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EMPIRICAL PAPER

Facilitating dyadic synchrony in psychotherapy sessions: Systematic review and meta-analysis

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Abstract
Objective: This paper highlights the facilitation of dyadic synchrony as a core psychotherapist skill that occurs at the non-verbal level and underlies many other therapeutic methods. We define dyadic synchrony, differentiate it from similar constructs, and provide an excerpt illustrating dyadic synchrony in a psychotherapy session.
Method: We then present a systematic review of 17 studies that have examined the associations between dyadic synchrony and psychotherapy outcomes. We also conduct a meta-analysis of 8 studies that examined whether there is more synchrony between clients and therapists than would be expected by chance.
Results: Weighted box score analysis revealed that the overall association of synchrony and proximal as well as distal outcomes was neutral to mildly positive. The results of the meta-analysis indicated that real client-therapist dyad pairs exhibited synchronized behavioral patterns to a much greater extent than a sample of randomly paired people who did not actually speak.
Conclusion: Our discussion revolves around how synchrony can be facilitated in a beneficial way, as well as situations in which it may not be beneficial. We conclude with training implications and therapeutic practices.

Keywords: synchrony; dyadic processes; therapist skills; process outcome research; coregulation; psychotherapy method; psychotherapy outcome; meta-analysis

Clinical or methodological significance of this article: In this paper, synchrony between clients and therapists is discussed as a core therapist skill that occurs at the non-verbal level. The meta-analysis and systematic review presented here indicates that while synchrony generally leads to positive treatment outcomes across different modalities, further research is required to determine when synchrony is beneficial and when it is not. The findings underscore the value of therapists being attentive to non-verbal cues and moving flexibly in and out of synchrony.

Psychotherapy is more than a verbal practice, since much of a therapist's skill set is also non-verbal. Clients do not only communicate their internal states verbally, but also through facial expressions, vocal tones, and body movements. Therapists' ability to identify and express non-verbal communication, their sensitivity to slight changes in the clients' emotions, their awareness of their own bodily sensations and expressions, and the ability to regulate affect together with the client are all crucial clinical skills that underlie many verbal therapeutic methods. The core of these abilities is the facilitation of *dyadic synchrony*, the alignment in time of the physiology and behavior of interacting individuals (Delaherche et al., 2012).

When people interact, they tend to spontaneously coordinate their behavior and physiology over time

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(Feldman, 2012). For example, when people are engaged in a naturally flowing conversation, their vocal tones tend to become aligned, and their bodies tend to start moving in the same cadence (Delaherche et al., 2012). Synchrony appears to play a central role in building rapport between individuals, coregulating emotional states, improving social learning and predicting the responses of others in social interactions (Feldman, 2021; Hoehl et al., 2021). Synchrony is thought to be an ancient survival mechanism that elicits coordinated actions between individuals (Feldman, 2012). Human infants are dependent on their caregivers to regulate their physiology and behavior, so their survival depends on social bonds (Feldman, 2021). Face-to-face synchronous interactions between infants and caregivers based on familiarity, matching, and attunement accelerate the maturation of infants' relational skills and provide essential environmental input for the development of self-regulation capabilities (Feldman, 2021). Through dyadic synchrony, children learn social skills that help them thrive in their community (Delaherche et al., 2012). By being synchronous, children enhance their ability to anticipate the reactions of others, which can be advantageous in numerous social interactions (Hoehl et al., 2021). Individuals gradually develop more productive self-regulation abilities and better communication skills, which lead to enhanced well-being (Schore & Schore, 2014). Nevertheless, adult physiology and behavior are continuously open to regulation and communication with others through dyadic synchrony (Feldman, 2012). Many studies have demonstrated the beneficial outcome of synchrony in diverse close relationships (Butler, 2015). It is important to note that despite the well-documented benefits of synchrony and the fact that synchrony is more likely to occur in response to positive interactions than neutral or negative interactions (Hoehl et al., 2021), synchrony in and of itself is not always beneficial, particularly when individuals amplify or escalate ineffective regulatory processes in each other (Butler, 2015). Furthermore, although synchrony is a dyadic process that often arises spontaneously when two people interact, there is growing acknowledgment that individuals differ in their ability to synchronize (Gamliel et al., 2021), and that synchrony is a skill that can be enhanced, particularly when people become aware of the circumstances in which synchrony can be beneficial (Hoehl et al., 2021). This skill is critical to the therapist's work in psychotherapy.

