this issue as a limitation since I find that it has not been addressed enough in the literature. Cartesian dualism is widespread in the medical world, where the biomedical model separates mind and body into distinct entities with logics of their own (Mehta, 2011). In particular, psychiatric brain research concentrates on linking symptoms with brain structure instead of understanding how meaning is constructed (Bertrando & Gilli, 2008). Similarly, psychotherapeutic research has concentrated on narratives and spoken dialogue, where the dualistic position could be interpreted as concentrating on disembodied dialogues (Bertrando & Gilli, 2008).

I think that the microanalytic study taught me the most about the complexity of the interrelation between mind and body. As researchers empirically retrieve data from the different modalities, this is done in a reductionist way, concentrating solely on one modality. It is overlooked how the information obtained can be combined with information from other modalities. When information from different modalities is combined, the assumption is often dualistic: information from dialogue or subjectively filled forms is thought to represent the mind, and the embodied reactions are thought to represent the body.

This happens even when a researcher attempts to view the dialogue and the embodied information as two separate and phenomenologically different aspects of a single system (dual-aspect monism; see Walach 2020). Incorporating a monistic view of mind and body seems an impossible quest in empirical research because the basic principles of empirical research, such as how the data is presented, extracted, and analyzed, point to a dualistic view. The embodied variables are considered to represent the body, and the verbal dialogue or answers given in questionnaires represent the mind.

I find that Studies I and III were primarily based on a dualistic view: the nonverbal matching and synchrony were considered as the body's responses, and the subjectively filled forms represented the mind. In Studies I and III, the research process began with a reductionistic approach, as I concentrated on extracting nonverbal matching or synchrony, and only after that was the information from the subjectively filled forms used to incorporate the mind into the study.

In the microanalytic study, we aimed to view the information from the different modalities as representing a single system—the embodied human mind. However, as we tried to combine information from the different modalities, we finally concluded that the different modalities told different stories of the same moments in couple therapy. I think this reflected the difficulties in combining information from different modalities in a reasonable way and was largely due to the methodological premises of empiricism.

I agree with the thoughts of Cromby (2012) that it is important to make research methodologies more multifaceted and include, for instance, the body in research in social sciences as well as combining qualitative and quantitative approaches. Still, I consider there to be many methodological issues that need to be solved in this quest. I feel that empirical research is still lacking in methodology to obtain a more monistic view of the processes of both mind and body in psychotherapy, even though many advances have been made. Based on my experience, I recommend using mixed methods (e.g., combining quantitative and qualitative methods) to establish a more complete picture of interpersonal coordination (matching and nonverbal synchrony) in psychotherapy.

## 4.11 Future directions

In the discussion, I have described some instances that would require future research. I thus aim in this passage to concentrate mainly on my own interests. My first plan is to develop a pseudosynchrony computation system for the ONS coding scheme. This is problematic because of the ONS's subject structure. The most time-consuming solution would be to create pseudosynchrony videos by shuffling the timeseries of the participants and combining participants' behavioral sequences with each other, as they never occurred in the session (as Bernieri et al., 1988), and have raters observe them. I do not find this approach plausible. I have already begun to investigate the methods of Louwerse et al. (2012), which Julien et al. (2000) used to create a pseudosynchrony calculation process.

A second interest is to compare the nonverbal matching depicted using the ONS coding scheme to the synchrony obtained with MEA and SUSY. The research aim is to discover the ways in which the interpersonal coordination depicted by the two methods overlap or diverge. I plan to conduct a mixed-method study by first comparing the methods on a sample level and then qualitatively inspecting moments in which matching or synchrony occurs as depicted by one or both methods and then comparing the different situations.

A third possibility would be to study how the separate movement categories depicted by ONS (head, arm, hand, torso, leg, and other) are related to the therapeutic alliance. It would also be interesting to investigate how the order of matching (who takes the posture of whom and vice versa, as well as who imitates the movements) is related to the therapeutic alliance. These were not examined in the studies presented here.

Another interesting quest would be to combine the nonverbal patterns obtained by the ONS with the speech turns in the sessions to obtain a picture of how nonverbal matching is related to speaking and listening. Luckily, the speech turns of each participant have been annotated for the measurement sessions of the couple therapy cases in the *Relational Mind* data and were used in a recent study comparing EDA, MEA/SUSY synchrony, and speech turns (Tourunen et al., 2022).

One of my aims was to develop the ONS coding scheme so that it could be used with a machine learning program in the future. However, ethical issues remain unsolved, even though new ethical guidelines for using artificial intelligence have been developed (Renier et al., 2021). How these can help in research on psychotherapy material is unknown.

More research is, in general, needed on interpersonal coordination of nonverbal behaviors in couple therapy by, for instance, studying the variables that influence it. Some interesting research questions could be: Are the therapist's behaviors or interventions related to interpersonal coordination between participants? Does the type of problem the couple comes with to therapy affect the interpersonal coordination patterns? Does a split alliance manifest itself in

interpersonal coordination patterns before it is seen in the dialogue? In what situations is interpersonal coordination of nonverbal behaviors important in couple therapy? Can interpersonal coordination hinder the psychotherapy process in some instances? When is it important not to match? The answers to these questions would provide clinically important information.

## 4.12 Clinical relevance

In the three studies comprising this thesis, I discovered that there was significant nonverbal synchrony in couple therapy, that nonverbal matching and synchrony were related to the therapeutic alliance, and that nonverbal matching did not always happen in significant moments of therapy. Because of the multiperson situation, the relationships between the nonverbal matching and synchrony patterns and the different variables, such as the therapeutic alliance, were found to differ between participants. Moreover, in a multiperson situation, the possibility of observing others synchronize in the sessions also affected the evaluations of the alliance.

Several findings shed light on the fact that many aspects can affect interpersonal coordination patterns. For instance, the wellbeing of the spouses, which was assessed at the beginning of the session, affected the synchrony patterns in the subsequent session. Qualitative inspection of the nonverbal matching patterns also revealed that the co-therapists coordinated with each other in sessions that followed a session in which the alliance had been evaluated as weaker. The microanalytical study demonstrated that in significant moments in a couple therapy session, there was sometimes less or even no nonverbal matching between participants. It seemed that interpersonal coordination (matching and nonverbal synchrony) could have different functions in the sessions depending on who was part of it, and in what kind of situation it occurred.

When considering my findings and the field in general, I find that research on the embodied aspects of psychotherapy lags behind clinical knowledge. Many practicing psychotherapists and clinicians understand the importance of embodied variables in the clinical encounter. Thus, it makes me apprehensive to suggest what the clinical relevance of the studies presented here could be. Based on my own clinical experience as a psychotherapist, I find that practicing psychotherapists can roughly be divided into two categories based on the therapists' knowledge of embodied aspects of therapy: the majority of psychotherapists work mainly in the verbal domain and are not always aware of the embodied variables affecting the therapy process, and a minority of therapists are bodily oriented psychotherapists, or psychotherapists who also use body-based interventions in their private practice. My main psychotherapy training is in the verbal domain, but I am also trained to use body-based interventions. I hope that my findings will make the therapists, who work mainly in the verbal

domain, more aware of the importance of the embodied aspects in therapeutic interactions.

One of the main conclusions of the studies was that there is an embodied facet of interaction that, while outside of our awareness, still affects the therapy process, especially the therapeutic relationship or alliance. Nonverbal synchrony between therapist and client has previously been related to the therapeutic alliance and outcome (Ramseyer & Tschacher, 2011, 2014), but also to dropout (Paulick et al., 2018a), to less progress in the sessions (Ramseyer, 2020), and even to alliance ruptures (Deres-Cohen et al., 2021). In couple therapy, the relationship between the spouses is the focus of therapy, and one of the markers of their satisfaction in the relationship could be nonverbal synchrony (Garcia, 2021; Sharon-David et al., 2019). However, the studies presented here demonstrated that couple therapy is a complex context in which many different synchrony patterns can occur. One aspect in the multiperson situation with two therapists was that the co-therapists could balance their implicit connectedness between both spouses. This could help avoid the development of a split alliance, which can be seen as hindering the therapeutic process in couple therapy (Friedlander et al., 2018; Sotero & Relvas, 2021). Study I indicated that a split in nonverbal matching patterns could signal the development of a split alliance in the session. If the majority of the matching or synchrony in a couple therapy session occur between two of the participants (not the spouses or the co-therapists), this could be seen as a marker for concern.

Developmentally, the nonverbal aspects of interactions precede verbal interactions. It is thus naïve to assume that the nonverbal aspects of the interactions would lose their importance in adulthood. My assumption is that matching and nonverbal synchrony enable the participants to intersubjectively meet in a nonverbal realm, and that this meeting happens implicitly and is important for creating a good relationship between the participants. Koole and Tschacher (2016) suggested that nonverbal synchrony is an important part of the development of the alliance because it couples the synchronized participants behaviorally and helps the participants understand each other. Gallese (2001) suggested that mirror neurons are responsible for empathy and social understanding, making us feel the other's actions inside ourselves, as if we would perform them ourselves. Matching and nonverbal synchrony could thus be interpreted as an embodied manifestation of trying to understand one another.

However, clinicians should be aware that matching and synchrony need to happen implicitly since explicit imitation could be interpreted as mockery (cf. Louwerse et al., 2012; Manusov, 1992; Trevarthen, 2005). I assume that interpersonal coordination happens naturally, as the therapist strives to understand the client. Therapists need to monitor the amount of coordination that occurs in the sessions, since too much synchrony or adaptation could have detrimental effects on the self-regulation of emotion (Galbusera et al., 2019) and blur boundaries between participants (Paladino et al., 2010). It could even lead to client dropout (Paulick et al., 2018a) or be related to nonimproving clients (Lutz et al., 2020) and to compassion fatigue in the therapist (Rotschild, 2006).

Therapists should also be aware of the context dependency of interpersonal coordination. In some situations, it will aid in creating rapport, but in others, it could be a sign of a relationship that is too enmeshed, a codependency, or even a rupture in the alliance (Deres-Cohen et al., 2021). However, a lack of interpersonal coordination could also be related to difficulties in forming relationships or feelings of disconnectedness. It has, for instance, been reported that persons suffering from loneliness have difficulty synchronizing with others (Saporta et al., 2022), and rehabilitation using synchronization interventions could be useful.

The signals and markers of the embodied part of interaction are underutilized by therapists in the explicit clinical reasoning process. Clinicians could use the amount of interpersonal coordination of nonverbal behaviors in their clinical reasoning process (cf. Gallagher & Payne, 2015) as information about how the clients are able to connect to others. I also urge therapists to become more aware of their own tendencies to react nonverbally. For instance, how much do they themselves adapt to others in their nonverbal behaviors during psychotherapy sessions? It is important for therapists to be present in their bodies, to use interoception as a part of clinical reasoning, and to become cognizant of the bodily patterns in the sessions.

I find it crucial that psychotherapy research has started to incorporate the embodied side of the interaction (Tschacher & Pfammatter, 2016), since this side of the interaction is always present in psychotherapeutic encounters, even in online therapy (García et al., 2022). As research on nonverbal behavior has increased, I hope it becomes mainstream research in psychotherapy and gradually leads to better theories on nonverbal behavior and embodiment in psychotherapy.

As I began with a quote from Daniel Stern, I will also end with one that describes the experiential aspect of connecting to and understanding others through embodied means (2004, p. 80).

> "[T]o resonate with someone, you may have to be unconsciously in synch with that person."

# YHTEENVETO (SUMMARY)

## Asentojen ja liikkeiden yhteensovittautuminen pariterapiassa

Vuorovaikutuksen aikana sovittaudumme luonnostaan toisiimme kehon asennoin ja liikkein. Kehollisesti yhteensovittautunut vuorovaikutus tuntuu luontevalta ja lisää yhteyden tunnetta. Yksilöpsykoterapiassa kehollisen yhteensovittautumisen on havaittu olevan yhteydessä terapian tuloksellisuuteen ja terapeuttiseen allianssiin eli yhteistyösuhteeseen. Pariterapiassa kehollista yhteensovittautumista ei ole tutkittu ennen tämän väitöskirjan osatutkimuksia.

Tutkimuksissa käytetty aineisto on kerätty *Relationaalinen mieli monitoimijaisten terapiadialogien muutoshetkissä* -tutkimusprojektissa. Projekti toteutettiin Jyväskylän yliopiston psykologian laitoksen psykoterapiaklinikalla. Aineisto koostui 12 pariterapiaprosessista, joissa terapeutit työskentelevät työpareina. Tutkimusprojektin tavoitteena oli tutkia osallistujien kehollista yhteensovittautumista ja osassa istuntoa osallistujien sydämen sykettä, ihon sähkönjohtavuutta ja hengitystiheyttä mitattiin erityisillä mittalaitteilla. Näiden mittausistuntojen jälkeen toteutettiin yksilölliset jälkihaastattelut, joissa osallistujille esitettiin videokuvaa neljästä merkitsevästä hetkestä istunnossa ja heitä pyydettiin palauttamaan mieleen, mitä he muistavat näiden hetkien aikana ajatelleensa, tunteneensa tai kokeneensa.

Tässä väitöskirjassa tarkasteltiin erityisesti kehon asentojen ja liikkeiden yhteensovittautumista ja sen yhteyttä terapeuttiseen allianssiin, terapian tuloksellisuuteen, osallistujien vireystilaan ja istunnonaikaiseen dialogiin. Väitöskirjan kolme osatutkimusta poikkesivat toisistaan sekä tutkimusasetelmien että -menetelmien osalta, tarjoten laajan ymmärryksen kehollisesta yhteensovittautumisesta pariterapiassa.

*Ensimmäisessä osatutkimuksessa* havainnoitiin yksi kokonainen pariterapiaprosessi (yhdeksän istuntoa). Tutkimuksen tavoitteena oli kehittää havainnointijärjestelmä tahattoman peilautumisen havainnointiin ja rinnastaa havainnoituja peilautumisia osallistujien istuntokohtaisiin allianssiarvioihin (Session Rating Scale). Tutkimusote oli pääasiassa laadullinen. Tutkimuksessa havaittiin, että pariterapian osallistujat peilasivat toistensa asentoja ja liikkeitä ja näiden havaintojen perusteella kehitettiin uusi luokittelujärjestelmä (Observing Nonverbal Synchrony - ONS). Kun aineistoa tarkasteltiin määrällisesti, havaittiin, että peilautumisen määrä vaihteli istunnosta toiseen. Mittausistunnoissa esiintyi vähemmän peilautumista. Tämä liittyi todennäköisesti siihen, että osallistujilla oli toisessa kädessään elektrodit, jotka olivat johdoilla kiinni mittauslaitteessa.

Kiinnostava laadullinen havainto oli, että peilautumista tapahtui enemmän terapeuttien välillä kuin puolisoiden tai asiakas-terapeutti-dyadien välillä. Laadullisessa tarkastelussa havaittiin, että terapeutit peilasivat toisiansa erityisesti istunnoissa, joita oli edeltänyt istunto, jonka allianssin osallistujat olivat arvioineet heikommaksi. Tämän perusteella vaikutti siltä, että terapeutit pyrkivät peilaamalla toistensa asentoja ja liikkeitä luomaan rauhallisen ilmapiirin, joka edesauttaisi allianssin rakentumista. Toinen olennainen havainto oli, että kuu-

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dennessa istunnossa, jonka allianssin kaikki muut paitsi naisasiakas arvioivat heikommaksi, suurin osa peilautumisista tapahtui naisasiakkaan ja toisen terapeutin välillä. Tämän istunnon jälkeen miesasiakas ja terapeutti, joka ei ollut peilannut naisasiakasta, arvioivat allianssin samansuuntaisesti. He arvioivat allianssin heikommaksi silloin, kun naisasiakas ja toinen terapeutti peilasivat toisiaan enemmän. Tämän perusteella vaikutti siltä, että kuudennen istunnon jälkeen pariterapiaan alkoi muodostua kaksi erillistä asiakas-terapeutti-dyadia. Pariterapiassa jaetun allianssin tila, jossa puolisoiden välillä esiintyy erimielisyyttä allianssin vahvuudesta, on havaittu heikentävän pariterapian tuloksellisuutta. Saattoi olla, että kehollinen peilautuminen antoi viitteitä jaetun allianssin tilan mahdollisesta kehittymisestä. Tämän pariterapiatapauksen tuloksellisuus ei puolisoiden oirekartoituksen (Outcome Rating Scale) ja terapian tuloksellisuusmittarin (CORE-OM) perusteella ollut parhaimmasta päästä. Peilautumisten perusteella jaetun allianssin tila ei kuitenkaan kehittynyt kovinkaan vahvaksi tässä pariterapiaprosessissa, sillä terapiaprosessin loppua kohti kehollista peilautumista tapahtui enemmän ja monessa eri ryhmittymässä (kaikissa dyadeissa, triadeissa ja jopa kaikkien osallistujien kesken).

*Toisessa osatutkimuksessa* tarkasteltiin yhtä pariterapian mittausistuntoa keskittyen sen neljään merkitykselliseen hetkeen. Ensimmäisessä osatutkimuksessa kehitettyä havainnointimenetelmää käytettiin osallistujien välisten kehon asentojen ja eleiden peilautumisen havainnointiin. Istunnon aikaista sanallista vuorovaikutusta tarkasteltiin Dialogical Investigations in Happenings of Change -menetelmällä, jonka perusteella istunto jaettiin temaattisiin kokonaisuuksiin (eng. topical episodes). Näiden kokonaisuuksien sisällä tarkasteltiin, ketkä puhuivat määrällisesti eniten tai säätelivät vuorovaikutusta ja sen sisältöä. Tämän lisäksi dialogin sisältöä tarkasteltiin Narrative Processing Coding -järjestelmän avulla, jolla tarkasteltiin muun muassa sitä, puhuttiinko istunnossa ulkoisista tilanteista vai sisäisistä kokemuksista, kuten tunteista. Kussakin temaattisessa kokonaisuudessa tarkasteltiin sekä osallistujien vireystilaa suhteessa heidän istunnonaikaiseen keskimääräiseen vireystilaansa että asentojen ja liikkeiden peilautumisen määrää. Tutkimuksen tavoitteena oli integroida eri modaliteettien (sanallisen vuorovaikutuksen, vireystilan ja peilautumisen) antama informaatio kokonaisuudeksi, pyrkimyksenä löytää toistuvia kuvioita tai selityksiä osallistujien kehon sisäisille (vireystila) ja ulkoisille (peilautuminen) reaktioille.

Aluksi tarkastelimme kaikkien muuttujien yhteyksiä koko istunnon tasolla, mutta emme löytäneet toistuvia yhteyksiä eri modaliteettien välillä. Näin ollen keskityimme lyhyempiin hetkiin vuorovaikutuksessa. Valitsimme tutkimuksen kohteeksi neljä merkityksellistä kohtaa, jotka tutkija oli valinnut jälkihaastatteluihin. Oletimme, että osallistujat kertoisivat jälkihaastatteluissa asioita, jotka auttaisivat meitä jäsentämään istuntojen aikaisten kehollisten reaktioiden ja dialogin ja terapeuttisen prosessin välisiä yhteyksiä. Ajatus osoittautui naiviksi, sillä osallistujat eivät juurikaan kommentoineet kehollisia tuntemuksiaan, emmekä saaneet haastatteluista vastauksia kysymykseemme, mihin kehollisten muuttujien reaktiot liittyivät. Tämä osatutkimus osoitti, että keholliset reaktiot ovat pariterapiatilanteessa monitulkintaisia ja monimutkaisia. Yksinkertaistetut

olettamat siitä, että vireystila olisi korkea hetkissä, joissa esiintyi voimakkaita tunteita, eivät saaneet vahvistusta. Vaikutti siltä, että kehollisiin reaktioihin vaikuttivat sekä yksilön sisäiset ajatukset, kokemukset, hänen mahdolliset defenssinsä että erilaiset systeemiset ilmiöt, kuten puolisoiden välinen suhde. Tutkimukseen osallistunut pariskunta oli tullut pariterapiaan, koska he kokivat, että heidän keskusteluyhteytensä oli kärsinyt lapsen syntymän myötä. Jälkihaastatteluissa kävi ilmi, että mies, joka istunnon aikana peilasi toisia osallistujia kaikista vähiten ja puhui niukasti omista tunteistaan, piti itsellään tiedon siitä, kuinka paljon hän nautti isänä olemisesta. Tämän hän teki hienotunteisuudesta vaimoaan kohtaan, joka oli kokenut synnytyksen jälkeisen masennuksen ja äitiyden kaikkea muuta kuin helpoksi. Yksi mielenkiintoisimmista havainnoista tässä istunnosta oli se, että peilautumista puolisoiden välillä oli melko vähän, mutta sellaisen temaattisen kokonaisuuden jälkeen, jossa puolisot olivat peilanneet toisiansa erityisen paljon, miesasiakas alkoi puhumaan tunteistaan ensimmäistä kertaa koko istunnon aikana. Tämän voisi tulkita niin, että mies rohkaistui puhumaan avoimemmin kokemuksistaan vasta pariskunnan saatua yhteyden toisiinsa implisiittisellä tasolla - kehon asentojen ja liikkeiden yhteensovittautumisena.

*Kolmannessa osatutkimuksessa* tutkittiin liikesynkronian yhteyksiä puolisoiden hyvinvointiin, osallistujien istuntokohtaisiin allianssiarvioihin ja terapian tuloksellisuuteen 29 istunnossa (11 pariterapiatapausta, 1-3 istuntoa per pariterapiatapaus). Liikesynkroniaa tutkittiin liike-energiaan perustuvalla menetelmällä (eng. Motion Energy Analysis), joka laskee liike-energian videokuvasta pikseleiden muutoksien perusteella muodostaen niistä aikasarjan. Tässä tutkimuksessa liike-energiaa tutkittiin kunkin osallistujan päänliikkeiden ja kehonliikkeiden osalta. Liike-energian perusteella osallistujien välinen kahdenvälinen synkronia laskettiin Surrogate Synchrony (SUSY) algoritmilla, joka laskee synkronian liike-energian aikasarjoista jakamalla aikasarjat 30 sekunnin ikkunoihin, joissa lasketaan ristikorrelaatiot +/-5 sekunnin viiveellä 0.1 sekunnin askelmissa. Tämän jälkeen SUSY muodostaa satunnaistetun aikasarjan sekoittamalla aikasarjan liike-energiat niin, etteivät samaan aikaan tapahtuneet liike-energiat ole pareja. Vertaamalla synkroniaa, joka on laskettu oikeiden liike-energioiden perusteella satunnaistettuihin synkronioihin, voitiin määritellä tilastollisesti merkitsevät synkroniat. Jokaisessa istunnossa esiintyi tilastollisesti merkitsevää synkroniaa valtaosassa dyadeista. Synkronioita, jotka eivät olleet tilastollisesti merkitseviä, esiintyi muutama (N = 9) ja näistä kolmasosa (N = 3) oli puolisoiden välisiä päänliikesynkronioita eri pariterapiatapauksissa.

Tutkimuksessa havaittiin, että kaikkien dyadien välinen liikesynkronia oli yhteydessä sekä puolisoiden hyvinvointiin että heidän allianssiarvioihinsa, kun taas sekä kehon- että päänliikesynkronia olivat yhteydessä terapeuttien allianssiarvioihin. Tarkastelimme myös sukupuolten välisiä eroja liikesynkronioiden, puolisoiden hyvinvoinnin ja osallistujien allianssiarvioiden välillä. Erityisen kiinnostavalta vaikutti se, että synkronia vastakkaista sukupuolta olevien asiakas-terapeutti-dyadien välillä oli yhteydessä sekä puolisoiden hyvinvointiin että allianssiarvioihin, kun taas synkronia samaa sukupuolta olevien asiakas-terapeutti-dyadien välillä oli yhteydessä terapeuttien allianssiarvioihin. Kiin-

nostavana yksityiskohtana voidaan mainita ristiriitainen tulos, jossa puolisoiden välinen päänliikesynkronia oli negatiivisesti yhteydessä naisasiakkaiden allianssiarvioihin, mutta positiivisesti yhteydessä naisterapeuttien allianssiarvioihin. Kolmannen osatutkimuksen perusteella voidaan todeta puolisoiden ja terapeuttien eronneen toisistaan sen suhteen, mitkä synkroniakuviot olivat merkitseviä suhteessa terapeuttiseen allianssiin.

Monenkeskisessä tilanteessa liikesynkroniaan tulee myös uusi ulottuvuus, sillä osallistuja voi sekä osallistua synkroniaan että havaita sitä muiden välillä. Tutkimuksessa havaittiin, että naisasiakkaat arvioivat allianssin vahvemmaksi, kun he näkivät muiden synkronisoituvan, kun taas miesasiakkaat ja miesterapeutit arvioivat allianssin vahvemmaksi, kun he itse synkronisoituivat muihin. Tuloksen taustalla voi olla monenlaisia tekijöitä. Yksi mahdollinen tulkinta on se, että tässä aineistossa naisasiakkaat tulkitsivat puolisonsa synkronisoitumisen toisiin osallistujiin hänen aktiivisena osallistumisenaan pariterapiaprosessiin. Aiemmissa tutkimuksissa on nimittäin saatu viitteitä siitä, että miesten aktiivinen osallistuminen pariterapiaprosessiin ja miehen allianssiarviot vaikuttavat pariterapian tuloksellisuuteen. Tärkeänä huomiona on kuitenkin mainittava, että emme varsinaisesti lähteneet tarkastelemaan sukupuolten välisiä eroja, vaan sukupuoli valikoitui osallistujia erottelevaksi tekijäksi, koska muita erottelevia tekijöitä oli vaikea löytää. Emme esimerkiksi voineet käyttää terapiaan erityisen motivoitunutta puolisoa erottavana tekijänä, sillä *Relationaalinen mieli* -aineistossa osallistujat saattoivat hakeutua terapiaan joko yhdessä tai jonkun toisen lähettämänä.

Johtopäätöksinä näistä kolmesta osatutkimuksesta voidaan todeta kehon asentojen ja liikkeiden yhteensovittautuminen olevan merkittävä tekijä myös pariterapiatilanteessa, ja se on yhteydessä terapeuttiseen allianssiin. Pariterapiatilanteessa neljän henkilön yhteensovittautumisen mahdollisuudet ovat kuitenkin moninaiset verrattuna yksilöterapiaan ja havaitsimmekin, että yhteensovittautumisen ja allianssien väliset yhteydet vaihtelivat osallistujien kesken. Toinen osatutkimus nosti esiin sen, kuinka monitulkintaisia ja monimuotoisia keholliset reaktiot ovat. Pariterapiatilanne on erityinen tilanne, jossa osallistujilla voi olla voimakkaitakin tunteita, defenssejä tai jännitystä, jotka vaikuttavat osallistujien kehollisiin reaktioihin. Tällaisia ovat muun muassa osallistujien yksilölliset odotukset, toiveet ja tavoitteet terapian suhteen, istunnon aikaiset tiedostetut ja tiedostamattomat ajatukset sekä parisuhteeseen liittyvät tekijät. Kaiken kaikkiaan nämä kolme osatutkimusta osoittivat isomman aineiston, yhden pariterapiaprosessin ja yhden istunnon tasolla, että kehollinen yhteensovittautuminen on merkityksellinen osa pariterapiaa ja vaikuttaa pariterapiaprosessiin todennäköisesti vahvistamalla osallistujien välistä yhteyttä.