Many psychotherapy theories highlight the importance of synchrony between clients and therapists (e.g., Aron & Harris, 2014; Fosha, 2001; Winnicott, 1971). According to these theories, psychotherapy seeks to provide clients whose development lacked early synchrony with an emotionally attuned other a corrective emotional experience that replicates more optimal development (Fosha, 2001). Through their synchronous interactions, the client-therapist bonds deepen, and the clients' ability to further explore and process their emotions grows. The opportunity to experience one's feelings with an authentic and emotionally present other who is more experienced in managing intense emotions may help clients develop more productive emotional regulation capabilities. Clients can expand their emotional regulation capacities by drawing on the combined resources of the dyad, which are eventually internalized. When client and therapist synchronize their physiology and dynamically tune their behavior to one another, they are more likely to achieve a better therapeutic relationship, which can promote the client's adaptive emotion regulation, and better therapeutic outcomes.

In this paper, the facilitation of dyadic synchrony is discussed as a core therapist skill. We define dyadic synchrony, differentiate it from similar constructs, and provide a clinical example. We systematically review the literature on the ways in which different forms of dyadic synchrony are assessed and their associations with psychotherapy outcomes. We then provide a meta-analysis that depicts the differences between synchrony and pseudo-synchrony in psychotherapy studies. We also describe situations in which synchrony may not be beneficial. Finally, we present training implications and therapeutic practices based on research evidence.

Definitions and Clinical Description

Numerous terms have been used to describe interdependence in dyadic processes (e.g., synchrony, congruence, convergence, mimicry, coordination, matching, reciprocity). This may blur important distinctions and make these dyadic processes difficult to apprehend. We define therapist facilitation of *dyadic synchrony* in psychotherapy as the therapist's ability to become aligned with the client's behavioral and physiological dynamics as they temporally change within sessions.

One important feature of this definition is therapists' ability to *become* coordinated with their clients' non-verbal cues. Synchrony exists on a continuum, ranging from intuitive synchrony that occurs spontaneously when therapists and clients are affected by each other's presence, to more deliberate synchrony that may occur when therapists become increasingly aware of nonverbal signals in both the clients' and their own behavior. Facilitating dyadic

synchrony requires therapists to navigate this continuum by allowing themselves to spontaneously synchronize with the moment-to-moment rhythmic structures of their clients' nonverbal behavior, while also deliberately identifying the intensity and direction of their clients' affective charge and modifying their own behavior accordingly. Skillful navigation of this spectrum may involve leading or following the client's emotional states, depending on what is most beneficial for the client at that particular moment.

The second feature is the therapist's ability to be sensitive to the *temporal qualities* of the client's behavioral and physiological cues as they change over time. Unlike congruence or matching, which refer to the correspondence between dyad members in a more static state, synchrony is a dynamic phenomenon that is more accurately described as continuous interpersonal coordination (Wiltshire et al., 2020). Therapists' coordination with their clients may occur at various times spans, from milliseconds through the session level, to the treatment level. Here, we focus on the time-intensive dynamic covariation of the client's and the therapist's physiology and behavior within sessions. For each behavior or physiological index measured for one member of the dyad, there is a limited window of time for the other member to produce a coordinated response. For example, synchrony can be estimated as the extent to which client's and therapist's moment-to-moment physiology or vocal tone rise and fall in unison, within a session. By contrast, if there is an association between client's and therapist's emotions as self-reported by each at the end of a therapy session, this would be viewed as congruence.

The third feature is that the coordination between the dyad's signals must be non-random. Since many intrapersonal affective measures have an oscillatory pattern, this may produce an auto-correlation within the signal, which can lead to spurious interpersonal correlations (Dean & Dunsmuir, 2016). There may be a correlation in a behavior over time because simply being in a conversation creates certain conditions that are common to both members of the dyad but cannot be ascribed to some underlying process of mutual influence. To rule out the possibility of an association occurring by chance, researchers have suggested comparing synchrony to *pseudo-synchrony*. Pseudosynchrony is typically estimated by comparing synchrony in shuffled pairs (e.g., by randomly matching audio from two people who did not actually speak) to genuine interactions to estimate the strength of synchrony (Ramseyer & Tschacher, 2010).

Finally, synchrony is a complex phenomenon, thus making it important to define its association with related concepts such as coregulation and convergence. Synchrony is a more general term that refers to any concurrent association between two parties over time, and can include attunement, coregulation, and dampening, but also mutual escalation or amplification. *Coregulation* refers to time-lagged associations in which the emotional arousal of one member of the dyad at one time point influences the emotional arousal of the other member of the dyad at the next time point, in a way that leads to a stable state (Butler & Randall, 2013). *Convergence* is the gradual minimization of differences between conversational partners over time (Delaherche et al., 2012). These processes are not fully independent and can become interconnected (Butler, 2015). For example, the client's and therapist's vocal arousal may rise and fall in unison (synchrony), while at the same time the therapist is drawing the client down into a more stable arousal level (coregulation). It is also possible that over time and repeated experience, synchronous interactions between this therapeutic dyad can result in greater dyadic similarity (convergence).

Although synchrony tends to occur when two people interact, the therapist can take steps to make synchrony beneficial for the client. Humans tend to dynamically move in and out of synchrony (Mayo & Gordon, 2020). Theories suggest that this pattern is more adequate than either too many or too few levels of synchrony (Feldman, 2007). The personal and situational context in which synchrony occurs is also crucial to understanding when synchrony leads to positive outcomes and when it does not (Shamay-Tsoory et al., 2019). For example, synchronizing with depressed clients who tend to experience blunted emotions may not be beneficial. Here, therapists may need to maintain a delicate balance between synchrony and upregulation of adaptive emotions. Similarly, if therapists become highly synchronized with clients who experience intense anxiety, this may lead to escalating negative emotionality. In these situations, therapists may need to down-regulate their own affect in response to the clients' affect. Thus, effective synchrony may depend on the therapists' ability to be attuned to their clients and to dynamically move towards and away from the clients' physiology and behavior, while regulating their own affective states.

Figure 1 presents the dyadic signals extracted from 15 minutes of a successful psychotherapy session, taken from a good outcome case (for more details, see Atzil-Slonim et al., 2022). Four types of signals are presented: Electrodermal Activity (EDA; panel A), Respiratory Sinus Arrhythmia (RSA; panel B), the affective valence extracted from facial expression (panel C), and the affective arousal extracted from

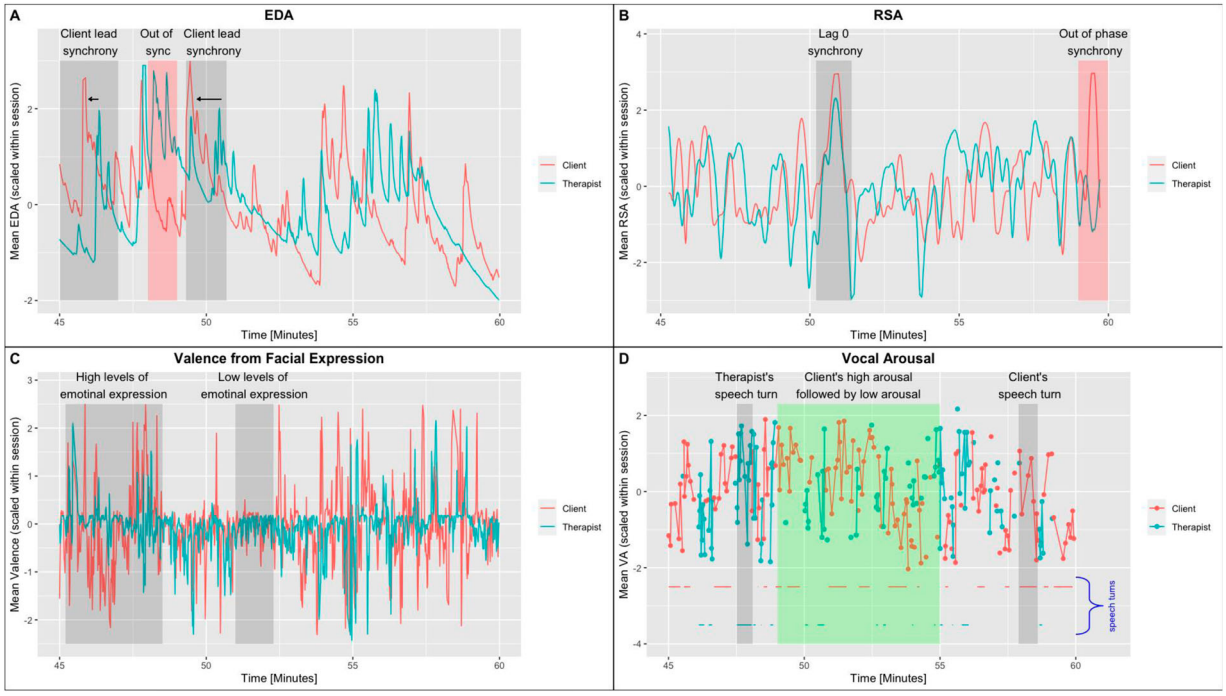

Figure 1. Illustration of dyadic synchrony in different modalities during a successful session. Notes: Illustration of dyadic signals extracted from 15 minutes of a successful psychotherapy session. Four types of signals are presented: the Electrodermal Activity (EDA; panel A), the Respiratory Sinus Arrhythmia (RSA; panel B), the affective valence extracted from facial expression (panel C), and the affective arousal extracted from vocal features (panel D).