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# ORIGINAL PAPERS

# I

# STUDYING NONVERBAL SYNCHRONY IN COUPLE THERAPY—OBSERVING IMPLICIT POSTURE AND MOVEMENT SYNCHRONY

by

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# Studying Nonverbal Synchrony in Couple Therapy—Observing Implicit Posture and Movement Synchrony

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## Abstract

Research on nonverbal synchrony (movement coordination) in psychotherapy has recently attracted increased attention. Nonverbal synchrony has been shown to relate to the therapeutic alliance and outcome. However, research on nonverbal synchrony in couple therapy remains scarce. In this study, we examined the therapy process of one couple in detail and created a coding scheme to depict posture and movement synchrony. In this case study, we found that the relationship between nonverbal synchrony and the therapeutic alliance was complex. During the therapy process, the amount of nonverbal synchrony varied, as did the participants' evaluations of the alliance. In couple therapy nonverbal synchrony could affect both the persons involved in it and the persons observing it. In one of the sessions, almost all the synchronies occurred between the female client and one of the therapists, and all except the female client evaluated the alliance to be weaker. In this case study, there were two therapists present, and the co-therapists' synchrony was found to be important for the male client's evaluations of the alliance. When there was more synchrony between the therapists, he evaluated the alliance to be stronger. Interestingly, the co-therapists' synchrony seemed to peak in sessions that succeeded sessions with a weaker alliance, as if the therapists were implicitly making a joint effort to strengthen the alliance. A short episode from one session is given to illustrate the findings. Our coding scheme enables studying nonverbal synchrony (posture and movement synchrony) in couple therapy and combining the research results to other temporally precise data obtained from the sessions. More research is needed to validate the method.

**Keywords** Nonverbal synchrony · Posture synchrony · Movement synchrony · Couple therapy · Mimicry · Alliance

## Introduction

Nonverbal synchrony is the tendency of participants to implicitly synchronize their behaviors to each other during interaction. Nonverbal synchrony has been studied using various methods (cf. Bavelas et al. 1986; Bernieri et al. 1988; Cornejo et al. 2017; Kimura and Daibo 2006), different terminology (interpersonal coordination, behavioral synchrony, interpersonal synchrony, mimicry, matching, alignment, etc.), and in different contexts, including psychotherapy (Altmann et al. 2019; Ramseyer and Tschacher 2011).

In psychotherapy, nonverbal synchrony has been shown to be related to the therapeutic outcome: the more synchrony there is between therapist and patient, the better the outcome (Ramseyer and Tschacher 2011). The more head movement synchrony there is, the better the global outcome of the therapy, whereas more upper-body movement synchrony is related to better evaluations of the sessions (Ramseyer and Tschacher 2014). Earlier research has shown that there is more nonverbal synchrony in sessions that the therapists or an outside expert evaluate to be of high quality (Nagaoka and Komori 2008).

Recently, Ramseyer (2020) showed that the relationship that nonverbal synchrony has with alliance and outcome is not as straightforward as the nomothetic research done with

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large samples (i.e., Ramseyer and Tschacher 2011, 2014) has suggested. A study of the intraindividual variation (i.e., using an idiographic perspective) in a limited number of therapy cases showed that sessions characterized by little progress were marked by high synchrony, and patients showing higher levels of synchrony across therapy sessions tended to report more interpersonal problems (Ramseyer 2020). Similarly, Paulick et al. (2018) showed that the highest amount of nonverbal synchrony between therapist and patient was related to non-improving patients, whereas an intermediate level of nonverbal synchrony was related to patient improvement and low levels of synchrony to patient dropout. These results are important since they show that it is too simplistic to think that more synchrony is always better in the context of psychotherapy.

Interestingly, research on nonverbal synchrony in couple therapy remains scarce, despite the importance accorded to paying attention to nonverbal communication patterns in couples (Gottman and Porterfield 1981). Synchronization of immediacy behaviors (i.e., gaze direction, body openness, distance, touching, and body position), which are said to regulate the intimacy between partners, has been shown to be more prevalent in satisfied couples (Julien et al. 2000).

The readiness to interact or engage in the couple therapy process has been studied using the Body Formation Coding System, which assesses engagement at the triadic level between the therapist and the couple (de Roten et al. 1999). The method focuses on how participants include or exclude others in couple therapy, i.e., how they turn toward or away from each other or lean forward or backward. It does not study synchrony per se. De Roten et al. (1999) found that the therapeutic alliance was not related to any kind of exclusion or inclusion pattern in the body formations; rather, a good therapeutic alliance occurred when participants engaged in predictable ways with each other, creating recurring patterns of engagement.

It should be noted that the relationship between the alliance and the outcome is generally more complex in couple therapy than in individual psychotherapy (cf. Friedlander et al. 2011); the relationship between evaluations of the alliance and the outcome may also differ even without the added complexity of nonverbal synchrony. According to some studies with heterosexual couples, the male client's evaluation of the alliance is more strongly related to the outcome than the female client's evaluations (Bourgeois et al. 1990; Symonds and Horvath 2004).

The System for Observing Family Therapy Alliance, hereafter SOFTA (Friedlander et al. 2006), is a method developed to observe alliances in family and couple therapy. The method focuses on a range of behaviors, including nonverbal behaviors, as markers of the alliance. The coding scheme does not include synchrony of nonverbal behavior, except for posture synchrony, i.e., implicit imitation of postures, which is considered in SOFTA to be a sign of emotional contact and a shared sense of purpose within the family.

Posture synchrony (also called congruence or mirroring) in psychotherapy has been shown to be related to the rapport between therapist and patient (Tickle-Degnen and Rosenthal 1990; Trout and Rosenfeld 1980); greater posture synchrony has been observed in moments of high rapport in a therapy session (Sharpley et al. 2001). Posture synchrony has also been shown to be related to empathy: when the therapist imitates the patient's posture, the therapist is perceived to be more empathic (Maurer and Tindall 1983). In case studies of psychotherapeutic processes, posture synchrony has been shown to occur implicitly (Davis and Hadiks 1994) and in important moments of a therapy session (Raingruber 2001).

According to research on nonverbal synchrony in psychotherapy and SOFTA, as well as research on posture synchrony, it seems plausible that implicit nonverbal synchronization between the participants in couple therapy could be associated with the therapeutic alliance.

## Nonverbal Synchrony—A Prosocial Glue

The influence of nonverbal synchrony on relationships has been extensively studied in various fields of research (cf. Chartrand and Lakin 2013). For the present study, findings from two fields are relevant: research on nonverbal synchrony, or movement coordination between participants, and research on mimicry, i.e., implicit imitation of physically similar movements. A meta-analysis on nonverbal synchrony showed that it has a robust positive effect on relationships (Vicaria and Dickens 2016). A review of mimicry research reached a similar conclusion, showing that mimicry has prosocial effects (Chartrand and Lakin 2013): it fosters liking (Chartrand and Bargh 1999) and rapport (Lakens and Stel 2011) and increases when the participants' goal is to affiliate with others (Lakin and Chartrand 2003).

Mimicry has been related to empathy as well. People who are more empathic tend to implicitly imitate others more (Chartrand and Bargh 1999; Sonnby-Borgström 2002; Sonnby-Borgström and Jönsson 2003). The tendency to imitate others has been called a primitive or bodily form of empathy (de Waal 2007), where imitating another person's behavior engenders a better understanding of the other's experience (Chartrand and Lakin 2013). It has been suggested that through implicit imitation, one strives to attune to the other's internal state (Chartrand and Lakin 2013; Davis and Hadiks 1994; Stel and Vonk 2010). Based on her case study, Raingruber (2001) suggested that in psychotherapy, therapists strive to understand and "be with" the client and develop a mutual sense of connection through synchronizing their nonverbal behavior with that of the client.

Two theoretical frameworks have been put forth concerning nonverbal synchrony (i.e., movement coordination). Baimel et al. (2015) suggested that nonverbal synchrony prepares us for engaging with the mental world of others and enhances our understanding of others through various cognitive processes. Koole and Tschacher (2016) developed the Interpersonal Synchrony model of nonverbal synchrony in psychotherapy, in which they grounded the therapeutic alliance in the nonverbal synchrony or coordination between therapist and patient. According to them, nonverbal synchrony facilitates an understanding of the other's experiences and emotions through coupling of the therapist's and patient's brains, which may over time improve patients' capacity for the regulation of emotion.

Here, we studied nonverbal synchrony in couple therapy, a context in which nonverbal synchrony patterns are more complex as the context involves multiple participants and multiple relationships, i.e., the relationship between the spouses (allegiance), the relationship between the clients and the therapist(s), and in this case, the relationship between the two participating therapists. This introduces a novel aspect into nonverbal synchrony: those who are not participating in nonverbal synchrony but are watching it may also be affected by it. This question was addressed in our study by investigating the associations of nonverbal synchrony patterns observed with the participants' evaluations of the therapeutic alliance.

## Methods Used to Study Nonverbal Synchrony

Our aim was to study nonverbal synchrony, especially implicit imitation of postures and movements, from authentic videos of couple therapy. To choose the research method, earlier methods used to study nonverbal synchrony were assessed. Two main methods were used in previous studies: observation and automated frame-differencing.

Observation is the method most commonly used (cf. Hall et al. 1995). Observation requires that trained raters evaluate the presence of predefined behaviors, which form the coding scheme. The methodology of observation varies: the raters can (1) name the most frequently occurring nonverbal behavior within a certain time interval, for instance, within 30 s (cf. Davis and Hadiks 1994; LaFrance 1985); or (2) evaluate the number of predefined behaviors in a segment of interaction (cf. Bernieri et al. 1988). The raters can also use behavioral ratings, i.e., the behavior is evaluated using a Likert-scaled questionnaire for evaluation (see Bavelas et al. 1986, for a detailed methodological paper on observational methods used in mimicry research). The frequency or occurrence of nonverbal behaviors at the exact moment they happen is not usually coded, thus emphasizing the observer's evaluation. Exceptions are the studies on nonverbal behavior conducted by Davis and Hadiks (1990, 1994), in which

they coded postures of therapists and clients separately; the studies did not look at nonverbal synchrony between the participants.

Observational data often results in nominal data, which is more difficult to analyze. Louwerse et al. (2012) presented a method for calculating nonverbal synchrony of nominal observational data by using cross-recurrence analysis. Such analysis reveals the temporal dynamics of the observational data and compares the recurrence of behaviors between two participants (i.e., synchrony).

All observational methods share the disadvantage that they are time-consuming and require trained raters. To shorten the data observation process, automated video analysis methods have been used (cf. Nagaoka and Komori 2008; Ramseyer and Tschacher 2011, 2014). These automated frame-differencing methods, such as motion energy analysis (MEA), mark the change in pixels between video frames as movement. With these methods, all movements in predefined regions of interest (e.g., head and trunk) are studied. Synchrony is then calculated based on these pixel changes. The estimate of nonverbal movement synchrony thus refers to any kind of simultaneously occurring movement within the region of interest. The physical appearance or shape of the movement is not considered. By using this method, head movement synchrony occurs even when one person shakes his head and the other one nods. Within the context of psychotherapy as a meaning-making process, this seems somewhat odd.

To test whether automated methods do indeed produce satisfactory results, Fujiwara and Daibo (2014) compared an automated method for detecting nonverbal behaviors to traditional coding and behavioral rating methods. They found that the automated method correlated to traditional coding and behavioral ratings. They concluded that automated methods are potentially more valuable since they are cost-effective and reduce the need to train skilled raters. For an extended review of methods used in studying interactional synchrony, see Kimura and Daibo (2006).

Even though the traditional method of observation is more time-consuming, it was chosen for this study because no automatic method to date has been capable of identifying the imitation of similar postures and movements (mimicry) from videos. The automated methods available are not suitable for analyzing sessions as lengthy as the studied psychotherapy sessions were, and they usually use servers that are not secure enough to ensure the privacy of the couple in therapy. Thus, no method that stored the data on a server outside the university could be used. Frame-differencing methods were not chosen because they are unable to discriminate between similar and dissimilar movements within the region of interest and do not capture instances of static posture synchrony.

Another important aspect was that the coding scheme developed here needed to mark the nonverbal synchrony of behaviors at the exact time they occurred in the session. This was important since one aim was to use the observational data in combination with other temporally exact data obtained from the session, such as autonomic nervous system reactions or spoken dialogue. Frame-differencing methods are usually not used in such a time-exact manner; thus, they were not considered (time windows are usually about 10 s). It was necessary to develop a coding scheme of posture and movement synchrony to be used in the context of couple therapy.

## Summary

On the basis of prior research, it can be concluded that nonverbal synchrony affects the relationship between the participants. In the context of couple therapy, nonverbal synchrony has not been studied much. According to earlier research and theoretical models of nonverbal synchrony, posture synchrony and mimicry facilitate the understanding of others and create liking and rapport between participants.

The observational method was chosen even though it is time-consuming because the frame-differencing methods lose qualitatively important aspects of nonverbal synchrony. For the present study, we observed and reported the results from one couple therapy process in detail; during development, other couple therapy cases were also observed.

The research aims were: (1) to develop a coding scheme for looking at nonverbal synchrony (especially implicit imitation of nonverbal behavior that is similar in physical appearance) in the context of couple therapy by using qualitative observation of therapy sessions; and (2) to investigate how the observed nonverbal synchrony patterns were related to the therapeutic alliance in a therapeutic process of one couple. A short episode selected from a session will illustrate one incident of nonverbal synchrony.

## Method

### Design, Participants, and Data Selection

The data analyzed here was selected from a pool of data that was collected in the Relational mind in events of change in multiactor therapeutic dialogues research project at the University of Jyväskylä (Seikkula et al. 2015). The therapy was conducted in a natural couple therapy setting with two therapists present. The presence of two therapists is the established way to work in couple therapy in the facility. The therapy was not manualized; rather, narrative and dialogical approaches were used. The therapy did not include any bodily interventions. The therapy sessions were recorded with six cameras. Four cameras focused on the participants' faces (one on each participant), and two cameras recorded the full bodies of dyads, one dyad being the couple and the other dyad the therapists. In this study, videos were used that showed the full bodies of the four participants in a split-screen format.

Since one aim of the research project was to study the synchrony of autonomous nervous system reactions, such reactions in the participants were recorded in the second and sixth sessions. For this purpose, heart rate monitors were attached to each participant's chest, two skin conductance electrodes were attached to the palm of each participant's non-dominant hand, and a respiration rate fabric belt was fastened around each participant's lower chest. The skin conductance measurement equipment was attached to the chair in which the participant sat, meaning that it restricted the movements of the non-dominant arm to a range of approximately 25 cm from the chair. Since the aim of the research project was to study the autonomous reactions of the participants and the interest in looking at the nonverbal synchrony between the participants developed only after the therapies had commenced, this meant that neither the therapists nor the clients were aware that their bodily movements would be analyzed.

Each therapy session lasted approximately 90 min. The therapeutic alliance was monitored using the Session Rating Scale (SRS), which was given to both the clients and the therapists after each session (Duncan et al. 2003). SRS is a visual analogue self-report measure that uses a Likert-type scale. It is an alliance measurement scale developed on the basis of Bordin's (1979) theory of alliance, which emphasizes the relational bond and agreement on goals and tasks. The ultra-brief version of SRS was used, which comprises four items depicting the four different aspects of alliance (Duncan et al. 2003). The "Relationship" scale assesses the statement, "I felt/did not feel heard, understood, and respected" and the "Goals and Topics" scale assesses the statement, "We worked on or talked about/ did not work or talk about what I wanted to work on or talk about." The "Approach or Method" scale requires rating the session to assess the statement, "The therapist's approach is/is not a good fit for me." The fourth item rates the overall session to assess the statement, "There was something missing in the session today" vs. "Overall, today's session was right for me." It is important to note that the clients evaluated the co-therapists as a team while the therapists evaluated the alliance in relation to both spouses simultaneously.

The research procedure was approved by the University of Jyväskylä Ethical Committee, and all participants gave their written informed consent to participate in the research project. The design and data collection were performed by Kaartinen, Kykyri, Penttonen, Tourunen, and

Seikkula. The coding scheme was developed by the first author Nyman-Salonen.

To develop the present coding scheme, the therapy process of one couple was examined. The couple was chosen since their therapy videos were available for analysis when the development of the coding scheme commenced. The process comprised ten sessions, nine of which (sessions 2–10) were analyzed. The first session was unfortunately omitted from analysis due to technical problems in the video recording. In two of the analyzed sessions (sessions 2 and 6), both the therapists and the clients wore autonomic nervous system measurement equipment.

## The Case

The couple came to therapy because of loyalty issues in their relationship; in addition, the husband had previously behaved violently toward his wife. Couple therapy was recommended; no violence occurred during the time the couple was in therapy. The wife was pregnant at the beginning of the therapy process, and the baby was born in the middle of it. The baby was present in some of the analyzed sessions. Most of the time, the baby was in a baby car seat on the floor, but if the baby started crying during the session, the parents held her on their laps. The two male therapists working with this couple were both experienced couple and family therapists.

### The Procedure: Qualitative Analysis of Videotapes for the Development of the Coding Scheme

To begin the development of the observational coding scheme, the first author systematically observed the aforementioned videotaped sessions. This was done without sound so that the dialogue would not influence the interpretation of the nonverbal behavior. The videos showed the full bodies of the participants in a split-screen format; the videos of the participants' facial expressions were not used because our interest was to study the nonverbal synchrony of the participants' body postures and movements. Furthermore, facial expressions might have influenced the interpretation of nonverbal behavior. In the full-body videos, the facial expressions of the participants were not clearly visible due to the distance of the camera from the participants and the layout of the split-screen video, which showed both the couple and the therapists. In the software used for observation, the screen showing the videotapes had to be quite small to enable the observers to see all four participants simultaneously in order to detect nonverbal synchrony.

The aim was to look at instances of nonverbal synchrony, i.e., instances in which a participant implicitly imitated the other's postures or movements. The qualitative analysis aimed at creating a categorical coding scheme.

As the aim was to create a replicable method that others could use, specific notes were taken on the precise definition of the various categories of implicit imitation. This meant that the most important criterion of nonverbal synchrony was the physical similarity of implicitly imitated postures and movements. This minimized observer bias by reducing the amount of evaluation the observers were required to perform. During the observational process, decisions on what to include in and exclude from the coding scheme were made and discussed with other observers (see "Interrater reliability" below). For instance, the abovementioned presence of the baby in the sessions was discussed; it was jointly decided how to take the baby's presence into account during the observations. The observations were carried out using the Noldus Observer program (two versions, 11.5 and 12.5, were used due to a software update that occurred during the research process; www.noldus.com).

### Interrater Reliability

The method was tested for interrater reliability. All the sessions were rated by the first author. Four additional observers (hereafter "raters"), who were undergraduate students in the Psychology department, rated two sessions each (session 3 was rated by the author and two raters, session 6 by the author and two other raters, and session 10 by all the raters). All raters were trained in using the observational method and observed the sessions without sound. The training began with a presentation of the method and coding scheme, after which the raters observed 10 min of one therapy session in pairs and discussed the observational method together and with the first author. After the observation, the two pairs' results were compared with the first author's observations and disagreements were discussed. After this, the raters observed one session individually; the observations were then discussed, first pairwise, and then with the first author. If the raters encountered unclear instances, they noted these for discussion during the observations. Some unclear instances occurred when the baby was in either of the parents' laps; it was agreed that the overall physical appearance of the parent, meaning how the parent held his or her arms and legs during that time, should be compared to the other participants' postures to check for posture synchrony.

Interrater reliability was obtained using the Noldus Observer program (version 12.5), based on the frequency and sequence of the behaviors observed in time intervals of 3, 2, 1, and 0.5 s. The Observer program calculates pairwise interrater reliability, an Index of Concordance, and the percentage of agreements as well as Cohen's Kappa, Pearson's Rho, and the Prevalence index (stating the degree to which

the number of agreements in one variable is higher than in another variable).

## Statistical Analysis

Statistical analysis was performed to examine whether the frequency of the nonverbal synchrony behaviors differed across sessions and whether wearing the measurement equipment had an impact on the frequency of nonverbal synchrony (measurement equipment was worn only in the second and sixth sessions). Analysis was performed using generalized estimated equations (GEE) with a non-parametric Poisson log-linear model. GEE is an extension of the general linear model but is suitable for use with longitudinal data (the same participants in a repeated-measures fashion) when the cases are not independent (Wang 2014). The statistical analysis was performed using IBM SPSS Statistics version 24.

## Qualitative Analysis of Nonverbal Synchrony Patterns and the Therapeutic Alliance

The therapy process was first analyzed separately for nonverbal synchrony patterns and the participants' evaluations of the alliance on the SRS. After this, the observations of posture and movement synchrony patterns in the sessions and the alliance evaluations were triangulated.[1] An episode illustrating how posture synchrony manifested itself in the session is presented.

## Results

First, the qualitative developmental process used for the coding scheme will be described, and the interrater reliability obtained using it will be presented. Second, the descriptives of the nonverbal synchronies will be shown. Third, the statistical analysis performed on the data obtained by comparing the nonverbal synchronies among the sessions will be presented. Fourth, the qualitative analysis of the therapeutic process triangulating the posture and movement synchronies observed with the participants' evaluations of the alliance will be presented. Finally, an episode of one session will be presented in which posture synchrony occurs between two of the participants.

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[1] The relationship between posture and movement synchrony to the therapeutic alliance was also calculated by calculating bootstrapped confidence intervals (95%) for the nonparametric correlations between the nonverbal synchrony behaviors per subject and alliance measurements of the session (SRS). The subscales (Relationship, Goals and Topics, Approach or Method, and Overall) and the sum of the subscales were used. The results are provided in "Appendix 2".

## Qualitative Observation Process for Developing the Coding Scheme

The first qualitative observation was that the participants in the couple therapy sessions sat quite still. Mainly speech-related gesturing, nodding, posture shifting, arm movements, and directing the gaze were observed. Two main categories of synchrony were observed: posture synchrony and movement synchrony.

Posture synchrony and movement synchrony were separated into two different categories because of their temporal differences. Posture synchrony, in which one person imitated another participant's posture, was a state event, meaning it had duration and lasted for some time until one of the participants left the shared posture. In contrast, imitation of movement was considered a point event, where only the frequency was calculated.

The categories were further elaborated. Posture synchrony was defined as two or more participants sharing a similar posture with their torso, legs, and arms. The most important criterion was that the physical positions of the bodies and the limbs had to be similar. Posture synchrony was not restricted to mirror images of the others' postures, as congruent postures were also included (the right arm and leg of person A matching the right arm and leg of person B). Previous research indicated that the felt difference between these is not relevant for the participant (Raingruber 2001).

Movement synchrony was defined as occurring when two or more participants made a similar movement with the same body part within a time interval of 3 s. The interval used in mimicry research varies from 3 to 8 s (Chartrand and Lakin 2013). An interval of 3 s was chosen based on research showing that shorter intervals of mimicry are more easily felt to be mimicry (Bailenson et al. 2004) and following a discussion with a senior researcher in the area of neuroscience Markku Penttonen.

Movement synchrony was further divided into subcategories based on the body parts involved: head, arm, hand, torso, and legs. A category named "other" was created because some synchronized movements were functional (e.g., picking up something or sighing) and did not fit into the body part subcategories. The most important criterion for movement synchrony was that the shape of the movement made by two, three, or four participants had to be similar. The similarity was defined by stating that the synchronized movements made by the participants had to start from the same position, make a similar movement in form, and end in the same position. For instance, head movements in which one participant nodded, i.e., moved their chin down and up, and the other participant only put their chin down, was not considered to be head movement synchrony because the end of the movement was dissimilar. The size of the movement was not precisely defined, but the movement had to be visible to the observer's eye to be included.

**Table 1** Coding scheme for observing nonverbal synchrony

| Behavior | Operational definition |
|---|---|
| Posture synchrony | Two or more participants being in a similar posture with their arms and legs, such as both arms on the armchairs with their hands facing in a similar direction and with their legs crossed |
| Head movement synchrony | Two or more participants making the same head movement within a 3-s interval, such as nodding |
| Arm movement synchrony | Two or more participants making the same movement with their arms (from the shoulder to the hand), where the peak of the movement occurs within a 3-s interval, such as touching their face with their hands |
| Torso movement synchrony | Two or more participants making the same movement with their torsos within a 3-s interval, such as stretching the torso |
| Hand movement synchrony | Two or more participants making the same movement with their hands within a 3-s interval, such as clapping their thighs |
| Leg movement synchrony | Two or more participants making the same movement with their legs within a 3-s interval, such as crossing their legs |
| Other movement synchrony | Two or more participants making a similar movement within a 3-s interval that does not fit into the aforementioned categories; for instance, two participants try to pick up something from the floor |

The subcategories were mainly created to enable examining the sessions in greater detail and were not used here for statistical testing. The coding scheme and definitions are shown in Table 1.

The subject structure of the method differed from that of earlier methods (see Table 2). During observations, it was noted that synchrony occurred between a dyad, triad, and even a tetrad of participants. It was decided that the various combinations of participants would be used as synchrony groupings. This meant that of the four participants, six dyads were created: the couple (A B), the therapists (T1 T2), and one of the therapists with one of the clients (T1 A, T1 B, T2 A, and T2 B). In addition, four triads were created: the therapists and one of the clients (T1 T2 A, and T1 T2 B), and one of the therapists and the couple (T1 A B and T2 A B), and finally, one tetrad that included all participants (T1 T2 A B). These combinations were used as subjects. Thus, synchrony was coded only for the synchrony groups (i.e., T2 A in posture synchrony) and individual coding (i.e., T2 nodding) was not used.

## Interrater Reliability for Session Coding

Interrater reliability for the session coding was obtained using the Noldus Observer program, version 12.5. The results were calculated using tolerance windows of 3, 2, 1, and 0.5 s. The results of the 1-s tolerance window are presented here. The overall Index of Concordance was 0.85, the percentage of agreement was 84.5%, Cohen's Kappa was 0.84 ($p < 0.001$), Cohen's Kappa max was 0.95, and Pearson's Rho was 0.99 ($p < 0.001$). The prevalence index was 0.9. These results show that interrater reliability was nearly perfect (Landis and Koch 1977). The respective results using a tolerance window of 0.5 s were 0.7, 71.2%, 0.7, 0.93, and 0.98, which were all also very high.

## Descriptives of Posture and Movement Synchrony

During the nine analyzed sessions, the frequency of the different nonverbal synchronies varied. Posture synchrony occurred on average 30.22 times during a session (SD 10.63; min = 13, max = 47) and movement synchrony occurred 93.78 times (SD 29.30; min = 55, max 152). The mean, standard deviation, minimum and maximum values, and the total value of posture synchrony per synchrony group for the nine sessions combined is presented in Table 3; the data for movement synchrony is presented in Table 4.