vocal features (panel D). The physiological channels (Panels A and B) indicate that the dyad had moments of relative synchrony; however, these moments also present a time lag between signals, indicating the therapist's effort to emotionally attune to the client, and the dyad's dynamic movement in-and-out of synchrony. The facial expression channel (Panel C) shows that the session began with the client's negative emotional expressions that were met with relatively neutral affect by the therapist. Subsequently, the client expressed more positive emotions that were met with stronger positive expressions by the therapist. The vocal arousal channel (Panel D) shows that when the client experienced high arousal, the therapist had lower arousal, a dynamic which could be evidence of a pattern of coregulation. Overall, Figure 1 demonstrates how the therapist skillfully worked in sync with the client in four different non-verbal channels at the same time.

Assessment

Dyadic synchrony is typically assessed by calculating the association or interdependence between the clients' and the therapists' signals in different modalities (e.g., body movement, voice, physiology, facial expression and text) over time. Palumbo et al. (2017) identified several key parameters when assessing synchrony. *Direction* indicates whether the therapist's signal precedes or predicts the client's signal or vice-versa. For example, when therapists follow their clients' tone of voice, this may reflect their attunement to the client, and when therapists' tone of voice predicts their clients' tone, this may reflect coregulation, i.e., "pulling" the client into a more adaptive arousal level. *Sign* refers to whether the correlation is positive or negative. Positive, or "in phase" synchrony indicates that the dyad's signals are moving in the same direction, whereas negative or "out of phase" synchrony indicates that they are moving away from each other. Successful coordination may require therapists to dynamically move toward and away from their clients (Mayo & Gordon, 2020). *Magnitude* refers to the strength of the association between the dyad members' signals. Successful coordination may require the therapist to facilitate the right level of synchrony.

To assess how therapists facilitate dyadic synchrony, the clients' characteristics as well as the situational context need to be considered as possible moderators between synchrony and outcome (Ramseyer, 2020). Furthermore, it is possible that facilitating synchrony in some modalities is more important than in other modalities. Below we describe how synchrony is typically assessed in different modalities

and how researchers examine the associations between synchrony and immediate within-session as well as distal, end of treatment outcomes.

Behavioral measures. Several behavioral measures are typically used. Body movement, in particular Motion Energy Analysis (MEA; e.g., Altmann et al., 2020) assesses nonverbal synchrony based on body movements using video recordings. Motion energy is defined as the difference in gray-scale pixels between consecutive video frames (Ramseyer & Tschacher, 2011). Synchrony can be quantified by the cross-correlation or cross-lagged correlation between two people's Fisher's Z transformed motion energy values (see Schoenherr, Paulick, Strauss, et al., 2019, for 10 MEA-based synchrony metrics).

Speakers' vocal pitch has also been shown to be associated with their emotional states (Hammerschmidt & Jürgens, 2007), and is commonly measured as the correlation of two people's mean fundamental frequency (mean f_0—the lowest voice frequency a speaker can produce) over time, which indicates co-fluctuation of emotional states (e.g., Bryan et al., 2018).

Researchers have also quantified emotional facial expression synchrony between clients and therapists (Altmann et al., 2021). Novel technologies such the FaceReader (Lewinski et al., 2014) and OpenFace (Baltrušaitis et al., 2016) allow for automatic emotion recognition.

Physiological measures. Skin conductance (SC) or electrodermal activity (EDA) is considered an indicator of sympathetic responses and affect (Lidberg & Gunnar Wallin, 1981). Sympathetic responses lead to the innervation of sweat glands, which causes a change in SC. Synchrony of EDA suggests a simultaneous change in two people's affects that can be quantified as the correlation of two people's EDA (Robinson et al., 1982). It can also be represented by the concordance index (Marci et al., 2007), calculated as the log odds of the overall positive over negative correlations of two people's EDA change rates. Metrics used in MEA can also be applied to EDA time-series data, such as windowed cross-lagged correlation (Bar-Kalifa et al., 2019; Prinz et al., 2022).

Respiratory rate and heart rate are influenced by the autonomic nervous system and may also be indicators of sympathetic responses and affect (Tschacher & Meier, 2020). Heart rate variability or electrocardiograms can also be tracked. In the only study that assessed the feasibility of using these indicators (Tschacher & Meier, 2020), the concordance index and the windowed cross-lagged correlation were applied to each time series to quantify synchrony.

Respiratory Sinus Arrhythmia (RSA) reflects the extent to which successive heartbeats vary within the breathing frequency band (Berntson et al., 1997). RSA is a common index of cardiac vagal control because it is linked to the extent to which the myelinated vagal nerve modulates cardiac activity (Porges, 2003), thus making RSA a well-established biomarker of the parasympathetic nervous system. Ample research has documented the association between RSA and favorable emotional regulatory processes (for a review, see Balzarotti et al., 2017). To the best of our knowledge, client-therapist RSA synchrony has yet to be examined.

Verbal measures. Verbally-based measures focus on the conversations between clients and therapists. Therapists' linguistic synchrony with their clients may reflect their ability to attune to their clients' idiosyncratic language (Shapira et al., 2022). One way to assess linguistic synchrony is Language Style Matching (LSM; Lord et al., 2015); i.e., the extent to which two people produce similar rates of syntactically important function words such as articles and pronouns which are known to be associated with speakers' social-psychological states (Chung & Pennebaker, 2007). The match between two people's rates of using function words is considered to indicate synchrony (Aafjes-van Doorn et al., 2020).

Overall, measures of synchrony vary considerably in terms of modality and the algorithms needed to calculate synchrony. Even within the same modality (e.g., MEA), changing the parameter settings and algorithms can alter the results drastically (Schoenherr, Paulick, Worrack, et al., 2019). Whereas dyadic synchrony is typically measured by assessing the interdependence or association between the dyas's signals, to assess whether therapists facilitate dyadic synchrony in a beneficial way several additional parameters (such as the direction, sign and magnitude of synchrony), as well as possible moderators (such as trait-like and state-like characteristics and the modality of synchrony) should be considered. Many studies have demonstrated that synchrony occurs above chance level by comparing pseudo-synchrony to real synchrony (Ramseyer & Tschacher, 2010). Numerous studies take the multilevel structure of the data (sessions nested within clients nested within therapists) into account to examine the associations between synchrony, session-level, and treatment-level outcome (e.g., Printz et al., 2021).

Clinical Example

The following clinical illustration was taken from a study of clients in short-term psychodynamic psychotherapy (Atzil-Slonim et al., 2022). This study

was approved by the local institutional review board, and all clients signed an informed consent form (IRB # AS/ 01507 /2019). This successful psychotherapy session was taken from case with a good outcome (for more details, see Atzil-Slonim et al., 2022). The session was rated by clinical judges as evidencing high behavioral synchrony according to the Coding Interactive Behavior Manual (CIB; Feldman, 1998). The CIB is a well-validated rating system for dyadic interactions (Feldman, 2012, 2021). Coding was conducted by three trained coders (as part of a larger study with multiple sessions). Inter-rater reliability was computed for 20% of the interactions and reliability was > 87% on all codes (Intra Class $r = 0.88–0.96$). The dyadic scales of the CIB addressed reciprocity, goodness of fit, fluency of the interaction, constriction and tension. Each scale was coded on a Likert scale from 1 (minimal expression of the target behavior during the session) to 5 (maximal expression of the target behavior during the session) after which the scales were averaged (while reverse coding the negative scales) to create the final dyadic synchrony score.

The client, a woman in her 40s, was diagnosed with Major Depressive Disorder (her identity is masked). Her primary distress was related to her relationship with her husband; she felt that she could not share her experiences with him.

The moment the therapist opened the door and looked at the client's facial expression, she realized that the client was extremely upset. They both sat and stared at each other. Even before words were uttered, the therapist (T) felt tension in her own body. The therapist's tone of voice was a little high and trembling when she asked the client how she felt. The client (C) began to answer in a hushed tone suggesting she was nervous and not quite comfortable.

C: My nephew has been diagnosed with a medical condition. His mother told me.
T: Can you say more about what you found out?
C: Yes. He is a great guy, just about to start college. I don't know what will happen now. It made me wonder if I also have this condition, maybe my kids. It may be genetic.
T: You say you are afraid. Can you elaborate?