Tables 3 and 4 indicate that for some of the synchrony groupings, there were sessions in which no synchrony occurred. Qualitative inspection reveals that posture synchrony occurred especially between therapist 2 and female client (A), between therapist 2 and the male client (B), between therapist 1 and the male client (B), and between the co-therapists (Table 3). Movement synchrony occurred mostly between the co-therapists and between therapist 2 and the female client (A) (Table 4). The movement

**Table 2** Synchrony groupings

| A B | The couple, A sitting on the right and B on the left |
|---|---|
| T1 T2 | The therapists, T1 sitting on the left and T2 sitting on the right |
| T1 A | Therapist 1 and client A (sitting opposite each other) |
| T1 B | Therapist 1 and client B (sitting diagonally to each other) |
| T2 A | Therapist 2 and client A (sitting diagonally to each other) |
| T2 B | Therapist 2 and client B (sitting opposite each other) |
| T1 A B | Therapist 1 and client A and B |
| T2 A B | Therapist 2 and client A and B |
| T1 T2 A | Therapists and client A |
| T1 T2 B | Therapists and client B |
| T1 T2 A B | All participants |

**Table 3** Posture synchrony per synchrony group during nine sessions

|  | T1T2 | T1A | T1B | T2A | T2B | AB | T1T2A | T1T2B | T1AB | T2AB | T1T2AB |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *M* | 4.22 | 0.00 | 6.22 | 11.44 | 5.44 | 2.22 | 0.00 | 0.22 | 0.00 | 0.44 | 0.00 |
| *SD* | 6.20 | 0.00 | 4.41 | 8.23 | 5.23 | 2.28 | 0.00 | 0.44 | 0.00 | 0.73 | 0.00 |
| Min | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Max | 20 | 0 | 16 | 22 | 16 | 6 | 0 | 1 | 0 | 2 | 0 |
| Sum | 38 | 0 | 56 | 103 | 49 | 20 | 0 | 2 | 0 | 4 | 0 |

*N* = 9

*T1* therapist 1, *T2* therapist 2, *A* female client, and *B* male client

**Table 4** Movement synchrony per synchrony group during nine sessions

|  | T1T2 | T1A | T1B | T2A | T2B | AB | T1T2A | T1T2B | T1AB | T2AB | T1T2AB |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *M* | 30.44 | 6.89 | 9.33 | 22.11 | 9.67 | 6.22 | 1.56 | 1.89 | 2.78 | 1.56 | 1.33 |
| *SD* | 12.3 | 3.3 | 3.61 | 13.08 | 4.64 | 4.79 | 1.67 | 2.26 | 2.17 | 2.83 | 1.73 |
| Minimum | 12 | 2 | 2 | 6 | 3 | 1 | 0 | 0 | 0 | 0 | 0 |
| Maximum | 52 | 13 | 14 | 41 | 18 | 14 | 5 | 6 | 6 | 9 | 5 |
| Sum | 274 | 62 | 84 | 199 | 87 | 56 | 14 | 17 | 25 | 14 | 12 |

*N* = 9

*T1* therapist 1, *T2* therapist 2, *A* female client, and *B* male client

synchronies consisted mostly of head nods (59% of all movement synchronies). It is noteworthy that nonverbal synchrony between the couple was not that frequent. All frequencies of posture and movement synchrony per synchrony group for each session are presented in Appendix 1.

## Statistical Analysis

### The Difference in Nonverbal Synchrony Between Sessions

The differences in the frequencies of postures and movements per session were calculated using GEE and a Poisson log-linear model. Pearson residuals over an absolute value of 2.0 were considered to deviate significantly from the estimated model.

Posture synchrony was significantly higher than the estimated mean in sessions 2 and 9 (Pearson residual 2.506 and 3.052, respectively) and lower than the estimated mean in session 3 (Pearson residual − 3.133). Movement synchrony was higher than the estimated mean in session 10 (Pearson residual 6.012) and lower than the estimated mean in sessions 2 and 6 (Pearson residual − 4.004 and − 3.282, respectively). In sessions 2 and 6, the participants wore autonomic nervous system measurement equipment that restricted the movement of their non-dominant hand. In the sessions in which the baby sat on one of the parents' laps (sessions 3, 6, 7, and 10), the amount of synchrony did not differ from other sessions (except for posture synchrony in session 3, and movement synchrony in session 6). In the other sessions, no posture or movement synchrony frequency was higher or lower than the estimated means.

## Qualitative Analysis of the Therapy Process

The qualitative analysis of the therapy process began with an inspection of the frequencies of posture and movement synchronies in the sessions (Figs. 1 and 2) and the participants' evaluations of the therapeutic alliance in the sessions (Fig. 3). After this, the nonverbal synchronies were contrasted with the evaluations of the alliance.

### Nonverbal Synchrony

Posture synchrony (Fig. 1) occurred mainly in dyads, and only rarely between three persons. Three dyads had more posture synchrony than any of the others: the co-therapists (all sessions except 3 and 6), the male client (B) and therapist 1 (all sessions except 6), and the female client (A) and therapist 2 (from session 4 through session 9). Therapist 2 was also in synchrony with the male client in most of the sessions (except for session 6). It seemed that therapist 2 was more involved in posture synchrony than therapist 1. At the beginning of the therapy, the female client was not in posture synchrony with anyone but her husband. As the therapy progressed, she became more actively involved in the nonverbal synchronies, and she and therapist 2 were in posture synchrony quite often. Posture synchrony between the clients was not that frequent, but occurred in sessions 2, 3, 5, 8, 9, and 10.

Movement synchronies per synchrony group in the sessions are shown in Fig. 2. The movement synchronies presented are the sum of all the movement synchrony types, i.e., head, arm, hand, leg, torso, and other. A large portion of the movement synchronies in general were head movement

**Fig. 1** Posture synchrony per synchrony group per session. This figure shows the posture synchronies per synchrony group for every session observed (2–9)
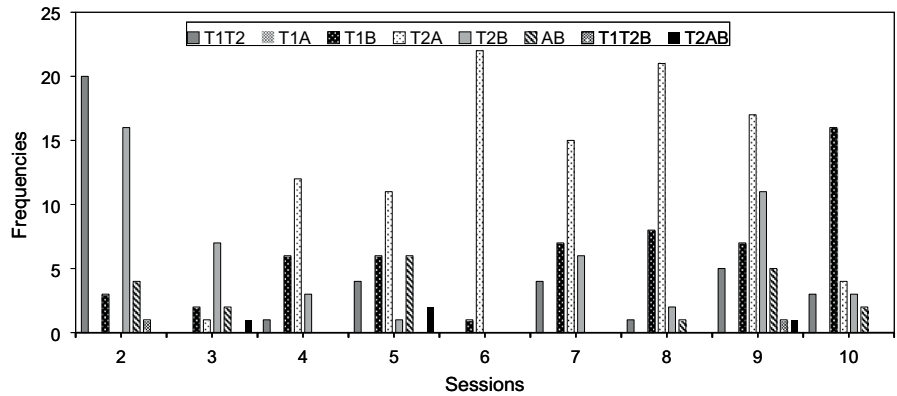


**Fig. 2** Movement synchrony frequencies per synchrony group per session. This figure shows the sum of all movement synchronies per synchrony group for every session observed (2–9)

*Movement synchrony frequencies per synchrony group per session*
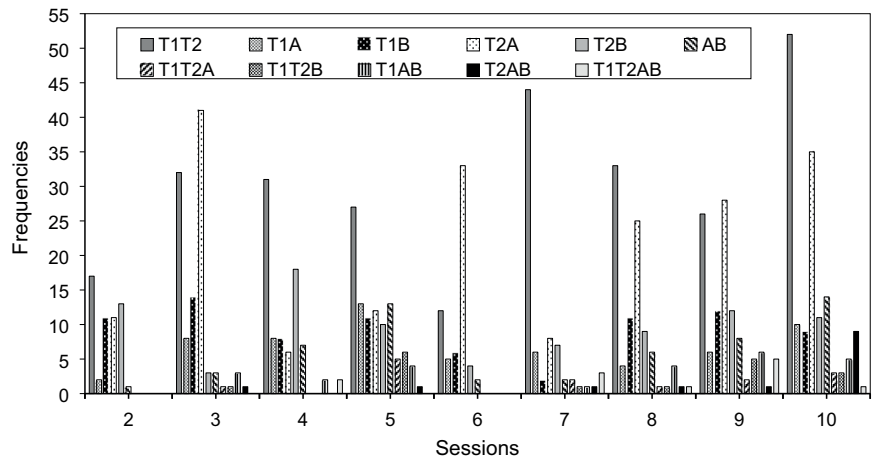


**Fig. 3** The participants' SRS scores per session. This figure shows the participants' evaluations of the alliance in each session (1–9) evaluated with the Session Rating Scale (SRS). The sum of scores is presented for each participant for every session. For clarity of the figure, the *y*-axis starts from the score 25 and not 0

*The participants' SRS scores per session*
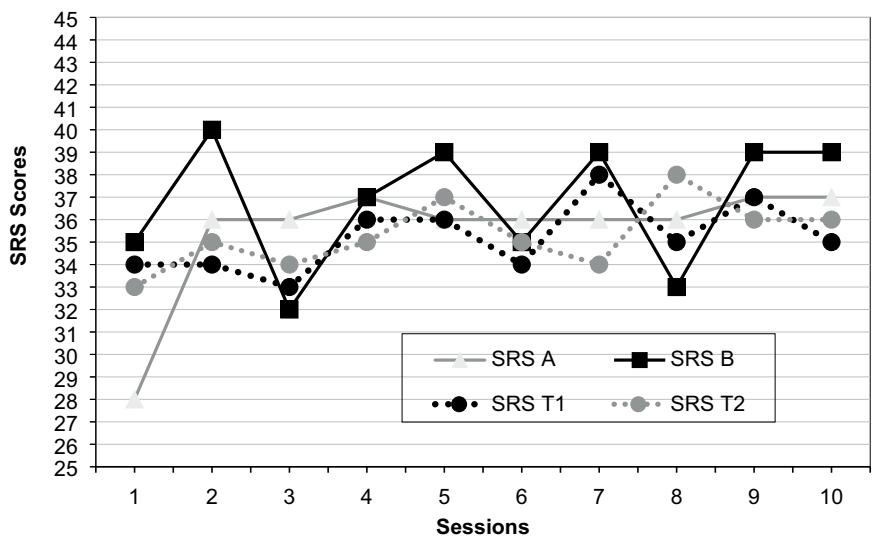
synchronies, i.e., nodding. Through the therapy process, there was movement synchrony in dyads, triads, and even the tetrad. Movement synchrony in general, as well as triadic and tetradic synchronies, occurred with greater frequency toward the end of the therapy process (sessions 8, 9, and 10). Session 6 differed from all other sessions regarding the amount of posture and movement synchrony in that it had the least amount of synchrony. The co-therapists and therapist 2 and the female client showed the largest amount of movement synchrony throughout the therapy process.

### The Therapeutic Alliance

The alliance scores (SRS) evaluated by the therapists and the clients varied across sessions. Figure 3 shows the sum of the SRS scores for each participant per session. The first session is included in the figure even though it was not available for nonverbal synchrony analysis. The first session was evaluated by all participants to have a weak alliance; the female client in particular evaluated the alliance to be extremely weak.

When we examined the overall process, it seemed that the alliance improved from sessions 2 to 5; however, the alliance was evaluated to be weaker in session 6. After session 6, the participants' evaluations diverged. The female client's evaluations were stable from session 2 onward, showing only a slight improvement during the last two sessions, while the male client's evaluations changed from session to session. The therapists seemed to agree on the alliance from sessions 1 to 6, after which their evaluations differed; that is, when one therapist evaluated the alliance to be stronger than in the preceding session, the other therapist evaluated it to be weaker. The male client's and therapist 1's alliance evaluations were remarkably similar from session 3 onward and differed only in the last session.

### Triangulation of Nonverbal Synchronies and Evaluations of the Therapeutic Alliance

At the beginning of the therapy process, the therapists evaluated the alliance to be weak (sessions 1 to 3). In the second session, the co-therapists frequently had posture synchrony, and in the third session, they had more movement synchrony than in the previous session. One interpretation of this could be that the therapists worked at the embodied level, i.e., nonverbally to establish a secure base for the therapy. The sixth session was also evaluated by all participants to have a weaker alliance; it is noteworthy that there was no posture synchrony between the therapists in this session, and movement synchrony between the co-therapists was not as frequent as in other sessions. The posture synchrony in the sixth session was almost entirely between therapist 2 and the female client. This dyad was also responsible for the greatest share of movement synchrony in the same session.

It is interesting to note that when the sessions had been evaluated to have a weaker alliance (session 1 by all participants and session 6 by all except the female client), the co-therapists synchronized to each other more in the subsequent session. It is as if they were making a joint embodied effort to strengthen the alliance by creating a rapport between themselves, thereby possibly communicating to the clients that they were interested in what was under discussion. The female client, who was involved in most of the synchronies in session 6, did not evaluate the alliance to be weaker in that session. But all in all, the female client evaluated all the sessions in such a stable way that it was difficult to interpret her nonverbal synchrony patterns and her evaluations.[2]

When the individual evaluations of the alliance and the nonverbal synchronies were compared, it was found that the male client evaluated the alliance to be stronger in sessions 2, 5, 7, 9, and 10, where there was posture synchrony between the co-therapists.[3] In the fourth session, the female client evaluated the alliance to be slightly stronger; in this session, she began to have more posture synchrony mainly with therapist 2. Before this session, she had mainly been in posture synchrony with her husband.

In the sessions in which the male client and therapist 1 evaluated the alliance to be weaker, the female client was in movement synchrony with therapist 2 (sessions 3, 6, and 8). In these sessions, these movement synchronies were mainly head nods, while the female client talked actively and therapist 2 responded.

In the sessions in which the co-therapists evaluated in opposite directions (sessions 7, 8, 9, and 10), there were no clear patterns to discern from the nonverbal synchronies. Toward the end of the therapy, both movement and posture synchronies were more frequent and involved more participants; at the same time, the participants evaluated the alliance to be stronger.

### An Episode from a Session Illustrating Posture Synchrony

The following passage is a short episode from the second therapy session, showing how posture synchrony occurred during the dialogue. Before this episode, there had been

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[2] Nonparametric Spearman's rank-order correlations with bootstrapped confidence intervals were calculated to analyze the relationship between the alliance in the sessions and the observed behaviors. For readability, only the nonverbal synchrony groups and SRS scores with significant correlations are included in the tables in "Appendix 2". There were no significant correlations between the female client's SRS evaluations and the nonverbal synchrony patterns.

[3] This relationship was confirmed with the correlational analysis of the frequencies of nonverbal synchrony and the male client's evaluations of the therapeutic alliance, which can be seen in Table 7 in "Appendix 2".

a discussion about an argument the couple had had. The female client had felt that the male client had not been loyal to her and their family. Rather, she felt he had been loyal to his family of origin, as he did not defend her against the criticism his family directed at her. Just before this episode, therapist 1 had challenged the male client by questioning whether he felt he would be abandoned by his family of origin if he took his wife's side, and he admitted it would be difficult at first. Posture synchrony is marked with italics in the transcript below the spoken dialogue, with brackets indicating the exact time at which it occurred. Transcript notations are explained in "Appendix 3". The pseudonyms "John" and "Lisa" are used for the couple. Therapist 1 is T1 and therapist 2 is T2.[4]

> *((T2 is in the same posture as John))*

T2:    yes

T1:    but is it possibly (1) somehow what you think (.) Lisa that (.).hh that if: and apparently when John has had continuous experiences about that family (.) not holding on to him (1) sort of abandoning in different ways (.) different family members there (.) there happen things that are not spoken of et cetera it is very
> *[((T2 leaves the shared posture with John))*
(1).hh sort of uncertain (.).hh that precisely this (.) uncertainty (.) draws *((gestures))* to that direction

Lisa:    mmm I-
> *[((T2 takes the same posture as John))*

T1:    that th-that somehow one would have to like see if there still is something (.) that one can hold on to and then when: (.) are you (.) I mean this is so silly but (.) people do

Lisa:    mm

T1:    and feel silly things (.) that when there is you (.) who is there (.) kids who are
> *[((T2 leaves the shared posture))*
there (.) so (.) so it is like (.) quotation marks self-evident
> *[((T2 takes John's posture))*

Lisa:    mmm? ((looks up))

T1:    i-is it possible that it goes something like this

Lisa:    yea

T1:    illogically but (.) in some way in its illogicality (.) understandable
> *[((John leaves the shared posture with T2))*

Lisa:    mmm (1) I did somehow think that it in a way comes from there (1) like from that kind of (.) longing for a family or (.) like longing for love from that family or something (1)

T2:    ((deep sigh, clears throat))
> *[((both therapists shift their postures))*

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[4]  The transcript was translated by one of the therapists.

In this episode, therapist 2 moved to and from posture synchrony with the male client. This could be interpreted as therapist 2 showing empathy toward the male client when therapist 1 was talking about his actions and trying to make sense of them together with the female client. The setting with two therapists present made it possible for one therapist to speak of difficult topics, while the other therapist could empathize with the other client at the physical level. Interestingly, when therapist 1 was about to finish his turn speaking, the male client left the shared posture with therapist 2, as if he were communicating to others that he was fine with the therapist's comment. Therapist 2 moved a great deal in this episode, which could also be interpreted as him being uneasy about what stand he should take in the situation. After this episode, they continued talking about the violence that had occurred between the couple and the impact it had had on the trust between the couple.

## Discussion

The aim of this study was to create a coding scheme for observing nonverbal synchrony in couple therapy, focusing on implicit imitations of identical nonverbal behaviors in a temporally precise recording of behaviors. Observation was chosen as the method, since frame-differencing methods would be unable to discern the similarity of movements, even though observation is time-consuming and reliant on the expertise of the observers. The qualitative analysis resulted in two main categories: posture synchrony and movement synchrony (mimicry). Posture synchrony has been shown to be related to rapport (Sharpley et al. 2001) and perceived empathy of the therapists (Maurer and Tindall 1983), and movement synchrony (i.e., mimicry) has been shown to increase liking and rapport (Chartrand and Lakin 2013) and to be related to empathy (Sonnby-Borgström and Jönsson 2003). Our interest was to see whether these nonverbal synchrony behaviors, which have been shown to have an impact on relationships, also affected the participants' evaluations of the therapeutic alliance in couple therapy.

Since the coding scheme was developed based on earlier research results, it is a theoretically informed method for studying nonverbal synchrony in psychotherapy. Theoretical models by Baimel et al. (2015) and Koole and Tschacher (2016) have suggested that nonverbal synchrony aids in understanding others; however, this topic requires additional research, especially in the context of couple therapy.

Temporal precision was important because an additional aim was to use the coding scheme with information from other modalities in psychotherapy, such as dialogue. In fact, the coding scheme has already been used in relation to dialogue and the embodied reactions of participants in two qualitative studies (Kykyri et al. 2019; Nyman-Salonen et al. 2020).

When the coding scheme is used in qualitative research, it is very informative to the researcher who observes the sessions. Even watching sessions without listening to the dialogue gives the observer insight into the session's atmosphere. When using automated methods, this tacit information is absent.

Creating a coding scheme was not a simple task. It was vital that the definitions of the observed categories be unambiguous in order for the observers to make similar observations. Excellent interrater reliability was obtained for the coding scheme. This was partly due to the concrete definitions of the categories of nonverbal synchrony, based on the exact physical appearance of the nonverbal behaviors of the participants. This reduced the observational bias as it required less subjective evaluation.

During the development, one couple therapy process was observed. The couple had come to therapy because of loyalty issues in the relationship, and there was a history of interpersonal violence between the couple. The case was chosen from a data set gathered in the Relational Mind research project. The data set comprised couple therapy cases with two therapists present at each session; the participants' autonomous nervous system reactions were recorded in some of the sessions. For the couple therapy case studied here, there was less movement synchrony in the sessions in which the participants wore autonomic nervous system equipment, which restricted the movements of the non-dominant hand. This indicates that even though the research setting was designed to be as natural as possible, the measurement equipment did restrict the participants' movements and influenced the sessions' nonverbal movement patterns. The amount of nonverbal synchrony differed between sessions and between the dyads involved. No overall clear-cut patterns could be discerned, except that movement synchrony was more prevalent toward the end of the therapy process, and all participants were involved.

Couple therapy as a context makes studying nonverbal synchrony intriguing, since there are multiple relationships present, namely, the relationship between the spouses and the relationship between the therapist(s) and each of the spouses separately. Nonverbal synchrony between the couple can signal how satisfied the clients are with their relationship (Julien et al. 2000), whereas synchrony between therapist and client can signal empathy (Maurer and Tindall 1983) or rapport (Sharpley et al. 2001). The synchrony between the couple in the case studied here was not very considerable; this was expected, since they had difficulties in their relationship. As there were two therapists present, this resulted in four possible therapy-client dyads that could synchronize. Different therapist–client dyads synchronized in different sessions. Nonverbal synchrony could be observed both between those who participated in the conversation and between the listeners. This has previously been demonstrated in a microanalytic case study on alliance formations in couple therapy (Kykyri et al. 2019). With two therapists

present, nonverbal synchrony between the co-therapists also occurred. Nonverbal synchrony between the co-therapists might be interpreted as a sign of the therapists being in rapport or supporting each other during the task at hand.

In this couple therapy case, both therapists synchronized their postures to that of the male client. It might be that both therapists implicitly[5] recognized the importance of connecting with the male client because of his history of interpersonal difficulties, including violence. According to recent studies, patients with whom therapists synchronize more tend to report more interpersonal problems (Ramseyer 2020). This is well in line with the case studied here. A high amount of nonverbal synchrony between therapist and client has also been related to non-improvement of the client (Paulick et al. 2018). It has been suggested that therapists make an increased effort with these patients. This might also be true for the case studied here. However, previous research on nonverbal synchrony in psychotherapy has been conducted in individual psychotherapy settings, which makes it difficult to draw conclusions from them in the context of couple therapy. One aspect that might also influence nonverbal synchrony was that both therapists were male. It could have been that it was easier for them to implicitly synchronize with the male client.

In this case, the other therapist also implicitly synchronized to the female client, possibly with the aim of keeping her involved in the therapy process and encouraging her to talk about her feelings and thoughts concerning the relationship. Importantly, it seemed that the therapists counterbalanced the nonverbal synchronies and took care that both spouses were involved in nonverbal synchrony with the therapists. This could be an implicit, nonverbal means of preventing the development of a split alliance, in which one spouse feels therapy is beneficial but the other does not.

The presence of two therapists in the case study made it possible to investigate how they managed the therapeutic process at the embodied level. The co-therapists synchronized to each other's postures, especially at the beginning of the therapy process, and movement synchrony between the therapists (mainly in the form of head nods) was frequent throughout the therapy process. In addition, the two therapists seemed to implicitly take on different positions during the sessions. On the level of the therapy process as a whole, one therapist worked more at the bodily level, synchronizing to the other participants, while the other therapist remained more passive in his bodily behavior. However, the positions of the therapists could also alter rapidly during sessions, so that the more passive therapist engaged actively in nonverbal synchrony, as the other therapist was less active. The patterns were dependent on the division of tasks between the

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[5] Since the therapy was talk therapy and emphasized dialogical methods, no bodily based interventions were used deliberately.

therapists, the topics discussed, and the participants involved in the discussion.

In this case study, the episode chosen to illustrate posture synchrony showed the division of tasks between the therapists. While one therapist talked about the male client, trying to make sense of his motivations together with the female client, the other therapist synchronized his postures to the male client, thus empathizing with him, as the male client might have felt threatened by being under scrutiny.

In this case study, the sixth session stands out in the investigation of the therapy process. There was less nonverbal synchrony observed between all participants, and almost all synchronies observed were between the female client and one of the therapists. The possibility cannot be ruled out that the autonomic nervous system equipment that the participants wore had an impact on the amount of movement synchrony. However, previous research on this particular session has shown that the female client brought up the threat of divorce (Itävuori et al. 2015). It seems likely that discussing difficult topics had an impact on the nonverbal synchronies: when the female client brought up this difficult subject, one of the therapists responded to it, signaling with his synchrony that he was interested in hearing what she had to say, while the other participants did not react to it by synchronizing nonverbally. This session was evaluated by all participants except the female client to have a weaker alliance than the previous session.

As for the relationship between nonverbal synchrony and the alliance, results of the qualitative analysis were mixed: being involved in nonverbal synchrony was not always related to one evaluating the alliance to be stronger, and watching others being in synchrony sometimes resulted in the observer rating the alliance to be weaker and sometimes stronger.

The female client evaluated the alliance in the sixth session to be of the same strength as the other sessions (when the others evaluated the alliance to be weaker). As previously mentioned, she actively engaged in both posture and movement synchrony in the session with one of the therapists; in fact, most of the nonverbal synchronies in that session occurred between the female client and one of the therapists. The fact that most of the synchronies in that session occurred in only one dyad could be seen as a split in nonverbal synchrony behavior. Interestingly, everyone except the female client evaluated the session to be weaker in alliance, even the therapist who was involved in nonverbal synchrony with her. However, as a precaution, it must be said that the female client's evaluations of the alliance remained quite stable throughout the therapy process, while the male client's evaluations of the alliance changed from session to session.

An opposing example of how watching others synchronize affected the evaluations of the alliance was that in the sessions in which the co-therapists were frequently in posture synchrony, the male client evaluated the alliance to be stronger. Posture synchrony between the co-therapists could have been seen as a sign of rapport between the co-therapists; alternatively, it could have created a general impression of empathy, which might have affected the male client. Observing nonverbal synchrony can thus have opposing effects, depending on the context and how the observer interprets the nonverbal synchrony; that is, it can be seen as something positive, like an empathic stance, or it can leave the observer feeling like an outsider.

One consideration when interpreting the alliance measures is that the clients evaluated the co-therapists as a team and the therapists evaluated the alliance in relation to both spouses simultaneously; therefore, it was not possible to see whether there would have been differences in alliance related to one of the spouses or one of the therapists. Further research is needed with a more specific alliance measure to evaluate the alliance for each relationship separately, as split alliances have been associated with dropping out of therapy (e.g., Muñiz de la Peña et al. 2009). It would be interesting to see how the dyadic nonverbal synchrony patterns affect the evaluations of alliance if one is involved in the synchrony or merely observing it.

One interesting result was that there seemed to be a peak in synchrony between the co-therapists in the session following a session that was evaluated to have weaker alliance. Earlier research has shown that there can be a high amount of nonverbal synchrony between the therapist and nonimproving patients, possibly indicating therapists making an increased effort with these patients (Paulick et al. 2018). Here, it seemed that the therapists' implicit and joint embodied work (nonverbal synchrony) increased as the alliance had been weaker in the previous session. It might be that this played an important role in facilitating the therapy process and fostering the alliance.

In this therapy process, movement synchrony increased toward the end of the therapy process; at the same time, the participants' evaluations of the alliance improved. Movement synchrony could be seen as an indication that all participants were actively involved in the therapy process, and this was reflected in the alliance.