The client's non-verbal behavior indicates high arousal. Her vocal pitch is high and she is restless. The therapist seems curious about the client's experience. In contrast to the client, the therapist's vocal tone and non-verbal behavior indicates calm.

C: What do you mean? Of course I'm afraid, wouldn't you be? This is a serious condition. I tried to talk with my husband about it, but you know what it's like talking to him, he can say things that may sound like he is listening but I know he is not.

The client is expressing her frustration that the therapist is not in sync with her. Her expression indicates anger, she turns away from the therapist.

T: You feel that I didn't really listen to you …

The therapist's arousal increases and her vocal tone becomes higher. The client crosses her legs, and leans to the right. Without either noticing, the therapist also crosses her legs and leans in the same direction. Synchrony is high at that point, but includes high levels of negative emotions.

[50 seconds of silence]

T: I realize now how stressful this experience may be for you. It is so scary what might happen to your nephew, and that it might affect you and your children. It is so frustrating that you are sharing this stressful experience and you feel like nobody really cares.

The therapist gradually down-regulates her own emotions. Her vocal arousal decreases from sentence to sentence. She leans back, while maintaining good eye contact with the client.

C: I'm so worried about him and about us …

The client is in tears; her voice is quiet.

T: You look sad
C: (crying quietly) I am so sad … he is so young …
T: It is so sad

Both the client's and the therapist's facial expressions are very sad. The client is crying. The situation reflects high intimacy and high synchrony.

This vignette illustrates how the therapist worked skillfully to synchronize with the client where the goal was to coregulate stressful and overwhelming emotions. The therapist was aware of the client's non-verbal behavior from the beginning and noticed that the client was upset. The non-verbal synchrony increased, but in a way that reflected an escalation of stressful emotions. The therapist tracked this escalation and down-regulated the distress by modulating her own emotional state. The client followed and her arousal level returned to a more homoeostatic level. Then, after a short silence, the therapist noticed the tears in her client's eyes and synchronously her facial expression became sad. She up-regulated the grief and emotional pain and shared these emotions with her client. The high non-verbal synchrony that was evident at that point seemed to allow the client to express her

emotions and to feel less alone in her painful experience.

Previous Reviews

Koole and Tschacher (2016) were the first to review the literature on synchrony in psychotherapy. They noted that, while there is a growing body of literature examining the existence of synchrony in psychotherapy, the ways in which synchrony leads to beneficial treatment outcome remain unclear. To the best of our knowledge, the only previous systematic review of this literature was conducted by Wiltshire et al. (2020). They reviewed 15 published studies in English that assessed the correlations between client-therapist coordination in different modalities (e.g., body movements, voice and physiology) and treatment outcome (e.g., symptomatology and drop-outs) in samples ranging from 2 to 101 dyads (M = 36 dyads). A variety of disorders were investigated in the studies. Most studies reported that stronger coordination was associated with better end-of-treatment outcomes, such as goal attainment. Movement coordination was the most highly associated with distal outcomes. Studies on vocal measures were mixed. One study found that vocal coordination was associated with better treatment outcomes (Rocco et al., 2017), whereas another indicated that vocal coordination was associated with an increase in clients' symptoms (Reich et al., 2014).

Research Review

Researchers have primarily examined the existence of dyadic synchrony and its association with treatment outcomes. Very few studies include other parameters of synchrony (such as direction, pattern and magnitude) or the ways in which therapists facilitate synchrony. Here, we conducted a systematic review of studies that examined synchrony between clients and therapists in different modalities (e.g., movement, voice, physiology and linguistic) and its association with proximal (in-session) or distal (treatment-end) outcome in psychotherapy. In addition, we conducted a meta-analysis on studies that compares synchrony to pseudo-synchrony in psychotherapy, to estimate the strength of synchrony in psychotherapy.

Method

Literature search and retrieval. Three doctoral students conducted a literature search according to PRISMA guidelines for meta-analyses (Moher et al., 2010; see Figure S2 in the supplemental material) in the following databases: PubMed, Academic Search Ultimate, PsycInfo, PsycArticle, Psychology and Behavioral Sciences Collection, Social Work Abstracts, and Health and Psychosocial Instruments. They used the search terms ("synchrony" AND "psychotherapy" OR "therapy" OR "counseling"; "mutual influence" AND "psychotherapy" OR "therapy" OR "counseling"; "coregulation" AND "psychotherapy" OR "therapy" OR "counseling"; "communication accommodation" AND "psychotherapy" OR "therapy" OR "counseling"). The initial search yielded 5802 articles. After removing duplicates (n = 430) and titles that were not related to psychotherapy (n = 4777), 595 articles remained. After implementing the inclusion and exclusion criteria, as described below, the results of the searches were merged and the abstracts were obtained and reviewed independently, and then each full-text was jointly evaluated by the three raters.