When evaluating the results, it must be remembered that the therapy conducted was talk therapy, emphasizing words and dialogue, and no deliberate bodily interventions were used. The research data was selected for analysis from a dataset of sessions of a research project that studied synchrony of autonomous nervous system reactions. The therapists were aware of this research aim, but not aware that their overt bodily behavior, especially nonverbal synchrony, would be analyzed. All synchronies were implicit and were not used as interventions.

## Clinical Implications

One must be cautious when suggesting clinical implications based on this research, since it is only one case study and the results were mixed. However, the coding scheme could be used by couple therapists in supervision or in couple therapy training, as one important aspect is for the couple therapist to become aware of the nonverbal synchrony patterns in the sessions.[6] Videotaping could be beneficial since it might not always be possible to notice nonverbal synchrony patterns during the sessions. As it is not common practice to have two therapists present, the individual therapists conducting couple therapy should be aware of their nonverbal interactions with each spouse. It might be that one is more inclined to be in nonverbal synchrony with one of the spouses, which could potentially contribute to a nonverbal split.

We assume that nonverbal synchrony is probably best as it happens implicitly and not deliberately. Nonverbal behavior affects the atmosphere of the session, and it can easily be interpreted negatively if a client feels it is used on purpose. However, when the therapist's general awareness of nonverbal behavior is better, then it is possible to remain nonverbally receptive to one spouse while talking to the other spouse.

## Limitations

Limitations concerning this study are as follows: (1) the coding scheme requires trained raters, and it is time-consuming. Unfortunately, no automated method for depicting static posture synchrony and movement synchrony of similar movements (mimicry) was found that could be used in sessions as lengthy as those in this case study were, and that would be secure enough to use with authentic psychotherapy cases. In the future, the coding scheme could be used to create computerized and partly automatic solutions for detecting implicit imitation of postures and movements. It would also be interesting to compare the nonverbal synchrony obtained by the coding scheme to nonverbal synchrony scores obtained by frame-differencing methods to see in detail how they differ in their definition of nonverbal synchrony. (2) The developmental process of the coding scheme began with the detailed observation of one couple therapy process. This idiographic stance could be seen as a disadvantage since it might only show nonverbal synchrony representative of this specific case, and it is not possible to make any generalizations about nonverbal synchrony in couple therapy. However, idiographic research (Ramseyer 2020) on individual psychotherapy and the couple therapy

case study presented here have shown that the relationship between nonverbal synchrony and alliance is more complex than earlier nomothetic research has shown. In the future, analysis with more couple therapy cases and a larger dataset is needed to test for the generalizability of the findings. (3) The omission of the first therapy session could be seen as a limitation. This was due to a technical problem with the recording, showing only the couple and not the therapists on the video. This was unfortunate, since the first session is usually very important in creating the alliance. (4) In some sessions, there was a baby present, which could influence the observational process. However, in the sessions in which the baby was on either of the parents' laps, there was not a considerable difference in the amount of posture or movement synchrony from the sessions in which this did not happen. The high interrater reliability also worked against this interpretation since it showed that the presence of the baby did not influence the observational process. Thus, this was a beneficial aspect in using observers rather than an automated frame-differencing method; it would not have been possible to use the videos with such a method because the baby on the lap would penetrate the regions of interest, resulting in erroneous data. (5) One limitation for generalizability could be the use of two therapists. This is, however, the way couple therapy is always conducted at the Psychotherapy Training and Research Centre at the University of Jyväskylä. One motivation for the use of two therapists is that it inhibits split alliances. In this case, the co-therapists were both male, and it might be that the results would have been different if the co-therapists had been of different sexes. (6) If the frequencies of nonverbal synchrony obtained with the coding scheme were used for quantitative research alone, it would be necessary to include a pseudosynchrony condition. Pseudosynchrony refers to creating a shuffled data set against which the real nonverbal synchronies are compared. This helps to establish whether nonverbal synchrony occurs above the level of chance; without the pseudosynchrony condition, it is not possible to establish this. The reason for the exclusion of pseudosynchrony was mainly the small amount of data in this case study; it prevented the shuffling of data points in order to create a surrogate dataset, according to the procedure presented by Louwerse et al. (2012). In addition, the subject structure of synchrony groupings limited the options for statistical analysis. Further research with a larger data set is required to enable pseudosynchrony calculations.

Studying the psychotherapeutic process by observing nonverbal behavior from videos of couple therapy can be a daunting task. For the researcher wishing to undertake a similar research process, we find it important that the phenomenon studied should be either well established in earlier research, or something that couple therapists emphasize based on their clinical experience. Choosing observation as the research method makes it vital to have a good team

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[6] One could first concentrate on recognizing only posture synchronies, which has been related to empathy (Maurer and Tindall 1983) and been found in important parts of the therapy session (Raingruber 2001); later, one could move on to observing movement synchrony. The manual for the coding scheme is available from the first author.

working together, since the replicability of the observations is crucial for making the research scientifically valid.

## Conclusion

In conclusion, it is clear that research on nonverbal synchrony in couple therapy is an understudied area, as this study is one of the first on the subject. The coding system created here is replicable in other therapy settings. It can be used when there are features in videos that prevent the use of automated frame-differencing methods (such as lightning issues or disturbing factors present in the video). It could also be used in supervision or psychotherapy training to enhance therapists' awareness of their nonverbal behavior.

This case study showed that couple therapy is a complex system that enables many constellations of nonverbal synchrony between the participants. Usually, nonverbal synchrony occurs in dyads, but as there were four participants present in the couple therapy case studied here, even triadic and tetradic synchrony was possible, something that current methods have not yet been able to study.

In couple therapy, nonverbal synchrony affected not only the participants who were involved in it but also participants who were not involved in it. This suggests that the relationship between nonverbal synchrony and alliance in couple therapy is more complex than earlier research on individual psychotherapy has shown.

In general, more research on nonverbal synchrony in couple therapy is important from both an idiographic and a nomothetic stance, since the study presented here suggests that nonverbal synchrony affects the relationship between therapist and patient; the relationship is an important aspect of the therapeutic alliance that can influence the outcome of therapy.

## Appendix 1

### Frequencies of Posture and Movement Synchrony Per Session Per Synchrony Group

See Tables 5 and 6.

**Table 5** Posture synchronies per session per synchrony group

| Session | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| T1T2 | 20 | 0 | 1 | 4 | 0 | 4 | 1 | 5 | 3 |
| T1A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| T1B | 3 | 2 | 6 | 6 | 1 | 7 | 8 | 7 | 16 |
| T2A | 0 | 1 | 12 | 11 | 22 | 15 | 21 | 17 | 4 |
| T2B | 16 | 7 | 3 | 1 | 0 | 6 | 2 | 11 | 3 |
| AB | 4 | 2 | 0 | 6 | 0 | 0 | 1 | 5 | 2 |
| T1T2A | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| T1T2B | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| T1AB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| T2AB | 0 | 1 | 0 | 2 | 0 | 0 | 0 | 1 | 0 |
| T1T2AB | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Sum* dyadic | 43 | 12 | 22 | 28 | 23 | 32 | 33 | 45 | 28 |
| *Sum* triadic | 1 | 1 | 0 | 2 | 0 | 0 | 0 | 2 | 0 |
| *Sum* tetradic | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Sum* post | 44 | 13 | 22 | 30 | 23 | 32 | 33 | 47 | 28 |

Sessions 2–9. *Dyads* therapist 1 and therapist 2, therapist 1 and client A, therapist 1 and client B, therapist 2 and client A, therapist 2 and client B, and the clients A and B. *Triads* co-therapists and client A, co-therapists and client B, therapist 1 and the spouses, therapist 2 and the spouses. *Tetrad* all participants

**Table 6** Movement synchronies per session per synchrony group

| Session | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|
| T1T2 | 17 | 32 | 31 | 27 | 12 | 44 | 33 | 26 | 52 |
| T1A | 2 | 8 | 8 | 13 | 5 | 6 | 4 | 6 | 10 |
| T1B | 11 | 14 | 8 | 11 | 6 | 2 | 11 | 12 | 9 |
| T2A | 11 | 41 | 6 | 12 | 33 | 8 | 25 | 28 | 35 |
| T2B | 13 | 3 | 18 | 10 | 4 | 7 | 9 | 12 | 11 |
| AB | 1 | 3 | 7 | 13 | 2 | 2 | 6 | 8 | 14 |
| T1T2A | 0 | 1 | 0 | 5 | 0 | 2 | 1 | 2 | 3 |
| T1T2B | 0 | 1 | 0 | 6 | 0 | 1 | 1 | 5 | 3 |
| T1AB | 0 | 3 | 2 | 4 | 0 | 1 | 4 | 6 | 5 |
| T2AB | 0 | 1 | 0 | 1 | 0 | 1 | 1 | 1 | 9 |
| T1T2AB | 0 | 0 | 2 | 0 | 0 | 3 | 1 | 5 | 1 |
| *Sum* dyadic | 55 | 101 | 78 | 86 | 62 | 69 | 88 | 92 | 131 |
| *Sum* triadic | 0 | 6 | 2 | 16 | 0 | 5 | 7 | 14 | 20 |
| *Sum* tetradic | 0 | 0 | 2 | 0 | 0 | 3 | 1 | 5 | 1 |
| *Sum* | 55 | 107 | 82 | 102 | 62 | 77 | 96 | 111 | 152 |

Sessions 2–9. *Dyads* therapist 1 and therapist 2, therapist 1 and client A, therapist 1 and client B, therapist 2 and client A, therapist 2 and client B, and the clients A and B. *Triads* co-therapists and client A, co-therapists and client B, therapist 1 and the spouses, therapist 2 and the spouses. *Tetrad* all participants

# Appendix 2

## Nonparametric Spearman's Rank-Order Correlations with Bootstrapped Confidence Intervals for Calculating the Relationship Between the Alliance in the Sessions and the Observed Nonverbal Synchronies

See Tables 7, 8 and 9.

**Table 7** Correlations of the male client B's SRS scores to the nonverbal posture and movement synchrony groups

| | Co-therapists' posture synchrony | T2 and client A movement synchrony | T2 and client B movement synchrony | T1, T2, and client A movement synchrony |
|---|---|---|---|---|
| Client B SRS relationship | 0.71* [0.18, 0.95] | −0.58 [−0.96, 0.25] | 0.33 [−0.32, 0.84] | 0.22 [−0.56, 0.77] |
| Client B SRS goals and topics | 0.84** [0.56, 0.92] | −0.28 [−0.88, 0.59] | 0.44 [−0.29, 0.88] | 0.50 [−0.97, 0.98] |
| Client B SRS approach and method | 0.89** [0.6, 0.97] | −0.30 [−0.93, 0.65] | 0.45 [−0.46, 0.95] | 0.55 [−0.71, 0.95] |
| Client B SRS overall | 0.68* [0.00, 0.99], | −0.37 [−0.91, 0.33] | 0.89** [0.73, 0.95] | 0.10 [−0.55, 0.81] |
| Client B SRS sum of subscales | 0.92** [0.71, 0.99] | −0.42 [−0.93, 0.56] | 0.60 [−0.12, 0.97] | 0.28 [−0.58, 0.86] |

Values in brackets indicate a 95% confidence interval for each correlation. For readability, only the nonverbal synchrony behavior groups and/or individual scores for SRS, including significant correlations, are presented

*Indicates $p < 0.05$

**Indicates $p < 0.01$

**Table 8** Correlations of therapist 1's SRS scores to the nonverbal posture and movement synchrony groups

| | Co-therapists' posture synchrony | Therapist 1 and client B posture synchrony | Co-therapists' movement synchrony | T2 and client B movement synchrony | T2, client A, and client B movement synchrony |
|---|---|---|---|---|---|
| T1 SRS relationship | 0.78* [0.43, 0.97] | 0.69* [−0.21, 0.96] | 0.10 [−0.72, 0.74] | 0.70* [0.00, 0.95] | 0.26 [−0.21, 0.66] |
| T1 SRS goals and topics | −0.13 [−0.73, 0.81] | −0.84* [−0.96, −0.56] | −0.76* [−0.97, −0.18] | −0.21 [−0.75, 0.65] | −0.68* [−0.95, −0.29] |
| T1 SRS approach and method | 0.31 [−0.77, 0.98] | 0.76* [0.30, 0.91] | 0.62 [0.00, 0.92] | 0.19 [−0.86, 0.89] | 0.48 [−0.12, 0.85] |
| T1 SRS overall | 0.31 [−0.77, 0.98] | 0.76* [0.30, 0.91] | 0.62 [0.00, 0.92] | 0.19 [−0.86, 0.89] | 0.48 [−0.12, 0.85] |

Values in brackets indicate a 95% confidence interval for each correlation. For readability, only the nonverbal synchrony behavior groups and/or individual scores for SRS, including significant correlations, are presented

*Indicates $p < 0.05$

**Indicates $p < 0.01$

**Table 9** Correlations of therapist 2's SRS scores to the nonverbal posture and movement synchrony groups

| | Co-therapists' posture synchrony | Therapist 1 and client B posture synchrony | Client A and B posture synchrony | T1, T2, and client A movement synchrony |
|---|---|---|---|---|
| T2 SRS relationship | −0.16 [−0.90, 0.63] | 0.73* [0.56, 0.98] | −0.05 [−0.56, 0.55] | 0.27 [−0.46, 0.93] |
| T2 SRS goals and topics | −0.70* [−0.9, −0.25] | −0.43 [−0.81, 0.08] | −0.08 [−0.89, 0.65] | −0.29 [−0.84, 0.34] |
| T2 SRS approach and method | 0.47 [−0.74, 0.93] | 0.83** [0.58, 0.93] | 0.25 [−0.43, 0.83] | 0.75* [0.29, 0.98] |
| T2 SRS overall | 0.61 [0.00, 0.91] | 0.18 [−0.57, 0.84] | 0.71* [0.11, 0.98] | 0.18 [−0.49, 0.76] |

Values in brackets indicate a 95% confidence interval for each correlation. For readability, only the nonverbal synchrony behavior groups and/or individual scores for SRS, including significant correlations, are presented

*Indicates $p < 0.05$

**Indicates $p < 0.01$

# Appendix 3

## Transcript notations

| Symbol | Meaning |
|--------|---------|
| possibly (1) somehow | Numbers in parentheses represent pauses in seconds |
| think (.) Lisa | A period in parentheses indicates a pause of less than 0.2 s |
| .hh | Indicates inhalation between words |
| ((gestures)) | Double parentheses contain relevant non-verbal information added by the transcribers |
| [((T2 is in the same… | Single brackets below the dialogue indicate the exact moment in the dialogue when nonverbal synchrony occurs |
| : | Indicates protracted or extended pronunciation of a word |

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II


# SIGNIFICANT MOMENTS IN A COUPLE THERAPY SESSION: TOWARDS THE INTEGRATION OF DIFFERENT MODALITIES OF ANALYSIS


by

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In M. Ochs, M. Borcsa, J. Schweitzer (Eds.), *Systemic research in individual, couple, and family therapy and counseling, European Family Therapy Association Series* (pp. 55–73). Springer, Cham.

https://doi.org/10.1007/978-3-030-36560-8_4

# Significant moments in a couple therapy session: Towards the integration of different modalities of analysis

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## Abstract

This chapter presents a couple therapy session from four different research perspectives: The verbal dialogue was analysed with the *Dialogical Investigations of Happenings of Change* method, the embodied reactions of each participant were analysed by examining *the electrodermal activity* of each participant, and *nonverbal synchrony* was observed between the participants. *Stimulated Recall Interviews,* conducted individually after the session, were used to gain insights on the participants' thoughts and feelings concerning particular moments in the session. We wished to determine what could be learned from the embodied reactions of the participants in couple therapy, including whether the data obtained via the different research methods were telling the same or different story about the same moment within the couple therapy session.

*Keywords:* "couple therapy", "embodied reactions", "dialogue", "inner dialogue", "mixed-methods", "modalities integration", "nonverbal synchrony"

## 1. INTRODUCTION

In recent years, research in the social sciences has taken an affective turn. Hence, in attaching meanings to phenomena, it is considered necessary to take into account emotions, affects, and feelings, as well as spoken content (Cromby, 2012). Here, we present a case study on the significant moments of a single couple therapy session, our aim having been to integrate information gained from (i) the verbal dialogue and the therapeutic process, (ii) personal autonomic nervous system responses (skin conductance responses, i.e. SCRs), and (iii) observed nonverbal synchronization behaviour. After the session, all the participants were individually interviewed. Their personal accounts were viewed as giving meaning to their embodied reactions.

In this case study, we wished to discover what the embodied reactions of the participants might indicate concerning the therapy process, notably whether the data obtained from the different modalities were intertwined or independent from each other, i.e. whether they complemented each other or told different stories of a given moment. We also wanted to see if the differing roles of therapists and clients in the therapy situation were reflected in their autonomic nervous system responses, and in their nonverbal synchronization behaviour.

The data used in this study was collected in the project *Relational Mind in Events of Change in Multiactor Therapeutic Dialogues.* The project has aimed to increase our understanding of attunement and of the embodied quality of dialogues in couple therapy (Seikkula et al., 2015). The project was situated at the University of Jyväskylä, where data was gathered from 12 couple therapy cases. In all the cases the autonomic nervous system responses of both the therapists and the couple were measured, usually in the second and sixth sessions. After the measurement sessions the participants were individually interviewed, using the *Stimulated Recall Interview* method (hereafter SRI), which employs video clips to prompt recall of the participants' thoughts and feelings and bodily sensations at certain moments in the therapy session. The project has international collaborators at the Aristotle University in Thessaloniki, at the Nordhausen University of Applied Sciences, and at the Masaryk University in Brno, where additional data from psychotherapy cases has been collected.

In this chapter, we first present the research methods applied, indicating the type of information they provide. Thereafter, we give an overview of the session under study, referring to information provided by the methods applied. Finally, we integrate the information gained, concentrating on the four clips that were selected to the SRIs.

## 1.1. The Analysis of the Dialogue

In psychotherapy research the dialogue plays a crucial role, not just because it is the main communication tool, but also because it connects the participants to each other. In this study the Dialogical Investigations of Happenings of Change (DIHC) method was used for organizing the session into thematic entities (Seikkula, Laitila & Rober, 2012). DIHC focuses on the quality of the dialogue; so in addition to looking at the verbal content, it focuses on how things are said and how they are responded to (Olson, Laitila, Rober & Seikkula, 2012). Therefore, with DIHC it is possible to differentiate dialogical and monological dialogue in psychotherapy conversations. Dialogical dialogue refers to dialogue in which participants include, within their speech, ideas previously mentioned by other participants; moreover, utterances are expressed so that they allow the other participants to respond. The presence of dialogical dialogue in the therapy process has been related to the outcome of the therapeutic process (Räsänen, Holma & Seikkula, 2012; Vall, Seikkula, Laitila, Holma & Botella, 2014). In addition, DIHC is used to analyse the dominances in the dialogue, for instance interactional dominance (i.e. who regulates the speech turns). The use of the method provides a good base for analysing the embodied reactions of the participants by focusing on the thematic entities.

## 1.2. Autonomic Nervous System Responses: Skin Conductance Responses (SCRs)

In this study, electrodermal activity (EDA) was recorded to track arousal, as indicated by changes in sympathetic nervous system (SNS) activity. Increases in SNS activation are related to the increased physiological arousal that accompanies preparation for action and emotions causing an increase in action tendency (Boucsein, 2012; Kreibig, 2010). In particular, rapid changes in EDA – measured as skin conductance responses (SCRs) are thought to be a direct measure of SNS activity (Benedek & Kaernbach, 2010). In this case study, the SCRs were chosen because of the interest in looking at how aroused each participant was in the session.

In previous studies on SNS activity in psychotherapy, the client's arousal level has been shown to rise at moments of confrontation (Olson & Claiborn, 1990), and when one's identity is blamed (Päivinen et al., 2016) and when the therapist is empathic towards the client (Finset, Stensrud, Holt, Verheul & Bensing, 2011). It has been suggested that an increase in autonomic arousal could be a sign of active emotional engagement (del Piccolo & Finset, 2017). The client's electrodermal arousal decreases when the clinician uses affective communication (Sep, van Osch, van Vliet, Smets & Bensing, 2014). In couple therapy, the participants' arousal levels can thus reflect emotions, emotional engagement and preparation for action.

## 1.3. Nonverbal Synchronization

During interaction, people tend to implicitly synchronize their nonverbal behaviour, i.e. gestures, postures and tone of voice. This adaption has several functions, including that of making the dialogue smoother by regulating turns and creating a mutual connection. This tendency has been related to increases in liking (Chartrand & Bargh, 1999) and rapport (Lakens & Stel, 2011). It has been suggested as a mechanism for emotionally attuning to the other person, facilitating an understanding of the other person's emotions (Stel & van den Bos, 2010).

In psychotherapy, the synchronization of postures has been seen as an external sign of rapport (Sharpley, Halat, Rabinowicz, Wiland & Stafford, 2001; Trout & Rosenfeld, 1980) and as a sign of the therapist being attuned to the client (Davis & Hadiks, 1994; Raingruber, 2001).

Within psychotherapy, therapists and clients nod frequently. Therapists nod their heads when displaying and maintaining affiliation with clients (Muntigl, Knight & Watkins, 2012). During dialogue, the listeners' head nods are important in creating moment-by-moment collaboration (Bavelas, Coates & Johnson, 2000). The head nods are interpreted as expressing a wish for the speaker to continue talking, as well as expressing understanding (Stivers, 2008).

Another commonly occurring movement in therapy is self-touching. These movements, also called displacement behaviours, have been related to heightened arousal and are thought to act as self-soothing movements (Troisi, 2002). In the present study, the nonverbal synchronization of postures and movements were analysed.

## 1.4. Inner Dialogue Captured by the Stimulated Recall Interview (SRI)

The SRI is a video-assisted method for investigating what people recall concerning their own inner thoughts and emotions in an event in which they participated (Kagan, Krathwohl & Miller, 1963). In the field of psychotherapy research, SRIs have been used to study the therapists' and clients' inner dialogues. The clients use the SRI to gain insight about themselves, whereas the therapists use the SRIs to elaborate on therapeutic strategies and to manage the therapeutic process (Rober, Elliott, Buysse, Loots & De Corte, 2008; Vall et al., 2018). SRIs offer insight into information that is usually hidden when one looks only at transcripts of the session. In the present study, the information from the SRIs was used to gain an understanding of the embodied reactions of the participants during the therapy session.

In this case study we aimed to integrate the information from these aforementioned research methods to gain a fuller understanding of a couple therapy session, especially the participants' embodied reactions in relation to the dialogue and the therapeutic process.

## 2. METHOD

The data for this study were gathered within the Relational Mind research project (Seikkula et al., 2015) at the University of Jyväskylä Psychotherapy Training and Research Centre. The couple therapy was non-manualized and employed narrative, dialogical and reflective therapeutic approaches. Two therapists were present. The sessions were video-recorded. The participants' autonomic nervous system (ANS) reactions (i.e. heart rate, electrodermal activity and respiration) were collected from both the couple and the therapists in the second and sixth sessions. After the ANS sessions, SRIs were conducted with the participants individually. Thus, video clips from the session were shown to the participants, who were asked to recall their thoughts, feelings and bodily sensations at the corresponding moment during the session.

The video clips were chosen by the researcher to represent four significant moments of therapy. They were chosen on the basis of (i) visible emotional expression, (ii) a notable change in the interaction and (iii) visible synchrony between participants in the ANS measurements (EDA, respiration). The participants gave their informed written consent for the use of the data, and the Ethical Committee of the University of Jyväskylä had approved the research.

### 2.1. The Case

The session analysed for this study came from a couple therapy with Tom and Mary (pseudonyms). The couple had been referred to couple therapy by Mary's therapist. Mary had suffered from depression after their child Eva (pseudonym) was born. Tom and Mary came to therapy, wanting to learn how to better communicate with each other and to explore their feelings of disconnectedness. The session was the second session of the therapy. Within it, ANS reactions were measured and SRIs were conducted. The two therapists were experienced couple and family therapists (both male).

### 2.2. Research Procedure

The various research methods were first applied separately. The Dialogical Investigations of Happenings of Change (DIHC) method was conducted by Berta Vall (BV) and Aarno Laitila (AL), and the extraction of the SCRs was conducted by Valeri Tsatsishvili and Markku Penttonen. The analysis of observing nonverbal synchronization of body postures and movements was done by Petra Nyman-Salonen (PNS), and the SRIs were analysed by Maria Borcsa.

Integration of the information from the different analyses was conducted by focusing on the clips selected for the SRIs. First, we started by looking at the dialogue and the therapy process in

the session, in conjunction with the embodied reactions of each participant (SCRs and nonverbal synchronization). The integration analysis was conducted by PNS, BV and AL.

Thereafter, the analysis was conducted starting from the individual information that the participants shared in the SRIs, which was looked upon as information concerning individual emotions or personal stances towards the topic spoken of in the therapy session. The individual emotions and thoughts were then related to the individual's arousal level and nonverbal synchronization behaviours, as well to the actual dialogue in the session and the therapy process.

## 2.3. Dialogical Investigations of Happenings of Change (DIHC)

The session transcripts were investigated using the three steps of DIHC (Seikkula et al., 2012). Step 1 divides the session into thematic entities called *Topical Episodes* (TEs), within which the same topic is spoken about. Step 2 explores the quality of the therapeutic conversation as either dialogical or monological and the dominance present in the dialogue, differentiating among (i) quantitative (who speaks the most), (ii) semantic (who regulates the topics that are spoken of) and (iii) interactional dominance (who regulates the turns). Step 3 involves a detailed analysis of the data, in which the Narrative Processes Coding System (NPCS) is applied (Angus et al., 2012; Angus, Levitt & Hardtke, 1999; Laitila, Aaltonen, Wahlström, & Angus, 2005). There are three *modes* in the model, namely (i) *External mode* (E) (accounts and descriptions of events that can be both real and imagined and answering the question 'what'), (ii) *Internal mode* (I) (descriptions of experiences or feelings), and (iii) *Reflexive mode* (R) (referring to meaning-making, and to reflecting on meanings). The TEs comprised entities in relation to which the information from the other research methods were examined.

## 2.4. Electrodermal Activity: Skin Conductance Responses (SCRs)

Electrodermal activity was recorded using two electrodes attached to the palm of the participant's nondominant hand. Skin conductance was obtained via a GSR sensor, an amplifier, a data acquisition unit (ExG 16) and a data acquisition program (all from Brain Products, Germany).

SCRs, representing phasic changes of EDA related to movement-by-movement changes in SNS activity, were extracted with Ledalab, a Matlab-based software package designed for skin conductance analysis (Benedek & Kaernbach, 2010). Subsequently, the SCRs from each participant were resampled to 1Hz and z-scored. For each participant, the arousal level during the TE was expressed as the average SCR amplitude within the TE. The extraction method used in this study has been used in a case study conducted by Laitila et al. (2019). Here, the term *arousal level* is used to refer to the participants' skin conductance responses.

In this case study the arousal level was interpreted in a qualitative manner. Thus, arousal levels with a value near to 0 indicated a level near to that participant's average arousal in the session. When the SCR was greater than 0.3, it was classified as *high arousal*. Arousal between 0.1 and 0.3 was classified as *some arousal.* Values close to 0 were classified as *average arousal,* values of –0.1 to –0.3 were classified as *low arousal*, and values of less than –0.3 were classified as *very low arousal*.

## 2.5. Observing Nonverbal Synchrony (ONS)

The nonverbal synchronization of postures and movements was analysed via a method created by Nyman-Salonen (submitted). The nonverbal synchronization behaviour of the participants was observed continuously using the Noldus Observer programme. Posture-synchronization occurred when two or more participants were in a similar posture (either a mirror image or congruent), and movement-synchronization occurred when someone mimicked another's movement within 3 seconds. The synchronized movements were either head movements, arm movements (usually displacement behaviour, meaning touching of the head or face), leg movements (mostly shifts in leg positions), torso movements and hand movements (mostly displacement behaviours).

## 2.6. SRIs

The researcher had selected four episodes for participants to view in the SRIs. The participants viewed these clips from the session individually and recalled the thoughts and emotions they had had at these particular moments in the session.

## 3. RESULTS

### 3.1. Overview of the session

We begin with the dialogical analysis for the complete session under study, showing the division of the session into *topical episodes* (TEs) (Table 1). These are used in presenting the results for the individual SCRs (Fig. 1), and for the nonverbal synchronizations (Figs. 2 and 3).

#### 3.1.1. The dialogue

Table 1 presents the topical episodes and the title that was given to each of them denoting the topic under conversation. The session as a whole was strongly dialogical, meaning that the clients were engaged in talking to each other. Initially, they mainly talked about their job issues (TEs 2, 3, 4, 5 and 7), with utterances expressing a reflective mode. However, Mary was already talking about her emotions in those moments. In the central part of the session (TEs 1, 8, 9, 10, 11, 13, 17, 18, 19), the conversation moved towards issues of motherhood and parenthood. In these moments, Tom started to talk about his emotions for the first time in the session. At the end of the session, the reason for being in therapy was discussed, which was related to the couple's feelings of disconnection (TEs 6, 12, 14, 15, 16). Within these moments, most of the participants talked emotionally, though in conjunction with external and reflective talk. This meant that they were jointly engaging in meaning-construction processes.

**Table 1** Topical episodes in the session. The clips chosen for the SRIs occurred in TEs 12, 14 and 16–18 (shaded).

| TE | Content | TE | Content |
|----|---------|----|---------|
| 1 | Wife's return, relation daughter | 11 | Ideal mother vs mother-as-she-is |
| 2 | Husband doubts about job | 12 | Reason for therapy–disconnection (SRI 1) |
| 3 | Aside to wife's trip abroad | 13 | What was different before child? |
| 4 | Argument about where to live | 14 | The conversation here and now (SRI 2) |
| 5 | Job man, living on another city | 15 | Man holding back in therapy & life |
| 6 | Both work oriented | 16 | Reasons for disconnecting (SRI 3) |
| 7 | Evaluation consequences of move | 17 | Not "natural mother" – guilt (SRI 4) |
| 8 | How would it be without Eva? | 18 | Acceptance of others (SRI 4) |
| 9 | Father-child relation; third wheel | 19 | Role models |
| 10 | Positions as parents | | |

In terms of dominance, it seemed that the couple talked to each other and were actively involved in the session, presenting dominance equally (regarding who talks more, who regulates what is talked about, and who regulates the turns). Primarily, it was the therapists who regulated the discussion (in 17 TEs out of 19), and the therapists also chose the topics of the conversation (in 12 TEs). In general terms, there was a natural exchange among participants. [1]

### 3.1.2. Electrodermal Activity as Manifested SCRs

Figure 1 presents the skin conductance responses for each participant in relation to their average in the session per TE. The results are presented from TE 2 onward, because TE 1 was omitted due to technical difficulties in recording the EDA. At the beginning of the session (TEs 2, 3, 4 and 7), Mary was more aroused, whereas the other participants were less aroused. Apart from in TE5, Tom's arousal was more evident later in the session, most notably in TE17. The therapists were more activated towards the middle and the end of the session: therapist 1 (hereafter T1) was aroused during TEs 9, 10, 11, 13, 18 and 19, while therapist 2 (hereafter T2) was aroused during TEs 9, 10, 11, 13, 14 and 15. In TE5 only the couple were aroused.

### 3.1.3. The Nonverbal Synchronization of Body Postures and Movements

Figures 2 and 3 present the dyadic nonverbal synchronization patterns in the session. Posture-synchronization occurred 12 times, with 9 of these instances occurring between the therapists. In TE 11, Mary and Tom were in posture-synchrony. There was no posture-synchronization within the episodes chosen for the SRIs.

All the participants were synchronized to each other's movements. The therapists were the most active (81 and 71) and then Mary (42) and Tom the least (26). Tom was more synchronized with Mary (13) than with the therapists (8), and Mary was more synchronized with the therapists (23) than with Tom (13).

Most of the synchronized movements in the session were head movements (81), i.e. head nods. The therapist-dyad were synchronized the most (49), followed by T2 and Mary (8), then Mary and Tom (7), T1 and Tom (6) and then other dyads or triads. Displacement behaviour synchronization occurred 21 times (arm movements 11 times, and hand movements 10 times).

At the beginning of the session, the therapists showed most synchrony (both in postures and head movements). Towards the end of the session, there was a rise in the frequency of synchronized

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[1] Exhaustive explanation of the DIHC results is beyond the scope of this chapter.

movements between all the participants, until TE 17, when all movement synchronization stopped.[2] There was no difference in the amount of movement synchrony between the TEs selected for the SRIs and the other TEs.
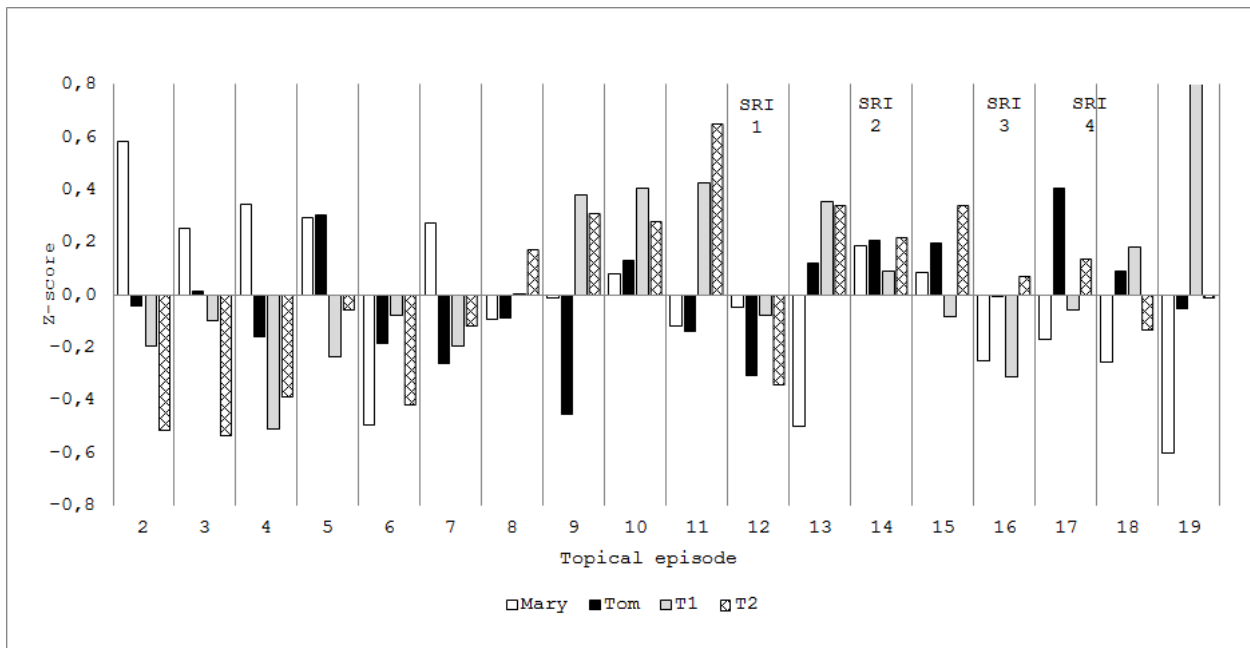


**Fig. 1** Skin conductance responses for each participant, in relation to their average in the session per TE. A zero value refers to each participant's average during the session.

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[2] This chapter is necessarily limited in scope; hence, not all the results obtained via this method are presented here.
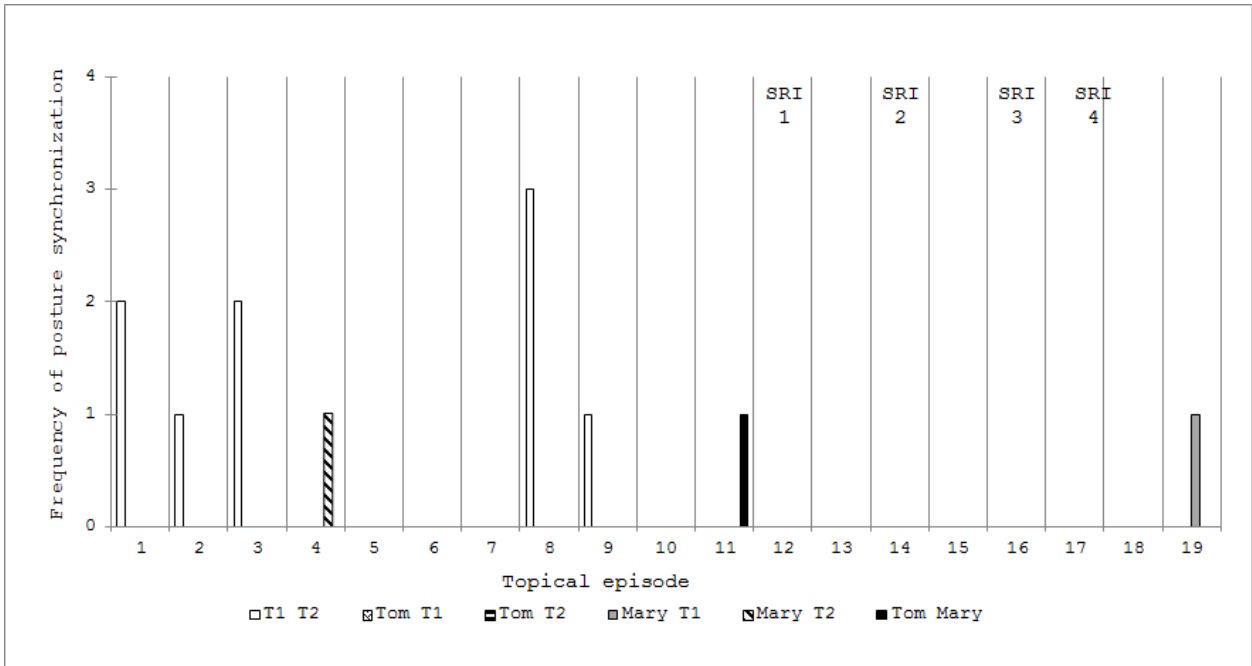
**Fig. 2** Posture-synchronization per dyad in each TE.
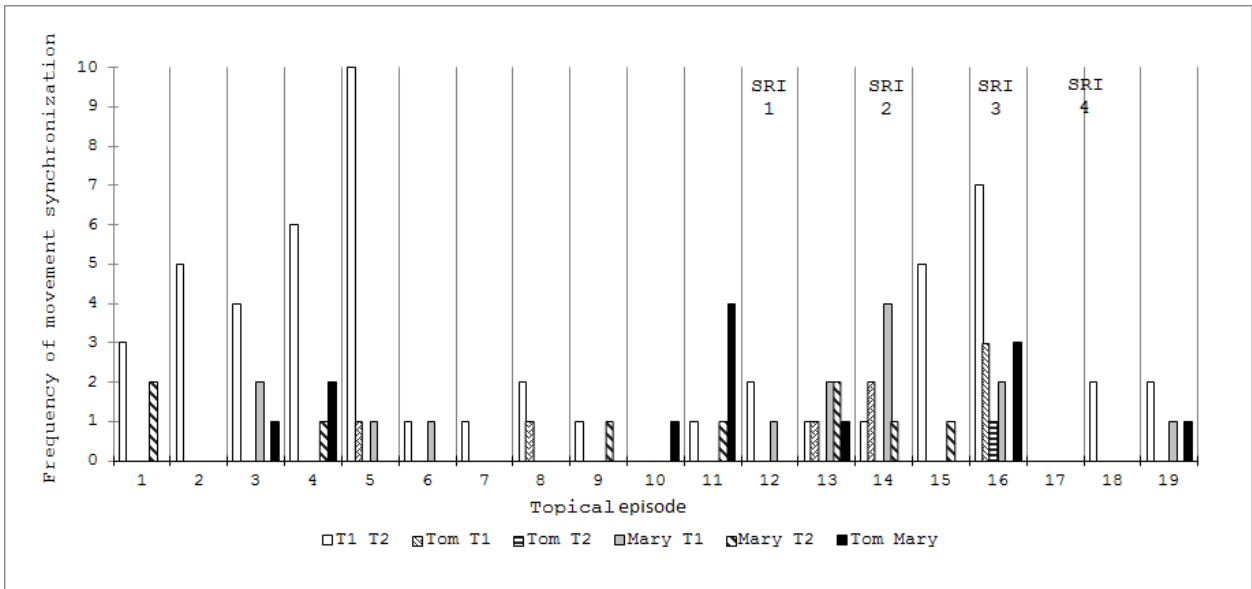


**Fig. 3.** Movement-synchronization per dyad in each TE.

### 3.2. Integration of the Information from the Different Research Methods Based on the Participants' Inner Dialogues (information from the SRIs)

The results here are presented separately for each SRI clip[3]. First of all, we present information on what happened *within the session* in the SRI clip shown to the participants. This includes the

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[3] The length of the SRI clips differed from the length of the TEs. In some instances the SRI clips contained segments from one TE or covered more than one TE.

dialogue and the participants' arousal levels plus their nonverbal synchronization behaviour that were analysed for the corresponding TE (for an overview of these, see Figs. 1, 2 and 3). Thereafter, we present the participants' *individual SRI accounts*. Here we seek to integrate their personal account to the embodied reactions with the dialogue and therapy process. Finally, a summary of the results for each clip is given.

### 3.2.1. SRI Clip 1 (TE12)

The clip was chosen for the SRI because of visible emotion (crying, laughter) and the theme (motherhood) and also because of Tom's noticeable movements and his EDA that decreased concurrently with that of T1. This clip occurred in the middle part of TE12 ('reasons for therapy – disconnection').

**Within the session** Mary did most of the talking (quantitative dominance), stating that she and Tom were disconnected and that they tried to talk to each other but lacked the necessary skills. Mary said she felt that Tom was still processing something, whereas Tom responded that he did not know what that might be. Mary reflected on her struggle of becoming a mother and of Tom just being a 'natural father'. Within the session the therapists regulated the conversation (interactional dominance). In analysing the therapeutic process, in this episode the therapists were preparing the ground for discussing the reason for therapy (disconnection).

Within the session (TE12), all the participants had low arousal levels, especially Tom and T2 had very low arousal (compared to their own personal arousal level means in the session) (see Fig. 1). The only synchronized movements in this clip were head movements between the therapists (T1 and T2) and between T1 and Mary (see Fig. 3).

**Individual thoughts and emotions** When Mary watched the video clip from the session, she shed tears. She said she had felt frustrated in the session because Tom had not been willing to address something – he was holding back, which meant that she had to bring up the difficult conversations they had had. She said she had been sad in the session because of them being disconnected. Mary's feelings of frustration were not visible in her arousal level in the session; however, her description of sadness would be in line with her low arousal level.

In the SRI, Tom said he had felt an unpleasant feeling in the session but simultaneously felt that they were getting somewhere, as in starting to make sense of their difficulties. Tom's SCR indicated very low arousal at this moment in the session. This could reflect a feeling that he had no need to react: he felt that they were getting somewhere in the therapy and that he could just let matters evolve. Tom was left outside the nonverbal synchronization in this episode.

In the SRI, T1 said that within the session he had been very pleased when Mary said that Tom was holding back, because it was the first critical comment on their relationship. This stance was also seen in the session, where T1 was nodding along with Mary. T1's arousal had been near to his average. He stated in the SRI that he had been somewhat annoyed at Tom in the session, because he talked so rationally and unemotionally, but his feelings of frustration didn't affect his arousal level.

In the SRI, T2 commented that during the session he had felt interest when Mary said she felt disconnected with Tom. However, T2's arousal level had been very low at that juncture, which could reflect that he felt it unnecessary to react or intervene in the therapeutic situation.

**Summary** At this moment the concurrent nods of the therapists during the session accorded with their comments in the SRI. Both said that they had felt that the topic was important. T1 had felt empathy with Mary's stance, and he nodded with her in the therapy, whereas Tom was 'left outside' the nonverbal synchronization. T2 also mentioned having been interested in Mary's point of view, but this did not appear in his nonverbal synchronization behaviour.

One reason for choosing the clip to SRI was the concurrent decreasing arousal levels of T1 and Tom. However, the SRI provided no definite explanation for this. One might have expected the decreasing arousal levels to reflect empathy between T1 and Tom. However, T1's account in the SRI conflicted with this interpretation. He had been annoyed with Tom and had empathized with Mary's situation.

### 3.2.2. SRI Clip 2 (TE14)

The clip was chosen for the second SRI clip because of the theme (man holding back) and visible laughter (Tom) and the EDA responses of T2, Tom and T1. This episode occurred within TE14 ('the conversation here and now').

**Within the session** T2 asked if Mary and Tom felt connected during the therapy session. Mary answered that she had shown her emotions and talked about their issues. However, as she saw it, Tom was holding back. Tom answered, mentioning that after the previous session Mary had said to him 'I hope next week they pick on you'. However, they both indicated that the therapy had led them to do things differently in their everyday life, in terms of talking more. In the session, it was Mary who talked the most, though both she and Tom regulated the discussion. The therapists were not active.

When analysing the therapeutic process, we viewed this moment as an ambivalent moment in the therapy. There were two parallel processes going on: the couple were talking to each other (being very dialogical). However, although Mary raised the matter of Tom holding back, the theme was avoided thereafter by both Mary and Tom.

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During the session (TE12), the SCRs of all the participants indicated some arousal, except for T1 who remained close to his average arousal level. T2 introduced the theme, which could be seen as a reason for his arousal (see Fig. 1). All the participants were involved in movement-synchronization behaviour with each other, and there were some synchronized displacement behaviours, between T1 and Mary and between T1 and Tom (see Fig. 3).

**Individual thoughts and emotions** In the subsequent SRI, Mary said that she had felt uncomfortable in the session throughout the clip chosen for the SRI, because she felt Tom was making her defend herself. She thought Tom had shifted attention towards her after they had talked about him holding back. This surprised her. She said that she had felt many emotions, first surprise, and in the end joy. The emotions could be seen in her SCR, which indicated some arousal. Another possible source to it was the fact that Mary and Tom were regulating the conversation, with no co-regulation on the part of the therapists. Mary's arousal might also have been connected to her doing displacement behaviours with T1.

In the SRI, Tom said that he had found it interesting that Mary said he was holding back. He was taken aback by her comment and felt that he needed to talk about it with her. In the actual session (TE 14), Tom's SCR indicated some arousal. This could be related to his feeling of surprise at Mary's comment or to the co-regulation of the conversation. Tom's arousal level could also be connected to him doing displacement behaviours in the session which T1 synchronized to.

In the SRI, T1 said he had felt pleased that Mary was showing her emotions in the session. He wondered if Mary was protecting Tom by showing her emotions, so that Tom did not have to show his. T1 felt that Mary's comment regarding Tom holding back contained a lot of truth, since he did not observe an emotional reaction from Tom. Within the episode, T1 had nodded along with T2 and did displacement behaviours with both Mary and Tom. This could reflect T1's endeavour to feel his way into their emotions (a bodily contagion process used as therapeutic empathy). T1 had not been highly aroused during this episode; it seemed that he was able to let the discussion take its course.

In his SRI, T2 said that the theme talked about in the session was very important. He had considered asking more about the topic. He was thus preparing for an action, which might be seen in his arousal level, as his SCR indicated some arousal. In the actual session, T2 followed the nodding of Mary and T1. This could have been a signal to the others that he felt the topic under discussion was important and that he was listening.

**Summary** At this moment, all the participants were aroused in the actual session. This could reflect the way in which the couple talked together and regulated the discussion while avoiding genuine exploration of the theme of Tom holding back. T2 was aroused, possibly because he was

preparing for an intervention. T1 was less aroused, although he was synchronized to both Mary's and Tom's displacement behaviour.

### 3.2.3.   SRI Clip 3 (TE16)

The episode was selected for the SRI because of the theme (heart of our disconnectedness), Mary crying and the long silences. Clip 3 covered a moment mid-way through TE16 ('reasons for disconnecting').

**Within the session** Mary talked about her realization that they had had such completely different experiences of their child's first year. For Tom it had been the best time of his life, whereas for her it was very different, i.e. a struggle. They had been a strong unit previously, but their different experiences of the time after the birth of their daughter was the heart of the disconnectedness. She said that Tom had never made her feel bad about her struggles: he had only once said that it was the best time of his life, to which Tom answered that he knew how that would have made her feel. From the point of view of the overall therapeutic process, this episode was a significant moment: within it, Tom and Mary talked about the issue of being in therapy. Within the session Mary did most of the actual talking; however, Tom had chosen the topic, with T2 regulating it.

In the actual session (TE 16), Mary had had low arousal, and T1 very low arousal, whereas Tom and T2 had been averagely aroused (see Fig. 1). In this particular clip, there was considerable movement-synchronization (the highest amount per episode in the session as a whole). All the participants were synchronized in their movements, and very importantly, the couple was synchronized to each other (see Fig. 3).

**Individual thoughts and emotions** In the SRI, Mary said that the episode was a moment of insight in the therapy. She felt sadness because of their separate experiences. Within the session she was crying; moreover, her arousal was low. In the session, Mary was synchronized to Tom and T1 in their head nods and displacement behaviours. She also nodded simultaneously with Tom. The displacement behaviours that might have been thought to reflect arousal did not, in fact, show in Mary's arousal level. The head nods could be related to her signalling the importance of the topic under discussion.

Tom indicated the importance of the topic in his SRI, saying that this was the main issue they were dealing with. At this moment within the session, he had nodded together with each therapist separately and also with Mary. Tom said he had felt sad in the therapy session, but he now felt it even more in the SRI situation. He reflected on feelings of guilt for enjoying life with the baby while being aware of how it impacted on Mary. His arousal level within the episode had been near

to his average for the session. This could reflect the combination of feeling sad and a feeling of important issues being discussed. Importantly Tom's arousal level had not been high, even though he did displacement behaviours. Interestingly, Tom showed more feelings in the SRI situation than in the therapy session itself. It seemed as if the context (being alone with the interviewer) allowed him to experience (and share) emotions.

In the SRI, T1 reflected on the couple's history: they had been such a strong unit before, and now felt disconnected. He also recognized his own unease at Tom having words for everything, without very much emotion. T1's SCR had indicated very low arousal, which could reflect that he did not need to react in the situation; thus, his frustration with Tom's rational talk was not seen in his arousal level. Within the episode, T1 had been nonverbally synchronized all other participants and equally to Tom and Mary. He also nodded frequently with T2, expressing the importance of the topic.

In the SRI, T2 said that he had seen the topic as very important: it lay at the heart of the couple's disconnection. He said that he had been very interested in Mary's point of view and had wanted to know more about Mary's feelings. His interest could be seen in his head-nodding behaviour.

**Summary** In this moment Tom and Mary were nonverbally synchronized to each other in the actual session. It was the only episode chosen for the SRIs in which this occurred. It appeared to signal an embodied connection between them. The other participants were also involved in the nonverbal synchronization behaviour. This could signal the importance of the topic, with everyone actively collaborating in the discussion. When they discussed a significant issue, there was considerable movement-synchronization between everyone, but not a particularly high level of arousal in all the participants. The displacement behaviours were not accompanied by high arousal.

### 3.2.4. SRI Clip 4 (TE17 to TE18)

The clip was selected for the SRI because of the theme (gender roles), the couple's laughter, and it was chosen by the researcher to end the SRI situation with a less stressful episode. The clip was from the middle of TE17 ('not "natural mother" – guilt') to the end of TE18 ('acceptance of others').

**Within the session** The topic primarily concerned Tom's role as a father and their untraditional parental roles, within which Tom did much of the caring for Eva – something that had been very similar in Tom's family of origin. Mary and Tom did most of the talking. Mary and T2 regulated the discussion and introduced the topics. From the perspective of the therapeutic process, this was a moment where not so much intensive therapy work was done.

Within the session (TE17 and TE18), Mary's arousal had been below her average, whereas Tom had moved from very high arousal to an arousal level near his average of the session. T2 had moved in the same direction as Tom, from having had some arousal to low arousal. By contrast, T1's arousal went in the opposite direction: he had first had low arousal, and then his arousal level rose (see Fig. 1).

In this clip (TE 17 and 18), there was a very low frequency of nonverbal synchronization in the actual session, with only the therapists nodding together (on two occasions) (see Fig 3).

**Individual thoughts and emotions** In the SRI, Mary indicated that this clip was not as emotionally strong as the others had been. Her low arousal level confirmed this.

For his part, Tom observed that he looked more relaxed in the clip. However, as he recalled the session, he had not in fact felt so relaxed at this point. His recollection seemed to be closer to reality, since in the session he had shown high arousal (TE17), which then decreased (TE18).

T1 said that he thought the topics towards the end of the session had been increasingly interesting and important. T1 was anxious because of the important topics coming up and because he knew he would have to end the session earlier than expected. Within the session T1's arousal level was rising, which could relate to his feeling of unease.

T2 did not recall any specific emotion during the clip. He had felt curious about the couple's roles and Tom's family of origin. In his SRI he commented that the couple's situation was like a puzzle, becoming piece by piece more complete. This could possibly be seen in his arousal levels, which had gone in the same direction as Tom's, i.e. decreased.

**Summary** This moment was not a significant moment in therapy. This was also seen in the lower arousal levels of the participants during the actual session. Only T1 was aroused, and this was possibly related to his feelings of distress of having to end the session prematurely.

### 3.3. Summary of the Findings from the SRIs in Combination with the Findings on Autonomic Nervous System Arousal and Nonverbal Synchronization

In general terms, the analysis of the SRI conversations revealed the complexity of the embodied reactions, in that (for instance) when a participant had high arousal, it did not always mean that the discussion was particularly emotional or difficult. The differing roles of the therapists and the clients were also visible in their embodied reactions. The therapists were more active in synchronizing nonverbally to others. It could be that the therapists were using nonverbal synchronization to further the dialogue and to signal the importance of the topic under discussion but also as a therapeutic tool to understand the clients' experiences. In the SRIs the therapists were

more empathic towards Mary's point of view, but this was not seen in their embodied reactions (SCR and nonverbal synchronization).