Eligibility criteria. Studies were eligible if they examined adult individual psychotherapy dyads with real clients (i.e., not standardized patients or hired actors). Hence, articles on couple therapy, group therapy, inpatient treatment, and child and adolescent treatment were excluded (N = 443). Reviews, meta-analyses, and dissertations were excluded. We limited the articles to those written in English, journal articles, and books. We included studies that measured correlations between independent characteristics of two dyad members engaging in psychotherapy, and where synchrony was defined as a within session phenomenon.

The remaining 152 articles were then examined for their inclusion of synchrony in the title or after examining the abstract. We included articles where the client and therapist were independently assessed for their internal state and not their partner's experience. We excluded studies that examined the correlation between two independent raters on presumably the same underlying phenomenon, such as the assessment of the correlation of client-rated and therapist-rated alliances. Studies that rated session-level observations, as opposed to within-session observations, were also excluded.

For the systematic review, we further excluded studies that only assessed process variables (Bar-Kalifa et al., 2019; Bryan et al., 2018; Cohen et al., 2021; Deres-Cohen et al., 2021; Gaume et al., 2019; Marci et al., 2007; Ramseyer et al., 2020; Ramseyer & Tschacher, 2010; Robinson et al., 1982; Rocco et al., 2018; Soma et al., 2020; Wieder & Wiltshire, 2020) and one study that assessed coregulation (Paz et al., 2021). A total of 135 studies were excluded.

For the meta-analysis, we further excluded articles where the data had been utilized in a previous study (Bar-Sella et al., 2022; Cohen et al., 2021; Lutz et al., 2020; Ramseyer & Tschacher, 2014; Schoenherr, Strauss, Paulick, et al., 2021). Studies that did not include a direct comparison of synchrony and pseudo-synchrony were excluded from meta-analysis but included in the review (Aafjes-van Doorn et al., 2020; Altmann et al., 2020; Reich et al., 2014) as were studies that did not report the pseudo-synchrony estimate (Schoenherr, Paulick, Strauss, et al., 2019). Single-case studies were excluded (Andreas et al., 2023; Ramseyer & Tschacher, 2006) from the meta-analysis but included in the systematic review. A total of 144 studies were excluded. The final database was composed of 17 studies for the systematic review, and eight for the meta-analysis (Tables I and II). The 17 studies covered 792 clients and 285 psychotherapists; the eight studies included 558 clients and 174 therapists in total. One study in the meta-analysis did not report therapist sample size (Ramseyer, 2020) and was not counted in the total therapist sample size.

Systematic Review

We review the relationship between dyadic synchrony and a number of distal and proximal outcomes. We could not synthesize the results into a full meta-analysis because some studies did not report effect sizes. Instead, we used box score analyses to aggregate the effect of synchrony across all studies (following the procedure of Hill et al., 2023).

A weighted box score analysis was conducted for proximal and distal outcomes separately as follows. Each outcome finding was evaluated. If there was a positive effect (e.g., lower symptom, higher efficacy, better relationship quality), the outcome was assigned a box score of +1; if there was a negative effect, the outcome was assigned −1; if there was no effect, or the effect did not reach significance, it was assigned 0. For a study with multiple outcome findings, we averaged the box scores of the findings to represent the box score of that study. We calculated the overall effect by averaging the box scores across studies, weighted by the sample size of each study. Moderators were not included in the box score analysis.

Because one therapist often had multiple clients but not vice-versa, we used client sample size as the sample size of a study. For example, if a study with a box score of +1 had 40 clients, and another study with a box score of −1 had 60 clients, the overall effect is $\frac{(+1)\times 40+(-1)\times 60}{40+60}=-.2$. An overall score between −1 to −.5 represents a negative overall effect, i.e., higher synchrony is associated with worse outcomes whereas an overall score between −.49 to +.49 is considered neutral, and between .5–1 to be positive.

In some studies, the results of individual measures and the combined results were reported. In this case, only individual measures were considered in the box score analysis. If only the combined results were reported, they were used in the box score analysis. In cases where the same hypothesis was estimated on the same measures, but with several different methods, the findings were first averaged across methods within this hypothesis, and then averaged with other findings in the same study.