It also seemed that the different embodied reactions of the participants were not in a linear relation to each other, meaning that when there was much movement-synchronization, there were no concurrent or consecutive higher or lower arousal levels among the participants. It would thus seem that the different embodied reactions (SCRs and nonverbal synchronization) within the session could have had different and independent functions within the therapy process. For example, the level of arousal was not directly connected to the emotional load of the dialogue or to the felt importance of it. When participants stated that the topic was important for them, they weren't highly aroused at that moment in the session.

## 4. DISCUSSION

In this case study, we wanted to know what the embodied reactions of the participants might indicate concerning the therapy process. We discovered that they were not easy to interpret. Earlier research on the autonomic nervous system responses has shown that many factors affect the arousal level of the participants in psychotherapy. We reached a similar conclusion. We discovered that the arousal patterns differed in different moments of the therapy process. As the therapists were preparing the ground for discussing the couple's reason for coming to therapy, all participants had low arousal. But in an ambivalent moment, where the couple avoided discussing the issue of Tom holding back, all participants were aroused. This could reflect them all being activated by the situation, as if interested in seeing how it would unfold, which was in line with earlier research indicating that active emotional engagement in the therapeutic process increases arousal (del Piccolo & Finset, 2017). But within a significant moment in the session where the issue of why the couple was in therapy was discussed, all participants had low arousal. This could be interpreted as a feeling of relief in the participants, which would be in line with earlier research suggesting that relief is accompanied by lower arousal levels (Kreibig, 2010). As for the qualities of dialogue (dialogicity, dominance and narrative mode), it did not seem that they were directly related to the arousal levels or nonverbal synchronies among the participants.

As for the combination of the arousal levels and nonverbal synchronization behaviour, our study suggests that the arousal level and the nonverbal synchronization behaviours contribute to the therapeutic situation in different ways. Autonomic nervous system activity occurs 'under the skin', whereas synchronized nonverbal behaviour is visible to all participants in the session. Thus, nonverbal behaviour can implicitly impact the therapeutic situation. In our case study one of the

therapists interpreted Tom as more rational. The implicit nonverbal synchronization patterns in this session might have contributed to this interpretation. In the session Tom was mostly synchronized to Mary, whereas Mary was more synchronized to the therapists. Thus, Mary was more connected to the therapists at the embodied level, whereas Tom was not. This might induce the therapist to interpret Tom as more distant.

It was notable that in the present therapy process, the therapists used their bodies differently. Thus, one therapist was involved mainly in the regulation of the dialogue, through the use of head nods, whereas the other therapist showed more contagion from the couple's displacement behaviour, which could be seen as a way of feeling his way into the client's arousal.

When considering the nonverbal synchronization behaviour of the participants in relation to the therapeutic process, one finding was that within all the moments chosen for the SRIs, there was no posture-synchronization. This was no surprise, since earlier research suggests that posture-synchronization is related to moments of high rapport (Trout & Rosenfeld, 1980). The lack of posture-synchronization in these moments could be a reflection of a choice of moments to the SRIs that contained emotionally loaded or therapeutically interesting topics, in preference to situations where there was high rapport between the participants.

As for movement-synchrony, all the SRI-clips showed head movement synchrony between participants. In the clips that were therapeutically more interesting, i.e. ambivalent or significant, there were more head nods between participants. This was in line with earlier research showing that head nods could be seen as a way of furthering the dialogue (Stivers, 2008) or marking interest in the topic discussed.

When one strives to integrate information from different research methods, straightforward conclusions are hard to make. Linear or correlational ways of thinking are challenged. It is too simplistic to think that arousal would rise as the emotional load of the dialogue, or the amount of nonverbal synchronization behaviour increases. The relations between the different modalities (i.e. autonomic nervous system responses, nonverbal synchronization and the dialogue) are by no means constant. They change depending on the therapeutic process and the challenge it forces the participants to face, their position or their role regarding the topic. The individual reactions of each participant can be seen as impacting on the dialogue, but they can also be a reaction to the dialogue or to each individual's personal agenda in the situation.

The individual agendas in the session could be accessed with the SRIs. It is a useful method to gain insight into the participants' inner thoughts and feelings during the session. The SRI is a valuable method because it narrows the gap between clinicians and researchers and promotes practice-oriented research (see Vall et al., 2018).

By using this kind of mixed-method procedure, it is possible to broaden our understanding of the therapeutic process and especially the impact the participants' embodied reactions have on it. Based on this study, further research combining the dialogue with embodied reactions is needed to clarify the functions of the different modalities.

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# III


# NONVERBAL SYNCHRONY IN COUPLE THERAPY LINKED TO CLIENTS' WELLBEING AND THE THERAPEUTIC ALLIANCE


by

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*Frontiers in Psychology, 21*

https://doi.org/10.3389/fpsyg.2021.718353

# Nonverbal Synchrony in Couple Therapy Linked to Clients' Well-Being and the Therapeutic Alliance

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Nonverbal synchrony between individuals has a robust relation to the positive aspects of relationships. In psychotherapy, where talking is the cure, nonverbal synchrony has been related to a positive outcome of therapy and to a stronger therapeutic alliance between therapist and client in dyadic settings. Only a few studies have focused on nonverbal synchrony in multi-actor therapy conversations. Here, we studied the synchrony of head and body movements in couple therapy, with four participants present (spouses and two therapists). We analyzed more than 2000 min of couple therapy videos from 11 couple therapy cases using Motion Energy Analysis and a Surrogate Synchrony (SUSY), a procedure used earlier in dyadic psychotherapy settings. SUSY was calculated for all six dyads per session, leading to synchrony computations for 66 different dyads. Significant synchrony occurred in all 29 analyzed sessions and between the majority of dyads. Complex models were used to determine the relations between nonverbal synchrony and the clients' well-being and all participants' evaluations of the therapeutic alliance. The clients' well-being was related to body synchronies in the sessions. Differences were found between the clients' and therapists' alliance evaluations: the clients' alliance evaluations were related to synchrony between both dyads of opposite gender, whereas the therapists' alliance evaluations were related to synchrony between dyads of the same gender, but opposite to themselves. With four participants present, our study introduces a new aspect of nonverbal synchrony, since as a dyad synchronizes, the other two participants are observing it. Nonverbal synchrony seems to be as important in couple therapy as in individual psychotherapy, but the presence of multiple participants makes the patterns more complex.

Keywords: couple therapy, nonverbal synchrony, motion energy analysis, surrogate synchrony, therapeutic alliance, client well-being

## INTRODUCTION

Synchrony is an elementary part of human interaction. Synchrony occurs automatically during conversations as we regulate turn-taking or adjust our nonverbal behaviors, including movement, pitch, and facial expressions, to each other. Synchrony can occur in many domains, from physiological arousal to body movements. In this article, we concentrate solely on the coordination

of body movements, hereafter nonverbal synchrony. The tendency to synchronize in human interactions has been studied quite extensively using different research methods, including conceptualizations and computations (Delacherche et al., 2012; for a review, see Vicaria and Dickens, 2016).

Even though research methods and computations vary, nonverbal synchrony has generally been related to positive aspects of the interpersonal relationship. Synchrony increases when participants like each other (Kämpf et al., 2018), are in rapport (Sharpley et al., 2001; Lakin and Chartrand, 2003), have a goal to affiliate with each other (Lakin and Chartrand, 2003), have an incidental feeling of similarity (Guéguen and Martin, 2009), and even during self-disclosure (Vacharkulksemsuk and Fredrickson, 2012). Nonverbal synchrony generates feelings of closeness, similarity, and entitativity and a feeling that the interaction is proceeding smoothly (Vicaria and Dickens, 2016). Nonverbal synchrony leads to affiliation (Hove and Risen, 2009), increases positive affect (Tschacher et al., 2014; Mogan et al., 2017; Galbusera et al., 2019), and even affects self-esteem (Lumsden et al., 2014).

On a social level, nonverbal synchrony enhances social bonding and contributes to a prosocial orientation (Mogan et al., 2017), making participants work better together on a joint task (Valdesolo et al., 2010) and increasing cooperation while diminishing self-advantage behavior (Wiltermuth and Heath, 2009). Some situations decrease nonverbal synchrony between interacting partners: during arguments (Paxton and Dale, 2013), interactions with a tardy partner (Miles et al., 2010), or interactions with an out-group member (Yabar et al., 2006; Bourgeois and Hess, 2008). Interestingly, people tend to synchronize more with their next interaction partner after having experienced exclusion from the previous one (Lakin et al., 2008).

What is the essence of nonverbal synchrony? According to the Russian-doll model of empathy (de Waal, 2007; de Waal and Preston, 2017), nonverbal synchrony can be understood as a bottom-up process of empathy, where synchronizing to the other's movements makes one implicitly understand the other one better. Nonverbal synchrony helps participants become more emotionally attuned to each other (Stel and Vonk, 2010). Empathic persons tend to synchronize better with others (Sonnby-Borgström, 2002; Finset and Ørnes, 2017). This affective empathy precedes cognitive empathy—that is, the ability to perspective-taking (de Waal, 2007). But nonverbal synchrony has also been reported to relate to cognitive empathy, it has been found to enhance the ability to reason about another person's mind (Baimel et al., 2015) by reducing the egocentric perspective, thus helping to connect with others (Miles et al., 2010). Nonverbal synchrony occurs in triads as well, and nonverbal synchrony has been suggested as complementary in situations where there is a lack of synchrony or similarity in other modes of interaction, such as language style (Dale et al., 2020).

In the context of psychotherapy, nonverbal synchrony has been proposed as a marker of therapeutic alliance (Koole and Tschacher, 2016). The theoretical framework called the In-Synch model describes how nonverbal synchrony is related to the

therapeutic alliance (Koole and Tschacher, 2016). According to the framework, nonverbal synchrony establishes a link between therapist and client at different levels of coupling, ranging from behavioral to physiological; and the more synchrony there is between client and therapist, the better the alliance. According to the model, nonverbal synchrony also builds the foundation for the co-regulation of emotions during therapy, which in turn facilitates the development of the client's emotion regulation skills. This link between nonverbal synchrony and emotional regulation has been investigated in children: nonverbal synchrony between infant and caregiver predicts more self-regulative skills and better emotional regulation and even empathy in older children (Feldman, 2007). It seems thus plausible that this link could sustain even into adulthood and be at play in the context of psychotherapy.

Empirical evidence shows that more synchrony leads to better outcomes—that is, the clients having fewer symptoms at the end of therapy—and to a stronger therapeutic alliance—that is, a better quality of the relationship better between client and therapist (Ramseyer and Tschacher, 2011). Interestingly, head movement synchrony, which consists mainly of conversational movements related to speaking and listening (for example, nodding), has been related to the global outcome of therapy, whereas body movement synchrony has been related to the alliance in the sessions (Ramseyer and Tschacher, 2014). Nonverbal synchrony has been put forward by other researchers as a process variable influencing the outcome of psychotherapy (Prinz et al., 2021).

High synchrony between therapist and client has not always been found to be beneficial. A high level of synchrony between the therapist and client at the beginning of therapy has been related to poor therapy outcomes (Paulick et al., 2018a), and high synchrony was observed in sessions that were marked with little progress (Ramseyer, 2020). In other contexts, synchrony was found to blur self-other boundaries (Paladino et al., 2010; Wiltermuth, 2012), and to impede self-regulation of affect (Galbusera et al., 2019). Research on attachment styles has found that more securely attached persons may synchronize less with others (Feniger-Schaal et al., 2016). These are factors that seem important in the context of psychotherapy.

Lutz et al. (2020) suggested that it is important for the therapist to be able not to synchronize with clients at the beginning of therapy, because synchronizing could strengthen the client's negative interpersonal patterns that they bring with them to the therapy. They found that low levels of synchrony in the early stages of therapy were related to earlier improvements in interpersonal change patterns (Lutz et al., 2020). But low levels of synchrony at the beginning of therapy have also been related to client dropout, with a medium level of nonverbal synchrony suggested to be most beneficial (Paulick et al., 2018a).

Client characteristics related to nonverbal synchrony have been studied. Depressed clients were found to be less in synchrony with others (Altmann et al., 2021) as well as clients with social anxiety disorder (Asher et al., 2020). Depressed clients have been found to be less involved in nonverbal synchrony at the beginning of therapy compared to anxious clients, but at the end of therapy there were no differences

between depressed or anxious clients (Paulick et al., 2018b). Clients with social anxiety disorders who were involved in a high amount of nonverbal synchrony in the early stages of therapy had fewer interpersonal problems and evaluated the therapeutic alliance more positively at the end of therapy (Altmann et al., 2020). But the results on nonverbal synchrony are somewhat inconsistent and possibly due to differences in synchrony computations, and choice of parameters, as well as different research contexts, client variables, and therapist factors.

More nonverbal synchrony was found in cognitive behavioral therapy, especially in the automated version, than in manualized psychodynamic therapy (Altmann et al., 2020). Prinz et al. (2021) studied whether specific therapeutic strategies were related to nonverbal synchronies in the session and found that nonverbal synchrony was associated with higher mastery (the therapist's ability to assist the client to cope with past situations) but with less resource activation (the clients becoming acquainted with their own positive and healthy potential, characteristics, abilities, and motivation *via* therapist interventions). Nonverbal synchrony was not associated with problem actuation (the activation of avoided experiences and behavior guided by the therapist) or motivational clarification (the therapist's ability to guide the client through a process of exploration to gain insight into needs and motives). It is fair to say that research on nonverbal synchrony in psychotherapy is still quite novel, and only some aspects of the effect of nonverbal synchrony on the psychotherapy process have been studied.

Many studies have replicated the finding that nonverbal synchrony occurs above chance level in psychotherapy (Ramseyer and Tschacher, 2011, 2014; Paulick et al., 2018a; Ramseyer, 2020; Prinz et al., 2021). As it seems to be a quite robust phenomenon, this suggests that nonverbal synchrony has an important role in psychotherapy. Nonverbal synchrony can be considered as a marker of the quality of the relationship between therapist and client. One proposition might be that, in accordance with the In-Sync model (Koole and Tschacher, 2016), high movement synchrony reflects a joint effort and mutual adaptation to each other, whereas low synchrony may show either complementary behavior (for instance, soothing as the other one is in distress) or disengagement from the relationship.

Even though nonverbal synchrony in psychotherapy has become a growing research area, nonverbal synchrony in couple therapy is still unexamined. In couple therapy, research on nonverbal synchrony is more complex given the presence of multiple participants and relationships. There is the relationship between the therapist and each spouse, and the relationship between the spouses (allegiance), and in the cases studied here, also the relationship between the therapists.

Here, we explored dyadic patterns of nonverbal synchrony in couple therapy. The data originated from a research project (Seikkula et al., 2015, 2018) that studied the synchrony of autonomous nervous system responses of participants in couple therapy, in which all participants wore equipment to record their responses in some of the sessions analyzed.

Research on nonverbal synchrony between romantic couples is sparse. Synchrony of immediacy behaviors (that regulate psychological distance/intimacy) between spouses has been reported to be more prevalent in satisfied couples (Julien et al., 2000). Synchrony between spouses has been found to lead to feelings of closeness and sexual desire (Sharon-David et al., 2019). Interestingly, couples did not synchronize more rapidly to each other compared to unfamiliar dyads, but both spouses evaluated the onset of synchrony more similarly than unfamiliar dyads, and this was true especially when the couple had evaluated their everyday interactions to be of good quality (Preissmann et al., 2016).

Research on nonverbal synchrony between the therapist and the couple is even more scarce. One study investigated body movements, but not synchrony, in couple therapy. Therapeutic alliance was related to predictable and recurring patterns of bodily movements (i.e., shifting of postures, leaning toward each other) between the couple and the therapist (de Roten et al., 1999). Previously, a case study we conducted found that there was a lot of nonverbal synchrony between the two therapists working together, and synchrony between the therapists was especially notable in sessions that followed sessions with weaker alliance evaluations (Nyman-Salonen et al., 2021). Nonverbal synchrony between therapists was suggested to be an embodied and implicit means of strengthening the therapeutic alliance. In a microanalytic discursive study on alliance formations in couple therapy, we found that the therapist who was listening to the conversation synchronized nonverbally with the client who was not involved in the conversation, which could signal an embodied alliance formation between the listeners (Kykyri et al., 2019). The context of couple therapy brings forth a new aspect of nonverbal synchrony: if two participants are synchronized, there is always someone who is watching the synchrony but not participating in it, who might still be affected by it.

Even though couple therapy is an ecologically valid naturalistic context for studying nonverbal synchrony, causal inferences cannot be made due to the many confounding variables that might affect synchrony and the way it is felt or interpreted by each participant. Therapists and the couple have different roles within the situation; the therapists are in their professional roles, acting accordingly, and are highly familiarized with the context. To the clients seeking help because of issues in their relationships, couple therapy may be a novel situation that could also be threatening. Further, the couple have their own relationship history, which makes them react to each other in predisposed ways. Moreover, in couple therapy, both spouses react to the situation separately but also as a part of their couple system. In couple therapy, there can be hidden variables or agendas that presumably affect how the participants synchronize with each other. We aimed to study whether nonverbal synchrony in couple therapy occurred between all the possible dyads and whether it was related to the clients' well-being, the therapeutic alliance in the sessions, and to the outcome of therapy.

A strong alliance has been related to a positive outcome in individual psychotherapy (Horvath and Symonds, 1991; Lambert and Barley, 2001), but also in couple therapy (Bourgeois et al., 1990; Johnson and Talitman, 1997; Anker et al., 2010). However, the relationship between therapeutic alliance and outcome in couple therapy is not as

straightforward as in individual psychotherapy (Friedlander et al., 2011, 2018), since multiple different alliances can influence the relationship. There is an alliance between one of the spouses and the therapist, the alliance between the other spouse and the therapist, and the alliance between the couple as a system and the therapist (Pinsof, 1995; Mamodhoussen et al., 2005). There is also a relationship between the spouses that might have a bearing on the therapeutic alliance (Pinsof, 1995).

Different factors influence the relationship between alliance and outcome in couple therapy. For instance, the relationship between alliance and outcome becomes stronger when both spouses agree on the strength of the alliance (Pinsof and Catherall, 1986; Symonds and Horvath, 2004). Even gender differences have been found concerning the relationship between alliance and outcome. The alliance evaluated by the male clients has been reported to be more strongly related to the outcome than the female client's evaluations (Bourgeois et al., 1990; Symonds and Horvath, 2004; Anker et al., 2010; Glebova et al., 2011). But if women rate their partner's alliance with the therapist more positively, a successful outcome is more likely; and when the male client evaluates the alliance to be stronger than what the female clients evaluate, marital distress decreases (Knobloch-Fedders et al., 2007). Tentatively speaking, it seems important for both spouses that the male partner's evaluations of the alliance is positive.

Nonverbal synchrony could also be a method for studying alliance in couple therapy, as it has been suggested to be a marker of therapeutic alliance in individual therapy (Koole and Tschacher, 2016). Different methods have been used to quantify nonverbal body movement synchrony. In this study, we used Motion Energy Analysis, hereafter MEA (Ramseyer and Tschacher, 2011), because it is the method that has been used the most in research on nonverbal synchrony in individual psychotherapy; however, it has not been used in couple therapy. Our research aim was to explore whether nonverbal synchrony between participants in couple therapy was related to the clients' well-being, therapeutic alliance and therapy outcome.

## Research Questions

RQ 1: We hypothesized that nonverbal synchrony of head and body movements occurred above chance level in the whole dataset. More specifically, there would be significant synchrony between all dyads in all sessions. We were also interested in whether there was a mean difference between head and body synchrony between three different types of dyads (client–client, client–therapist, and therapist–therapist).

RQ 2: We hypothesized that the well-being of the clients, the alliance, and the outcome of therapy would be related to the nonverbal synchrony patterns in the session.

## MATERIALS AND METHODS

## Design and Participants

The couple therapy data were collected in the research project Relational Mind in Events of Change in Multi-actor Dialogues,

which took place at the Psychotherapy Training and Research Centre of the Department of Psychology at the University of Jyväskylä (Seikkula et al., 2015). At the facility, it is common practice for therapists to work in dyads with couples. The research project studied embodied attunement between the participants in couple therapy. The therapy was not manualized but was influenced by dialogical therapy.

The overall Relational Mind data consisted of 12 couple therapy cases, of which 11 consisted of man and woman. For all therapies, two therapists were present. Ten therapists worked with the couples; that is, many of the therapists worked on more than one couple therapy case. Normally, the therapist dyads varied, but one dyad worked on two cases. The therapists were between 31 and 64 years old, mainly with a degree in family therapy (7 out of 10 therapists). All but one therapist had over 10 years of experience from clinical work. Six of the 10 therapists were female.

The therapy sessions were recorded using six cameras: one camera focused on each participant's face and one camera recorded the full bodies of the two therapists and the couple. The couple and the therapists were seated in chairs around a round table: The clients sat next to each other, and the two therapists sat next to each other on the opposite side of the table.

Because of the research group's interest in autonomous nervous system responses, all participants' autonomous nervous system reactions were usually recorded in the second and sixth session. In these measurement sessions, heart rate monitors were attached to the chest, two skin conductance electrodes were attached to the palm of the nondominant hand, and a respiration rate belt was fastened around the lower chest. The skin conductance electrodes were attached to the chair in which the participant sat and thus restricted the movement of the non-dominant arm to a range of approximately 25 cm from the chair.

The well-being (outcome) and alliance were assessed using the ultra-brief forms of the Outcome Rating Scale (ORS) and the Session Rating Scale (SRS; Duncan et al., 2003; Miller et al., 2003), and the outcome with the Clinical Outcomes in Routine Evaluation – Outcome Measure (CORE-OM) questionnaire (Barkham et al., 2001; Evans et al., 2002). SRS and ORS have been used in the context of couple therapy (Anker et al., 2010; Kuhlman et al., 2013). ORS is a short outcome measurement that measures the well-being of the clients. It was given to both clients before each session; the SRS measures the session-level alliance and was given to both clients and therapists after each session. Both the SRS and ORS are visual analogue self-report measures, and the participants marked their answer to the question by making a cross on a 10-cm long line. The results were converted to numbers by measuring the place of the cross, and then numbered using 0 (left) to 10 (right), making a Likert-type scale. The ultra-brief form of ORS measures well-being with four items: general sense of well-being (Overall), personal well-being (Individually), well-being in relation to one's family and close relationships (Interpersonally), and well-being in relation to one's work or school and friendships (Socially). The SRS has four items depicting four different aspects of alliance. The "Relationship" scale comprises

the item "I felt/did not feel heard, understood, and respected," and the "Goals and Topics" scale comprises "We worked on or talked about/did not work or talk about what I wanted to work on or talk about." The "Approach or Method" scale requires rating the session based on the item "The therapist's approach is/is not a good fit for me." The fourth question rates the "Overall session" with the item "There was something missing in the session today" vs. "Overall, today's session was right for me."

The outcome of the therapy was assessed with the CORE-OM questionnaire (Barkham et al., 2001; Evans et al., 2002), administered to the clients in the first session, after the last session, and at a follow-up after 6 months. CORE-OM is a standardized brief self-report instrument for evaluating change in psychotherapy. It covers four domains: subjective well-being, problems (depression, anxiety, physical aspects, effects of trauma), functioning (close relationships, general functioning, and social aspects), and risk (to self and to others; Barkham et al., 2001; Evans et al., 2002).

The research procedure was approved by the University of Jyväskylä Ethical Committee. All participants gave their written informed consent to participate in the research project.

## Data Selection

For the movement analysis, one couple therapy case was omitted, since one of the spouses suffered from obsessive movement patterns, which affected the data. Videos from 11 couple therapy cases were used. Of the 11 couples, seven were married (one registered partnership), three were living together, and one couple lived separately. All of the couples had been together for over a year and almost all of them had been together for several years. The mean age of the female clients was 41 (range = 27–54), and the mean age of the male clients was 44 (range = 34 to 61). Mean psychotherapy duration per couple was six sessions ($M = 6.27$, Mdn = 6), and duration varied between cases (Min = 4, Max = 10).

The inclusion criteria of the therapy sessions for movement analysis were done based on the parameters required by MEA: the lighting needed to be stationary and the video screen needed to show all participants' full bodies. The participants needed to be seated at all times, and all regions of interest (head and body) needed to be visible in the video at all times. For MEA, videos showing the full bodies of the participants in a split-screen format were used.

From a pool of 69 videos, 29 met these criteria, which indicates one to three sessions per case ($M = 2.6$, $SD = 0.7$, Mdn = 3). Out of the qualified videos, 17 were from measurement sessions, and 12 were from regular sessions.[1] The videos were converted to QuickTime format, edited to 10 frames per second, cut from the beginning to the point where all participants sat in their chairs, and cut at the end when participants began taking out their calendars to schedule the next meeting. This

resulted in sessions that lasted, on average, 79 min ($SD = 8.29$ min, Min = 52 min, Max = 90 min).

## Analysis Procedure

All selected sessions were analyzed with MEA (Ramseyer and Tschacher, 2011). MEA is an automated computer program designed to quantify movements from video recordings. Motion energy is defined as the amount of gray-scale pixel changes occurring between consecutive video-frames. The changes are calculated within a region of interest (ROI) that can be manually defined on the video screen. Given that the context was couple therapy with two therapists present, eight ROIs were defined: the head and the body of each participant separately. Preprocessing of the data was first done on the basis of the videos: The ROIs of each participant's head and body were checked manually in each video before the extraction of the data to guarantee that no overlapping of movement between the different ROIs occurred (as the full-body videos of one dyad were filmed from behind the other dyad, sometimes one participant of a dyad leaned forward and visually entered the ROI of the other dyad, resulting in erroneous data). MEA then generated a time series of pixel changes for all defined ROIs. Preprocessing at the MEA level was performed by setting the threshold for recording of pixel changes at a value of 15, which is the default of this procedure. Thus, all pixel changes inside a ROI less than 15 were considered as video noise and disregarded. Additionally, the spurious peaks at the beginning of MEA records, which however last only for less than 1 s, were deleted.

After obtaining the raw data from the MEA, movement synchrony between different ROIs was computed using the Surrogate Synchrony (SUSY) procedure (Tschacher and Haken, 2019; for a web-based app see https://www.embodiment.ch). SUSY allows dyadic synchrony to be computed: head and movement synchrony for six dyads (client 1–client 2, therapist 1–therapist 2, and all four client–therapist dyads) was calculated. SUSY divided the time series of the MEA individual movement raw data into segments of 30 s. In each segment, all the cross-correlations were calculated up to time lags of +/− 5 s by shifting one of the time series stepwise (in 0.1 s steps because of the sampling rate of 10 frames/s) in relation to the other one. The cross-correlations were standardized using Fisher's $Z$, which were then aggregated to a mean $Z$ value of nonverbal synchrony for all lags separately in each segment. The mean $Z$ values of all segments were averaged, resulting in a mean $Z$ value of nonverbal synchrony for the whole therapy session for each dyad and synchrony type (head and body). SUSY calculates the mean $Z$ synchrony using both absolute values from the cross-correlations ($Z_{abs}$), by converting negative values of cross-correlations into positive ones, and the original positive and negative (thus, 'non-absolute') values of the cross-correlations ($Z_{noabs}$). Using non-absolute values ($Z_{noabs}$) enables distinguishing between in-phase synchrony (i.e., both participants' movements are positively correlated) and anti-phase synchrony (i.e., both participants' movements are negatively correlated: when one is moving more the other one is moving less). Both absolute and non-absolute cross-correlations and in-phase and anti-phase synchrony of datasets have been interpreted by Tschacher and Meier (2020) and Coutinho et al. (2021).

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[1]The reason for the measurement videos being of better quality was that they were adjusted at the beginning of the session by a researcher, and were monitored throughout to ensure the quality of the video, whereas the videos from the regular sessions were recorded by the therapists, who put the recording on at the beginning of the sessions, and the videos were not monitored for quality during the sessions. This resulted in inadequate zoomings, that is, the whole bodies of one or two participants were not visible on the screen.

To investigate whether synchrony occurred above chance level, surrogate datasets were created by shuffling the segments of the original data from the two time series, aligning segments that never occurred at the same time. Many surrogate datasets can be generated from the data of a session, for example, in a 50-min session containing 100 segments, $100 \times 99 = 9,900$ surrogate datasets. A value of the pseudo synchrony of each surrogate dataset was then computed in the same way as the synchrony computations described above. Lastly, the empirically obtained synchrony calculations were standardized using pseudo-synchronies by comparing the mean value of the surrogate data to the same value of the empirically collected synchrony, giving the effect size for each dyadic head and body synchrony in the session. The effect size was obtained for both absolute values ($ES_{abs}$) and non-absolute values ($ES_{noabs}$). We used the non-absolute effect sizes ($ES_{noabs}$) for all statistical calculations, since they allow for the distinction of in-phase and anti-phase synchrony.

The head and body synchrony effect sizes ($ES_{noabs}$) of each of the six dyads (client 1–client 2, therapist 1–therapist 2, female client–female therapist, female client–male therapist, male client–female therapist, male client–male therapist) were obtained from all sessions, resulting in 12 dyadic nonverbal synchrony effect sizes ($ES_{noabs}$) per session. Contrary to the earlier research, we used the movement data from the whole session for the synchrony computations, resulting in a more valid value of nonverbal synchrony between participants. We used the gender of the participants to distinguish between the four participants in each situation.

The objective for using SUSY was twofold: First, it is the synchrony computation method that has been used the most in psychotherapy research. Second, as the context is psychotherapy, in which the dialogue, and the embodied responses of the participants unfold in seconds, it was important to use a method that enables synchrony computation using time lags of several seconds as the time unit. This kind of synchrony calculation depicts the movement interaction between participants in the therapy setting in a ecologically valid way, reflecting the embodied responsiveness between participants.

## Statistical Analyses
### The Data
The data came from 11 couple therapy cases, 1–3 sessions from each case were analyzed. Intraclass correlations (ICCs) were computed to determine whether the data were indeed hierarchical (significant amount of the total variance of the dyadic nonverbal synchrony effect sizes was between cases). The ICCs were calculated in MPlus version 8.4 using two-level models (level 1 within, level 2 between) with Maximum Likelihood with robust standard errors (MLR) as estimator. Six models with two variables in each model were calculated.

Due to the hierarchical data set, and thus the non-independence of the nonverbal synchrony effect sizes (which were nested within cases), complex models were used for the majority of the statistical analyses. Complex models have been developed for analyzing clustered data (Muthén and Satorra, 1995). Complex models take into account the clustered sample by correcting the standard errors using a sandwich estimator, thus giving more

reliable values of $p$. The small dataset and the small number of clusters restricted the number of estimated parameters in one model. Thus, several one-level complex models were used for estimating correlational relations and for comparing means. The number of models is specified below for each computation. The models were all computed using MLR as estimator, and case was used as the cluster variable. All models were saturated, meaning that all degrees of freedom were used, and thus fitted the data perfectly. All complex models were computed using MPlus version 8.4.

### Individual Movements
We studied the individual movements of each participant to gain a full picture of the data used for the nonverbal synchrony calculations. The individual amount of movement of head and body per participant in each session was obtained with MEA, and the data were organized according to gender. The amount of movement was adjusted to the length of the session, providing comparable values. Six complex models were calculated to estimate the difference between how much the participants moved their head and body. The following three pairs were compared: female client vs. male client (head and body in separate models), female therapist vs. male therapist (head and body in separate models), and the mean of both clients vs. the mean of both therapists (head and body in separate models). The nonverbal synchrony effect sizes were designated as dependent variables and their means were compared.

### Measurement Sessions
To assess potential influence of wearing measurement equipment on the participants' movement patterns, three complex models were used to estimate the differences in how much the participants moved in regular vs. measurement sessions: The first model included the mean of all participants' head movements, the second model included the mean of all participants' body movements, and the third model included the mean of all participants' head and body movements. Session type was designated as the independent variable and movement as the dependent variable. As for the comparison of nonverbal synchronies in regular sessions vs. measurement sessions two complex models (head and body separately) were calculated for each dyad type (client 1–client 2, therapist 1–therapist 2, client–therapist) with session type as independent variable and synchrony as the dependent variable. For the client–therapist dyad, a mean of nonverbal synchrony of all four possible dyads (female client–female therapist, female client–male therapist, male client–female therapist, and male client–male therapist) was used.

### Nonverbal Synchrony (RQ 1)
To study whether nonverbal synchrony in the whole data set occurred above chance level as expected, Cohen's $d$ was calculated according to the procedure described by Tschacher and Meier (2020). The difference between the mean $Z_{noabs}$ of all $N$ sessions and the mean $Z_{noabs-pseudo}$ of the surrogate dataset of all $N$ sessions was divided by the standard deviation of the $Z_{noabs-pseudo}$ for the surrogate data set. Cohen's $d$ is thus an effect size at the level of all $N$ sessions.

To calculate whether the head and body synchrony between each of the six dyads was significant in each session, the effect sizes ($ES_{noabs}$) of each dyadic synchrony value ($N = 12$) per session were computed using one-sample $t$-tests.

The means of head and body synchrony between the three different types of dyads (client–client, client–therapist, therapist–therapist) were compared using six complex models: (1) client–client vs. client–therapist head synchrony, (2) client–client vs. client–therapist body synchrony, (3) client–client vs. therapist–therapist head synchrony, (4) client–client vs. therapist–therapist body synchrony, (5) therapist–therapist vs. client–therapist head synchrony, and (6) therapist–therapist vs. client–therapist body synchrony. The synchrony value for the client–therapist dyad consisted of the mean of nonverbal synchrony of all the four different dyads (female client–female therapist, female client–male therapist, male client–female therapist, male client–male therapist). The nonverbal synchrony effect sizes were designated as dependent variables.

## Clients' Well-Being and Nonverbal Synchrony

The relationship between the clients' self-reported well-being (ORS) and nonverbal synchrony was calculated with complex models. Six complex models were used for both female and male clients to calculate the relationship between the client's ORS and all six dyadic (client 1–client 2, therapist 1–therapist 2, female client–female therapist, female client–male therapist, male client–female therapist, male client–male therapist) head and body synchronies. Two additional complex models, one per client, were calculated to find out the relationship between ORS and nonverbal synchrony between one of the spouses and both therapists (for this the mean synchrony between female client–therapist 1 and female client–therapist 2, as well as the mean synchrony between male client–therapist 1 and male client–therapist 2 was used). In these eight aforementioned models, both ORS and nonverbal synchrony were designated as dependent variables.

To study the relation between the mean of both clients' ORS and the mean of all head and body synchronies two complex models were calculated, where ORS was designated as the independent variable and synchrony as the dependent variable. One model included the mean of both clients' ORS and the mean of all head synchronies, and the other model included the mean of both clients' ORS and the mean of all body synchronies.

To calculate whether taking part in synchrony or observing had any impact on the relationship between ORS and nonverbal synchrony two new aggregated variables per client were computed: one variable for the mean of all dyadic synchronies in which the client participated, and another variable for the mean of the nonverbal synchronies that the client observed. The new variables were used in one complex model per client, where all variables were treated as dependent variables.

## Therapeutic Alliance and Nonverbal Synchrony

The relationship between all participants' evaluations of the alliance (SRS) and the non-absolute effect sizes of nonverbal synchronies was calculated almost identically as the relationship between ORS and nonverbal synchrony: First, the relationship between all participants' SRS evaluations and the nonverbal synchrony of the six dyads were calculated separately for each participant. One complex model included the SRS evaluation of one participant and head and body synchrony of one dyad, thus six complex models for each participant were calculated (in which all variables were designated as dependent variables). Second, the relation between the mean of both clients' SRS and the mean of both therapists' SRS with the mean of all participants' head synchrony (one complex model) and body synchrony (one complex model). The two mean SRSs were designated as independent variables and the mean of synchrony as the dependent variable. Third, we studied the relationship between each participant's SRS and the nonverbal synchronies in which they participated or observed. One complex model per participant was calculated with the SRS and the two new variables (participated, observed) as dependent variables.

## Outcome and Nonverbal Synchrony

CORE-OM was filled by all participants at the beginning and end of therapy, and after a 6 month follow up. The relationship between the outcome (change in CORE-OM) and nonverbal synchrony was calculated using one aggregated head synchrony value and one aggregated body synchrony value for each case and dyad. The aggregation was done because of CORE-OM only giving three change values (beginning to end, beginning to 6 months, end to 6 months) for each client to represent the whole therapy process. There was unfortunately a large amount of missing data in the CORE-OM because clients failed to return their questionnaires, which resulted in an extremely small sample size ($N = 6$). Spearman's rank order correlations were used (because of outliers in nonverbal synchrony values). Bootstrapping was not used because of the small $N$ possibly distorting the bootstrapped sample. The calculations were performed using IBM SPSS Statistics version 26. First Spearman's rank order correlations were computed for the six dyads' head and body synchronies and the basic CORE-OM change scores (beginning to end, beginning to 6 months and end to 6 months) for each client separately. Second, a mean of all the participants' head synchronies and a mean of all body synchronies were correlated with the participants' CORE-OM change scores. Third, the mean of both clients' CORE-OM scores was correlated with all the dyadic nonverbal synchronies.

# RESULTS

## The Data

First, we explored the basic characters of the data, and computed ICCs of all dyadic nonverbal synchronies ($ES_{noabs}$) to establish if the data was hierarchical. After this we studied the individual movement patterns of each participant to get an overview of the data used to compute the dyadic nonverbal synchronies. We investigated the validity of the data, that is, whether wearing measurement equipment affected individual movement patterns or nonverbal synchrony patterns.

**TABLE 1 |** Intraclass correlations of the head and body synchronies for each dyad.

| | Client–client | Female client and male therapist | Female client and female therapist | Male client and male therapist | Male client and female therapist | Therapist– therapist |
|---|---|---|---|---|---|---|
| Head synchrony | 0.475* <br> $p < 0.001$ | 0.454* <br> $p < 0.001$ | 0.430 <br> $p = 0.156$ | 0.251 <br> $p = 0.140$ | 0.511* <br> $p = 0.009$ | 0.343 <br> $p = 0.072$ |
| Body synchrony | 0.133 <br> $p = 0.297$ | 0.740* <br> $p < 0.001$ | 0.329* <br> $p = 0.015$ | 0.333* <br> $p = 0.001$ | 0.273 <br> $p = 0.254$ | 0.457* <br> $p = 0.019$ |

*Significant result. N = 29.*

**TABLE 2 |** The mean differences between the individual movement between participants.

| Dyads | Female client (A) - male client (B) | Female therapist (A) - male therapist (B) | Client (A) - therapist (B)[†] |
|---|---|---|---|
| Head β | 35.865* <br> $p = 0.002$ | 30.748* <br> $p = 0.011$ | 31.218* <br> $p = 0.001$ |
| mean A | 105.950 | 41.426 | 88.018 |
| mean B | 70.086 | 72.174 | 56.800 |
| Body β | 23.731 <br> $p = 0.271$ | 42.655 <br> $p = 0.165$ | 37.664* <br> $p = 0.027$ |
| mean A | 155.225 | 84.369 | 143.360 |
| mean B | 131.494 | 127.024 | 105.694 |

*Significant result. [†]The client–therapist comparison was performed based on the mean of the movements of both clients and the mean of the movements of both therapists.*

**TABLE 3 |** Estimates of the difference between synchrony in regular and measurement sessions.

| Dyad | Client–client | Therapist– therapist | Client–therapist[†] |
|---|---|---|---|
| Head synchrony | −0.247 <br> $p = 0.075$ | −0.309* <br> $p = 0.046$ | 0.042 <br> $p = 0.672$ |
| Body synchrony | 0.029 <br> $p = 0.890$ | −0.088 <br> $p = 0.582$ | −0.239 <br> $p = 0.071$ |

*Significant result. [†]For the client–therapist dyads the mean of the synchrony from the four dyads (female client and female therapist, female client and male therapist, male client and male therapist, male client and female therapist) was calculated.*

## Intraclass Correlations

The ICCs show how many percent of the whole variance is between cases. ICCs were calculated for each dyadic nonverbal synchrony value ($ES_{noabs}$) using 60 two-level models (level 1 within, level 2 between). The majority (58%) of the dyadic nonverbal synchrony effect sizes ($ES_{noabs}$) had significantly more variance between cases than within cases, pointing to the data being hierarchical. All results are provided in **Table 1**.

## Individual Movement

The amount of individual movement of each participants' head and body adjusted by the length of the sessions were calculated to understand the data underlying the dyadic nonverbal synchrony patterns. A significant difference was found between all head movement means between all dyads (female vs. male clients,

female therapists vs. male therapists, and clients vs. therapists), as shown in **Table 2**. For individual body movements, the only significant difference was between the mean of both clients' and the mean of both therapists' body movements (clients' $M = 143.36$, therapists' $M = 105.69$). No other significant differences were found. All results are provided in **Table 2**.

## Measurement Sessions

There was no difference between individual movements in the regular vs measurement sessions. No significant differences were found for head movements ($\beta = -1.15$, $p = 0.91$), body movements ($\beta = -1.16$, $p = 0.95$), or all movements ($\beta = -1.16$, $p = 0.93$).

For the nonverbal synchrony, the only significant relation was that there was less therapists' head synchrony in the measurement sessions ($\beta = -0.31$, $p = 0.046$). All results are provided in **Table 3**.

## Nonverbal Synchrony in the Whole Data and in All Dyads (RQ 1)

We hypothesized that there would be significant dyadic nonverbal synchrony in the whole data set. To obtain the effect size of the overall synchrony of the whole data set, Cohen's d was calculated based on all the effect sizes of all dyads ($6 \times 2 \times 29$) in all sessions ($N = 29$) by using the method described earlier (Tschacher and Meier, 2020). The effect size for the whole dataset ($d = 1.36$) met Cohen's (1988) convention for a large effect ($d > 0.80$).

We also hypothesized that there would be significant nonverbal synchrony ($ES_{noabs}$) in all sessions and between the majority of dyads. Twelve values of nonverbal synchrony per session were obtained, head synchrony for each dyad ($N = 6$), and body synchrony for each dyad ($N = 6$). For all cases and dyads, this resulted in 348 different synchrony values. However, 32 values were treated as missing because some of the cases were not gendered balanced (in three sessions with a female–female couple, the dyadic nonverbal synchronies in which the male client was included were missing, and in five sessions with male–male therapist dyads, the nonverbal synchronies in which the female therapist was included were missing, since they did not fit into the classification pattern of gender-based dyadic synchronies). We did not omit any synchrony values from the client-client and therapist-therapist dyads. This resulted in 316 synchrony values. Using one-sample $t$-tests on the effect sizes of each dyadic synchrony, the significance of the nonverbal

TABLE 4 | The amount of significant and not significant nonverbal synchrony per dyad.

| Dyads | Client and client | | Female client and male therapist | | Female client and female therapist | | Male client and male therapist | | Male client and female therapist | | Therapist and therapist | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Head | Body | Head | Body | Head | Body | Head | Body | Head | Body | Head | Body |
| **In-phase synchrony** | | | | | | | | | | | | |
| Significant | 13 | 9 | 12 | 8 | 18 | 16 | 15 | 16 | 14 | 12 | 29 | 25 |
| Not significant | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| **Anti-phase synchrony** | | | | | | | | | | | | |
| Significant | 13 | 20 | 17 | 20 | 6 | 7 | 9 | 9 | 7 | 8 | 0 | 4 |
| Not significant | 3 | 0 | 0 | 0 | 0 | 1 | 2 | 1 | 0 | 0 | 0 | 0 |
| n | 29 | 29 | 29 | 29 | 24 | 24 | 26 | 26 | 21 | 21 | 29 | 29 |
| missing | 0 | 0 | 0 | 0 | 5 | 5 | 3 | 3 | 8 | 8 | 0 | 0 |

Significant $p < 0.05$. All in-phase synchronies (N = 189), all anti-phase synchronies (N = 127).

synchronies was calculated for all synchrony values ($N = 316$). Of all nonverbal synchrony effect sizes 97% ($N = 307$) were significant and 3% were not significant ($N = 9$). Out of the effect sizes 189 were positive, indicating in-phase synchrony, and 127 effect sizes were negative, indicating anti-phase synchrony. A summary of the significances is provided in **Table 4**.

Nonsignificant in-phase synchrony was found for two body movement synchrony effect sizes (of the 189 effect sizes) between two different dyads (female client and male therapist; male client and female therapist) in two different cases. Nonsignificant anti-phase synchrony was found for seven nonverbal synchrony effect sizes (of the 127 effect sizes): five head movement synchronies and two movement body synchronies. Nonsignificant anti-phase head synchrony between clients was found in three different cases and sessions. Anti-phase head movement synchrony between the male client and the male therapist was nonsignificant in two different cases and sessions (one of the sessions also had nonsignificant client–client head synchrony). In one session, anti-phase body movement synchrony was nonsignificant in two dyads: between the male client and the male therapist and between the female client and the female therapist.

In-phase and anti-phase synchrony can be distinguished by the effect size being positive (in-phase synchrony) or negative (anti-phase synchrony). **Figure 1** shows two cross-correlation functions depicting body synchrony between two different dyads in the same session, the first one being in-phase synchrony, and the second showing anti-phase synchrony.

We further assessed potential differences in means between the synchrony of head and body movements ($ES_{noabs}$) between the three different types of dyads (client–client, client–therapist, therapist–therapist). The nonverbal synchrony effect size of the client–therapist dyad was the mean of the four client–therapist dyads. All comparisons were significant except for head movement synchrony between the client–client dyad and the client–therapist dyad ($\beta = 1.516$, $p = 0.248$). All estimates and the mean of synchrony of each dyad type can be seen in **Table 5**.

Out of interest to find out whether the sample size was too small especially when using the mean value for the client–therapist dyad, a *post hoc* power analysis was conducted using MPlus version 8.4 using Monte Carlo simulation with 1,000 replications

to test whether the sample size had enough power at the level of an alpha of 0.05. For four out of five of the significant relations, the *post hoc* power was above 0.9. For the nonsignificant comparison (client–client vs. client–therapist head synchrony), the *post hoc* power was 0.279 for head synchrony, and 0.496 for body synchrony. All *post hoc* powers are shown in **Table 5**.

## Clients' Well-Being and Nonverbal Synchrony

The relationships between the clients' well-being (ORS) and head and body synchronies were calculated using several complex models (see method section). ORS was administered to the clients before each session, which meant that we tested whether the well-being of the clients at the beginning of the session was related to the synchronies later on in the session. The mean of both clients' ORS was significantly related to the mean of all body synchronies ($ES_{noabs}$) across the whole data ($\beta = 0.537$, $p = 0.004$), whereas the relationship of ORS to the mean of head synchronies ($ES_{noabs}$) was not significant ($\beta = 0.276$, $p = 0.280$). All relationships between the female and male client's ORS and the dyadic synchronies ($ES_{noabs}$) are shown in **Table 6**.

Complex models were computed to determine whether there was a difference in the relationships between ORS and the synchronies in which a client participated or observed. For ORS, no significant relations were found for either of the clients concerning nonverbal synchronies in which they participated or observed (female clients participated $\beta = 0.407$, $p = 0.063$, or observed $\beta = 0.073$, $p = 0.785$; male clients participated in $\beta = 0.240$, $p = 0.081$ or observed $\beta = 0.372$, $p = 0.050$).

## Alliance and Nonverbal Synchrony

The relationship between the participants' evaluations of the alliance (SRS) and the head and body synchronies were calculated using complex models. The alliance was evaluated by all participants filling out the SRS after each session. All relations between the participants' SRSs and the dyadic nonverbal synchronies are displayed in **Table 7**. The significant relations were quite evenly distributed among the different participants (female client had four significant relations,
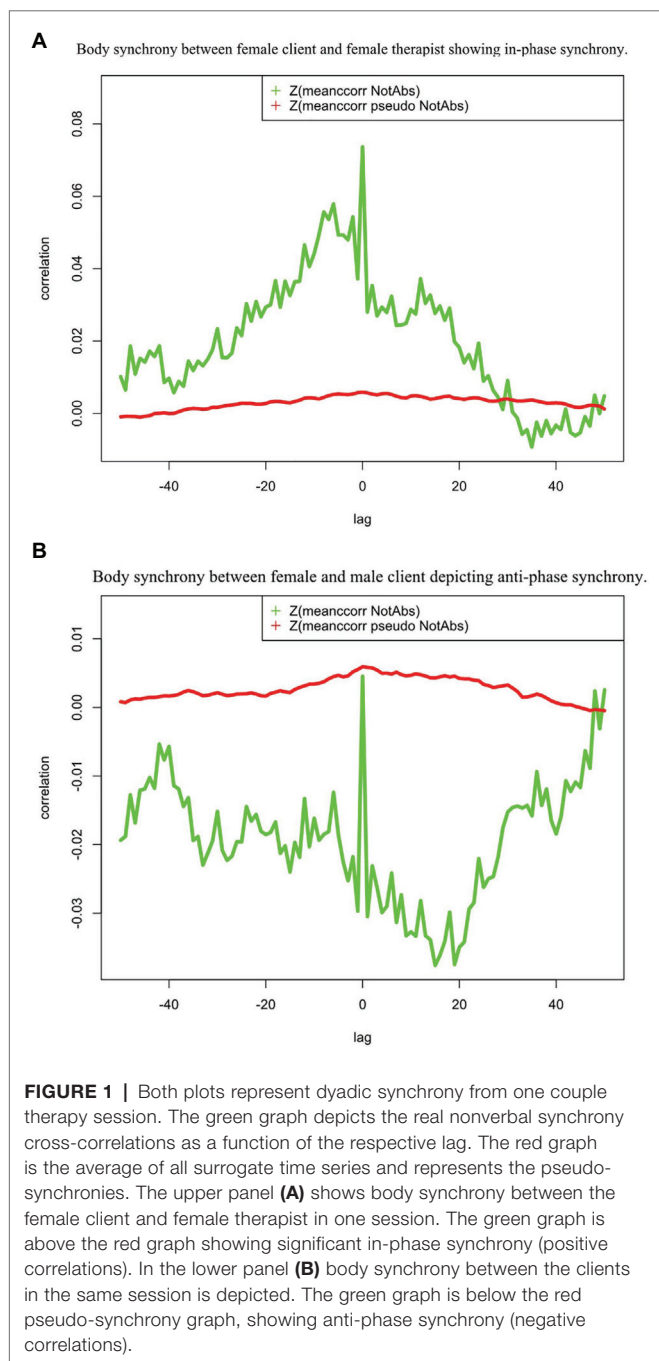
**FIGURE 1 |** Both plots represent dyadic synchrony from one couple therapy session. The green graph depicts the real nonverbal synchrony cross-correlations as a function of the respective lag. The red graph is the average of all surrogate time series and represents the pseudo-synchronies. The upper panel **(A)** shows body synchrony between the female client and female therapist in one session. The green graph is above the red graph showing significant in-phase synchrony (positive correlations). In the lower panel **(B)** body synchrony between the clients in the same session is depicted. The green graph is below the red pseudo-synchrony graph, showing anti-phase synchrony (negative correlations).

**TABLE 5 |** The differences in the means between head and body synchrony for the three different types of dyads.

| Dyads | Client–client (A) vs. client–therapist[†] (B) | Client–client (A) vs. therapist–therapist (B) | Therapist–therapist (A) vs. client–therapist[†] (B) |
|---|---|---|---|
| Head $\beta$ | −1.516 | −7.664[*] | 6.149[*] |
| | $p = 0.248$ | $p < 0.001$ | $p < 0.001$ |
| mean A | −0.665 | −0.665 | 6.999 |
| mean B | 0.850 | 6.999 | 0.850 |
| | | | |
| Body $\beta$ | −2.106[*] | −5.883[*] | 3.778[*] |
| | $p = 0.038$ | $p < 0.001$ | $p < 0.001$ |
| mean A | −1.438 | −1.438 | 4.445 |
| mean B | 0.668 | 4.445 | 0.667 |

[*]Significant results. [†]The client–therapist dyad's effect sizes ($ES_{noabs}$) were the mean of all client–therapist dyads (female client–female therapist, female client–male therapist, male client–female therapist, male client–male therapist). Post hoc power analysis were computed for the comparisons between the dyads. The client–client and the client–therapist dyad head synchrony reached a post hoc power of 0.279 and body synchrony a post hoc power of 0.496. The comparison of the client–client and therapist–therapist dyad head synchrony reached a post hoc power of 1.000 and body synchrony a post hoc power of 0.972. The comparison between the therapist–therapist and client–therapist dyad head synchrony reached a post hoc power of 1.000 and body synchrony a post hoc power of 0.989.

For both clients, their SRS evaluations were related to the mean of all body synchronies in the sessions (female clients' $\beta = 0.467$, $p = 0.003$; male clients' $\beta = 0.449$, $p = 0.012$), but not to the mean of head synchronies (female clients' $\beta = 0.158$, $p = 0.371$; male clients' $\beta = 0.239$, $p = 0.119$). As for the therapists, the female therapists' SRS evaluations were significantly related to the mean of both body ($\beta = 0.365$, $p = 0.025$) and head ($\beta = 0.316$, $p = 0.004$) synchrony. For the male therapists, no significant relations were found between their SRS evaluations and the mean of all body ($\beta = 0.198$, $p = 0.121$) or head synchronies ($\beta = 0.136$, $p = 0.076$).

As with ORS, we wanted to investigate whether there was any difference in the alliance evaluations regarding whether one participated in or observed nonverbal synchrony. The relationships were computed for each participant using complex models.

For female clients, their SRS was significantly related to the mean of the synchronies that they observed ($\beta = 0.315$, $p = 0.046$), but not to the synchronies in which they participated ($\beta = 0.043$, $p = 0.831$). For male clients, the opposite result was found: Their SRS was significantly related to synchronies in which they participated ($\beta = 0.341$, $p = 0.027$), but not to synchronies that they observed ($\beta = 0.329$, $p = 0.066$).

For female therapists, no significant relationships were found between their SRS evaluations and the synchronies in which they participated ($\beta = 0.259$, $p = 0.291$) or observed ($\beta = 0.269$, $p = 0.051$). The male therapists' SRS evaluations were significantly related to the synchronies in which they participated ($\beta = 0.172$, $p = 0.032$) but not to the synchronies that they observed ($\beta = 0.193$, $p = 0.101$).

## Therapy Outcomes and Nonverbal Synchrony

The relation between CORE-OM and the dyadic nonverbal synchronies was calculated using data where the dyadic

male client had two significant relations, female therapist had three significant relations, and male therapist had two significant relations). The relations between the participants' evaluations of the alliance and the nonverbal synchrony patterns are illustrated in **Figure 2** and **Figure 3**.

The mean of both clients' SRS evaluations was significantly related to the mean of all body synchronies ($\beta = 0.532$, $p < 0.001$), but not to the mean of all head synchronies ($\beta = 0.284$, $p = 0.076$). The mean of both therapists' SRS was significantly related to both the mean of all head synchronies ($\beta = 0.305$, $p = 0.005$) and body synchronies ($\beta = 0.369$, $p = 0.023$).

TABLE 6 | The relations between the clients' Outcome Rating Scale (ORS) and head and body synchronies ($ES_{nobs}$).
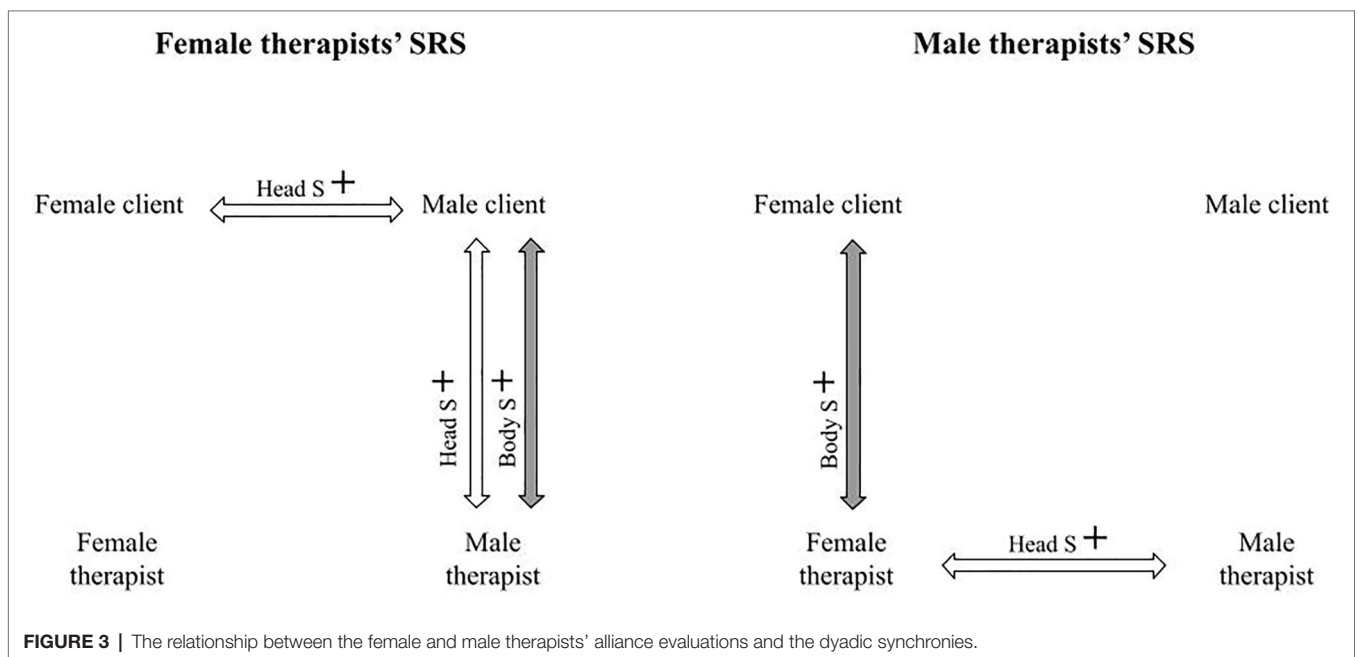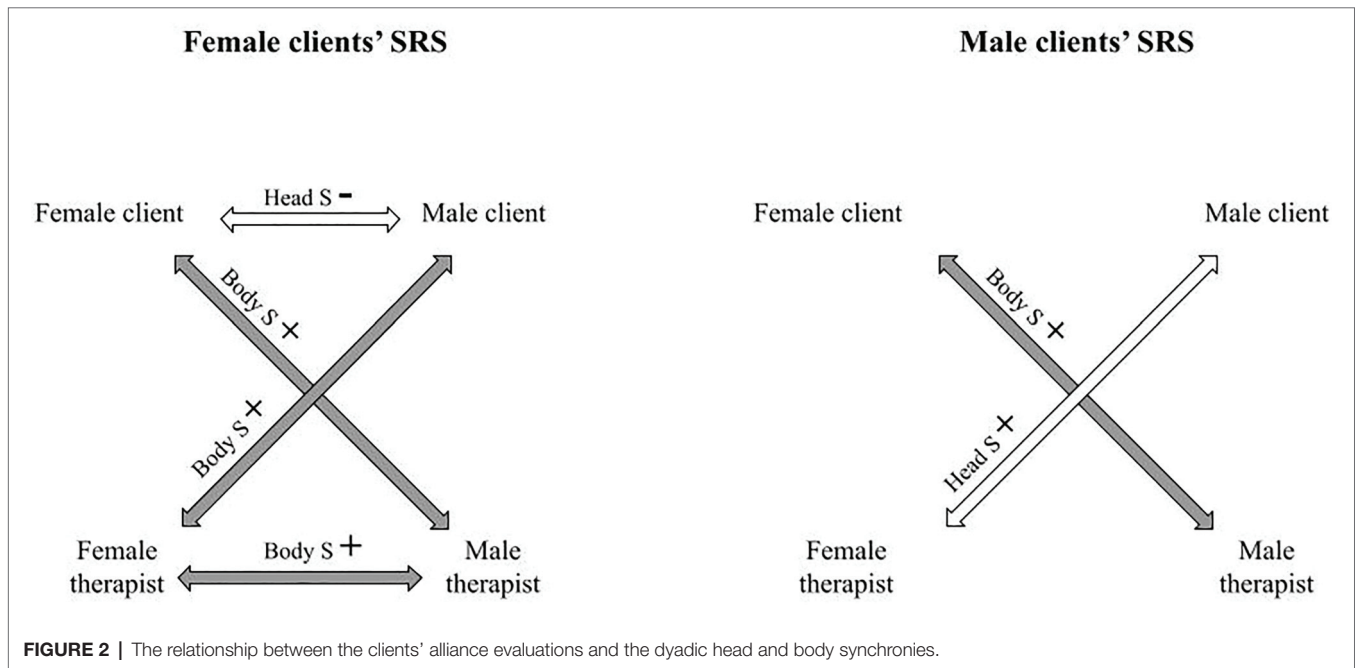
| Dyads | Client and client | | Female client and male therapist | | Female client and female therapist | | Male client and male therapist | | Male client and female therapist | | Therapist and therapist | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Head | Body | Head | Body | Head | Body | Head | Body | Head | Body | Head | Body |
| Female client ORS β (p) | −0.182 (0.554) | −0.13 (0.954) | 0.259 (0.110) | 0.517* (0.003) | 0.057 (0.790) | −0.037 (0.858) | 0.207 (0.267) | 0.072 (0.549) | 0.508* (0.006) | 0.543* (0.000) | 0.130 (0.450) | 0.234 (0.325) |
| Male client ORS β (p) | −0.125 (0.603) | −0.30 (0.877) | −0.139 (0.636) | 0.359 (0.118) | 0.461* (0.015) | 0.161 (0.373) | 0.098 (0.626) | 0.086 (0.491) | 0.418* (0.038) | 0.673* (0.000) | 0.366* (0.001) | 0.522* (0.000) |

*Significant result.

TABLE 7 | The relations between all participants' Session Rating Scale (SRS) evaluations and head and body synchronies ($ES_{nobs}$).

| Dyads | Client and client | | Female client and male therapist | | Female client and female therapist | | Male client and male therapist | | Male client and female therapist | | Therapist and therapist | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Head | Body | Head | Body | Head | Body | Head | Body | Head | Body | Head | Body |
| Female client SRS β (p) | −0.365* (0.003) | −0.134 (0.296) | −0.009 (0.954) | 0.324* (0.040) | 0.079 (0.599) | −0.182 (0.306) | 0.188 (0.257) | 0.152 (0.297) | 0.281 (0.086) | 0.514* (0.000) | 0.178 (0.323) | 0.481* (0.000) |
| Male client SRS β (p) | −0.089 (0.733) | 0.270 (0.180) | 0.157 (0.351) | 0.415* (0.007) | 0.268 (0.310) | 0.073 (0.810) | 0.244 (0.156) | 0.136 (0.456) | 0.451* (0.022) | 0.415 (0.065) | −0.057 (0.834) | 0.283 (0.168) |
| Female therapist SRS β (p) | 0.436* (0.005) | 0.077 (0.714) | −0.043 (0.725) | 0.029 (0.748) | 0.144 (0.555) | 0.283 (0.226) | 0.198* (0.038) | 0.449* (0.002) | 0.078 (0.707) | 0.342 (0.147) | 0.419 (0.062) | 0.199 (0.348) |
| Male therapist SRS β (p) | −0.078 (0.505) | −0.148 (0.380) | 0.045 (0.564) | −0.056 (0.674) | 0.225 (0.103) | 0.415* (0.013) | 0.044 (0.654) | 0.262 (0.074) | 0.013 (0.904) | 0.163 (0.354) | 0.304* (0.002) | 0.212 (0.075) |

*Significant result.

**FIGURE 2 |** The relationship between the clients' alliance evaluations and the dyadic head and body synchronies.



**FIGURE 3 |** The relationship between the female and male therapists' alliance evaluations and the dyadic synchronies.

nonverbal synchronies were case wise aggregated, i.e., calculating the mean of head synchrony and the mean of body synchrony for each dyad in each case. Spearman's rank order correlations were used. First, both client's CORE-OM change scores were correlated with all dyadic nonverbal synchrony effect sizes. The female clients' CORE-OM change scores from beginning to end were significantly related to body synchrony between the male client and female therapist $r(4) = 0.829$, $p = 0.0041$, and the female clients' CORE-OM change scores from end to 6 months were significantly related to head synchrony between the

female client and male therapist $r(4) = 1.000$. No significant relations between the male clients CORE-OM change scores and the dyadic nonverbal synchrony effect sizes were found.

Second, both clients' CORE-OM change scores were correlated with the mean of all head and body synchronies. The male clients' CORE-OM change score beginning to 6 months was significantly correlated with the mean of all head synchronies $r(4) = 0.829$, $p = 0.0042$. No other significant correlations with the mean of head or body synchrony were found.

Third, the mean of both clients' CORE-OM change scores was correlated with all dyadic head and body synchronies.

The mean of both clients' CORE-OM change score from the beginning to the end was significantly correlated with body synchrony between the male client and the female therapist $r(4) = 0.886$, $p = 0.0019$. No other significant correlations were found.

## DISCUSSION

We explored whether nonverbal synchrony occurred in couple therapy, and if it was related to the well-being of the clients, and to the therapeutic alliance and therapy outcome. Nonverbal synchrony occurred above chance level in all sessions, and usually between all dyads. Importantly, significant nonverbal synchrony occurred between all possible dyads, meaning that all participants were included in the nonverbal synchronies. Nonsignificant synchrony was rare and occurred mostly between spouses (in three sessions, all in different cases). This was consistent with expectations, since nonverbal synchrony between spouses has been related to satisfaction in the relationship (Julien et al., 2000), and spouses coming to couple therapy have sought help because of difficulties in their relationship.

It is noteworthy that almost all of the synchronies showing in-phase, where both participants' movements were positively correlated, were significant, as well as the majority of the anti-phase synchronies, where one participant moved more when the other one moved less (cf. Tschacher and Meier, 2020). Most of the few nonsignificant synchronies were anti-phase synchronies. Anti-phase synchrony could signal giving space to the other, that is, one person talking and nodding and the other listening, whereas in-phase synchrony could signal more of a mutual and more simultaneous involvement in the conversation. In our data, all head movement synchronies and almost all body movement synchronies between the co-therapists were in-phase synchrony, indicating that the therapists were moving more in unison.

Comparing the three different types of dyads (client–client, client–therapist, therapist–therapist) revealed that the co-therapists had indeed more head and body synchrony than the other kinds of dyads. Previous research on the same data also found a large amount of physiological synchrony (electrodermal activity) between co-therapists (Karvonen et al., 2016; Tourunen et al., 2020). The large amount of synchrony between the co-therapists can be interpreted as them being bodily involved similarly in the situation, in listening to the clients' problems, and in trying to help them through their professional roles.

In the couple therapy it is important to detect both in-phase and anti-phase synchrony, since as multiple participants are present it makes the movement patterns more diverse. It is for instance usual that one dyad is talking and moving more, whereas the other dyad is listening and remaining quite still. Qualitative inspection of the couple therapy videos revealed that there could be long instances where one of the participants sat quite still listening to others talking. Thus, we assessed differences between how much the participants moved. Clients moved their heads and bodies more than therapists did, which

is contrary to earlier findings in individual psychotherapy (Ramseyer and Tschacher, 2014). Female clients moved their heads more than male clients, which again replicated previous findings (Ramseyer and Tschacher, 2014). An opposite pattern was found for the therapists: male therapists moved their heads more than female therapists. Head movements were usually speech-related, that is, nodding while talking or listening, or signal turn-taking. Nods have been reported as signs of affiliation (Stivers, 2008). It would be interesting to study whether more head movements in this data were related to talking more in the session. The fact that clients moved more than therapists could be related to the couple therapy context, where the clients' lives and their relationship form the content of the session, whereas the couple therapists' main function is to be receptive, listen to the clients, and help them.

As the data originated from a research project studying the participants' autonomous nervous system responses, the participants wore autonomous nervous system equipment in some of the sessions. We wanted to know if these altered the movement patterns of the participants. No differences were found for individual movements. For nonverbal synchrony, the only difference was that there was less head movement synchrony between the therapists in the measurement sessions. All of the therapists' head synchronies were in-phase synchronies, meaning that they both moved their head more (or less) when synchrony occurred. It might be that wearing measurement equipment made the situation novel even for the therapists and made them concentrate more on their own thoughts and bodily reactions, thus affecting how they worked together but not how they nonverbally related to the clients.

## Clients' Well-Being and Nonverbal Synchrony

The clients evaluated their well-being with ORS at the beginning of each session (the recommended use of ORS; cf. Anker et al., 2010; Kuhlman et al., 2013), which makes it possible to establish how their well-being affected their participation in the nonverbal synchronies in the session. The well-being of the clients was related to the mean of all body but not head synchronies, which means that when clients felt better, there was more body movement synchrony between all participants. Bodily movements are more unspecific than head movements and can be speech-related gesturing or shifting postures. It has been suggested that body movements are more implicit than head movements, and thus could be related to the immediate situation and emotions within it (Ramseyer and Tschacher, 2014).

The well-being of the clients was not related to them participating in or observing nonverbal synchrony. Even though we were not interested in gender differences per se, gender differences were found. As the female client felt better, there was more head and body synchrony between the male client and the female therapist, and body synchrony between herself and the male therapist. The female clients' well-being has also been related to physiological synchrony between male client and female therapist (Tourunen et al., 2020). When the male client felt better at the beginning of the session, there was

more body synchrony between himself and the female therapist and more head and body synchrony between the therapists. The fact that synchrony between the therapists was related to the male clients' well-being suggests that it was as if the therapists implicitly adjusted their co-working style according to how the male client was feeling. Interestingly when the clients felt better, they were more bodily synchronized with the therapist of the opposite gender.

## Therapeutic Alliance and Nonverbal Synchrony

Nonverbal synchrony has been suggested as a marker of therapeutic alliance in individual psychotherapy (Koole and Tschacher, 2016). In couple therapy the context is more complex, and we wanted to explore the relationship between nonverbal synchrony and the therapeutic alliance. The alliance was evaluated after each session; therefore, it can be interpreted as being associated with the nonverbal synchrony patterns occurring earlier in the session. Associations were found between the nonverbal synchrony patterns and the therapeutic alliance, even in this small data set. In accordance with previous research (Ramseyer and Tschacher, 2014) we found that clients evaluated the alliance as stronger when there was more body synchrony in the session. For the therapists, both head and body synchrony were related to their evaluations of the alliance, which has not been reported before.

Interestingly, female clients evaluated the alliance to be stronger when they observed more synchrony between the other participants in the session (in contrast to taking part in synchronies themselves), whereas male clients and male therapists evaluated the alliance to be stronger when they participated in nonverbal synchronies. For female therapists, no such associations were found. It appears possible that when the female clients saw other persons synchronizing together, they implicitly felt that something important was being worked on. Research on physiological synchrony using the same data revealed that female clients also made increasingly better evaluations of the alliance when the physiological synchrony between their spouse and the male therapist increased (Tourunen et al., 2020).

A detailed examination of the relation between nonverbal synchrony and alliance revealed that for both female and male clients' alliance evaluations, synchrony between male client and female therapist, and female client and male therapist, were of importance. It is interesting that synchrony between the same dyads were relevant for clients of both genders. It seems that both clients implicitly felt the importance of all participants being included in the dyadic synchrony patterns for them to evaluate the working relationship to be of good quality. This pattern of dyadic synchrony between the opposite genders was not seen in the psychotherapists' alliance evaluations. On the contrary, both therapists evaluated the alliance to be stronger when there was more synchrony between the two participants of the same gender but opposite to themselves (the other therapist and one of the spouses). For female therapists, head and body synchrony between the male client and male therapist

were significant. For the male therapists, body synchrony between the female client and female therapist was significant. Head synchrony between the co-therapists was related to the male therapists' but not the female therapists' evaluations of the alliance. We found such a difference interesting, as it could suggest that female and male therapists implicitly concentrated on different aspects of co-working. It might not be gender related but having to do with the male therapists being more experienced family therapists than the female therapists.

For female therapists, more head synchrony between clients was related to them evaluating the alliance to be stronger. It might be that the female therapists implicitly evaluated synchrony between clients as a positive marker of their relationship as previous research has suggested (Julien et al., 2000; Sharon-David et al., 2019). But surprisingly, more head synchrony between the spouses made the female clients evaluate the alliance to be weaker. Head movement synchrony might signal active participation in the conversation, nodding together could signal agreement on the subject. Agreement, if too early in the therapy process, could create an impasse, and might make it difficult to bring forth difficult subjects concerning the relationship. Nonverbal synchrony has previously been related also to negative aspects of the relationship, such as blurring boundaries between people (Paladino et al., 2010) or negatively affecting self-regulation (Galbusera et al., 2019). It is important to recognize that nonverbal synchrony might not always serve a good purpose in couple therapy.

Even though the results have been presented by gender, it is important to keep in mind that as the data were quite small, generalizations based on the gender cannot be made. The gender was needed in the statistical computations to distinguish between the two therapists and the two clients. To summarize, the significant nonverbal patterns for the alliance differed between the therapists and clients, suggesting that they implicitly experienced different nonverbal synchrony patterns as relevant. For clients, nonverbal synchrony by dyads of the opposite gender was related to their alliance evaluations, whereas for the therapists, nonverbal synchrony by dyads of the same gender but opposite to their own were related to their evaluations of the alliance.

## Therapy Outcome and Nonverbal Synchrony

The relationship between the CORE-OM outcome measurement and nonverbal synchronies must be considered precursory, since the data set was extremely small. It is noteworthy that some of the relationships between the outcome change scores and nonverbal synchrony were similar to the relationships between the therapeutic alliance evaluations and nonverbal synchrony. For instance, for female client, changes from the beginning of therapy to the end of therapy were related to body synchrony between the male client and the female therapist, and her six-month follow-up was related to head synchrony between herself and the male therapist. These same dyads were related to her alliance evaluations. For male clients, head

synchrony among all participants was related to his outcome 6 months after the therapy ended.

## Conclusion

The study presented here is the first to study nonverbal synchrony in couple therapy. In spite of the small amount of data, nonverbal synchrony was significant between the majority of dyads, and we found significant relations between nonverbal synchrony and the clients' well-being, alliance, and therapy outcome.

One important finding was the difference between therapists and clients, concerning which dyads were related to their alliance evaluations. For clients, synchrony between dyads of the opposite gender was relevant, and that all participants were included in the nonverbal synchronies. In particular, synchrony between the male client and female therapist was related to both clients' well-being, to both clients' evaluations of the alliance, and to the therapy outcome for the clients. For therapists, other patterns were found, such as synchrony in same-gender dyads relating to their alliance evaluations. The results were reported gender-wise to distinguish between the four participants, but other unknown variables could lie behind the associations.

Our findings suggest that nonverbal synchrony is a potential marker of therapeutic alliance in couple therapy, albeit with some restrictions. The relationship between nonverbal synchrony, alliance, and outcome is more complex in a multi-actor context, where there are multiple relationships and alliances at play compared to individual psychotherapy. The couple therapy conducted in our data was not manualized, and the therapists used dialogical and system-therapeutic ways of working. The fact that there was nonverbal synchrony in all sessions and among almost all dyads is in line with earlier research that have demonstrated nonverbal synchrony during interactions and in the therapeutic context, especially in non-manualized therapies (Altmann et al., 2020). But the presence of four participants with different roles within the situation made the context more complex.

## Clinical Implications

Nonverbal synchrony can be seen as a process variable influencing the outcome of therapy (Prinz et al., 2021), as nonverbal synchrony could serve important functions in couple therapy, signalling attunement (Stel and Vonk, 2010), empathy (Finset and Ørnes, 2017), and helping to connect with others (Miles et al., 2010). Thus, nonverbal synchrony is a vital part of therapy because it enables participants to feel connected to and understood by others. But nonverbal synchrony could have other functions as well. Research on interaction (not in the context of psychotherapy) has suggested that nonverbal synchrony could serve a compensatory function, smoothing out the interaction when there is a lack of synchrony in some other aspect of the interaction (Dale et al., 2020). This corresponds to previous research reporting that verbal and nonverbal markers of alliance were not always in congruence in couple therapy (Kykyri et al., 2019).

Our results indicate that the relation between nonverbal synchrony and alliance and outcome in couple therapy is not straightforward but affects spouses and therapists (and even female and male participants) in different ways. It is crucial for the therapist to be attentive to the nonverbal synchrony patterns in the sessions since they can be related to the well-being of the clients, to therapeutic alliance, and even outcome. But conclusions cannot be made based on this study alone, more research is needed.

There is for instance some evidence from research on individual psychotherapy that a curvilinear model of nonverbal synchrony would be best, where a medium-level synchrony may offer better outcomes than low or high synchrony (Paulick et al., 2018a). Research on mother–infant synchrony has given similar suggestions. A high amount of synchrony is not always beneficial for the developing child, but it might lead to a more insecure attachment (Beebe and Steele, 2013). On the other hand, persons with secure attachments have a tendency to synchronize less to others (Feniger-Schaal et al., 2016). Intimate relationships and crises within them bring forth the individual's attachment style, and manifest in couple therapy. More research is needed in the couple therapy context to be able to discover if these findings apply to couple therapy as well.

The result that synchrony of head movements between the spouses was negatively related to the female clients' alliance evaluations suggests that nonverbal synchrony might not always serve a good purpose in couple therapy. Previous research has also hinted that it is equally important to be able to withdraw from synchronizing with others in some situations. For clients, not synchronizing with others might help in the self-regulation of affect (Galbusera et al., 2019). For therapists synchronizing with the client might in some situations reinforce the client's negative behaviors (Bänninger-Huber and Widmer, 1999; Lutz et al., 2020). Mayo and Gordon (2020) suggested that it is important to study moving in and out of synchrony, since there are always two forces working simultaneously: adjusting and synchronizing to others as well as withdrawing from synchrony and acting independently.

## Limitations and Suggestions for Future Research

The dyadic nonverbal synchrony data were based on 29 sessions, and it comprised data from only 11 couple therapy cases, thus generalizations cannot be made. Because of the limited number of cases, we obtained nonverbal synchrony from the entire therapy sessions, something that is not common. Nevertheless, the results from this study should be regarded as exploratory. The presence of four participants resulted in six different dyads that could synchronize in either head or body movements. Dyadic synchrony is the most common form of nonverbal synchrony studied in psychotherapy settings. Couple therapy with four participants would provide a good context for studying triadic and quadratic synchrony, which was not done in the study presented here. In the future, the procedure of calculating triadic synchrony (Dale et al., 2020) or the multivariate synchrony approach (Galbusera

et al., 2019; Meier and Tschacher, 2021) could be used. It would be interesting to find out the extent to which triadic or generally multivariate synchrony occurs in couple therapy.

Another shortcoming of the study presented here is that it was not possible to use multilevel modeling because of the small amount of data within clusters. The statistical methods chosen were the best option for overcoming this difficulty.

The use of self-report measures for the evaluation of subjective well-being, the therapeutic alliance, and outcome can be criticized. In particular, the ultra-brief forms of ORS and SRS could be criticized for not giving a detailed enough account of the evaluations. For instance, the alliance was evaluated holistically by the participants, meaning that both spouses evaluated the therapists as a team, and the therapists evaluated the alliance to both spouses simultaneously. However, the use of ultra-brief forms is clinically sound, since filling out the forms is convenient, even in a standard therapy setting. The large amount of missing data in the CORE-OM form was unfortunate, and the results should be read with caution.

In the future, research with a larger dataset is needed to confirm the results. It would also be interesting to study what variables affect nonverbal synchrony in the couple therapy context. For example, does the content of the discussion affect the synchrony patterns? What variables induce in-phase or anti-phase synchrony? Do the synchrony patterns reveal the participants' views or attitudes towards the topic spoken of? Does nonverbal synchrony signal like-mindedness or empathy in the couple therapy context? It would also be interesting to further elaborate on the relationship between nonverbal synchrony and alliance based on the In-sync model (Koole and Tschacher, 2016). An alliance measure that would be better suited to the couple therapy context would be beneficial to help study the relationship between systemic alliances and nonverbal synchronies. Could nonverbal synchrony be used to study alliance ruptures, as Friedman (2020) suggested? We suggest that more research on nonverbal synchrony in couple therapy is needed, since nonverbal synchrony could be used as a marker of therapeutic alliance and could be seen as reflecting the clients' well-being.

## DATA AVAILABILITY STATEMENT

The datasets presented in this article are not readily available because the data is confidential psychotherapy data from 11 couple therapy cases, with data organized by gender. Even though the data is anonymized, because of the small $N$, we are not comfortable with sharing it openly. Requests to access the datasets should be directed to PN-S, petra.nyman-salonen@jyu.fi.

## ETHICS STATEMENT

The studies involving human participants were reviewed and approved by University of Jyväskylä Ethical Committee. The patients/participants provided their written informed consent to participate in this study.

## AUTHOR CONTRIBUTIONS

PN-S: first authorship. V-LK: senior authorship, research design, and collecting of the data. WT: senior authorship and synchrony computation. JM: statistical methods. AT: research design and collecting of the data. MP: research design and collecting of the data. JS: last authorship, research design, and collecting of the data. All authors contributed to the article and approved the submitted version.

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