Synchrony and proximal treatment outcomes. Eight studies examined the association between synchrony and session-level outcomes, involving 323 clients and 118 therapists (Table I). Most studies used MEA as the measure of synchrony and used the Bern Post-Session Report (BPSR) or Symptom Checklist K-9 (SCL-K-9) as the outcome measure. The associations were assessed either in the same session or one session apart. Weighted box score analysis revealed that the overall association of synchrony and proximal outcomes was neutral to mildly positive, *weighted box score* = .257.

Movement Synchrony. Findings from the six MEA studies were mixed, which involved 259 clients and 111 therapists. The weighted box score was .214, showing a neutral to mildly positive association of movement synchrony and proximal outcomes. Four studies reported positive associations between body synchrony and outcomes, such as lower symptom levels (Andreas et al., 2023; Ramseyer, 2020) and higher self-efficacy (Ramseyer & Tschacher, 2011, 2014). Body synchrony was not associated with client-rated wellbeing (Ramseyer & Tschacher, 2006). A negative association was found with therapist-rated progress (Ramseyer, 2020), while another study could not replicate this finding (Ramseyer & Tschacher, 2006). Two studies reported non-significant associations between synchrony and symptoms in the next session (Prinz et al., 2021; Ramseyer, 2020), although Ramseyer (2020) noted marginal significance.

Moderators were assessed in some studies. Andreas et al. (2023) found that the association between synchrony and symptom was only significant in a telehealth setting but not in an in-person setting. Ramseyer and Tschacher (2014) found that the association between synchrony and client self-efficacy only appeared with body synchrony but not head synchrony.

Table I. Empirical studies on synchrony and proximal outcomes: basic information and settings ($N = 8$).

Study	Year	Client N	Therapist *N*	Synchrony Type	Outcome Measures	Method of Analysis	Time Resolution
Andreas et al.	2021	1	1	Body movement (MEA)	SCL-K-9	*Synchrony*: WCLC *Outcome*: Pearson's *r*	*Window size*: 10 seconds, *Max time lag*: ± 5 seconds
Prinz et al.	2021	175	57	Body movement (MEA)	HSCL	*Synchrony*: WCLC (peak) *Outcome*: Multilevel model	*Window size*: 5 seconds, *Max time lag:* ± 5 seconds, *Step size*: 1 second
Prinz et al.	2022	60	6	Skin conductance	ORS	*Synchrony*: WCLC (peak) *Outcome*: Multilevel model	*Window size*: 2 minutes, *Max time lag*: ± 10 seconds
Ramseyer & Tschacher	2011	70	42	Body movement (MEA)	BPSR	*Synchrony:* WCLC *Outcome*: Multilevel model, Pearson's *r*	*Window size:* 1 minute, *Max time lag:* ± 5 seconds, *Step size*: 0.1 second
Ramseyer & Tschacher	2014	70	-	Body and head movements (MEA)	BPSR	*Synchrony:* WCLC *Outcome*: Pearson's *r*, partial Pearson's *r*	*Window size:* 1 minute, *Max time lag:* ± 5 seconds
Ramseyer & Tschacher	2016	1	1	Hand movement (MEA)	BPSR	*Synchrony:* WCLC *Outcome*: Pearson's *r*, Backward stepwise regression	*Window size:* 1 minute, *Max time lag:* ± 5 seconds, *Step size*: 0.04 seconds
Ramseyer	2020	12	10	Body movement (MEA)	BPSR, SCL-K-9	*Synchrony*: WCLC *Outcome*: Multilevel model, Quantitative idiographic process analysis (QUIPA)	*Window size:* 1 minute, *Max time lag:* ± 5 seconds, *Step size*: 1 minute
Tschacher & Meier	2020	4	1	Respiration, Electrocardiogram, Heart rate, Heart rate variability	Session report questionnaire (precursor of BPSR; Grawe & Braun, 1994)	*Synchrony*: WCLC, CO *Outcome*: Multivariate multilevel regression, Multivariate ordinary regression, Multivariate stepwise regression	Respiration WCLC: *window size* 30 seconds, *max time lag* ±1–5 seconds; CO: *segment size* 30 seconds, *window size* 3 seconds, *step size* 1 second; Electrocardiogram WCLC: *window size* 1 minute, *max time lag* ±1 second; CO: *segment size* 1 minute, *window size* 0.25–0.5 seconds, *step size* 0.25–0.5 seconds; Heart rate & variability WCLC: *window size* 4 minutes, *max time lag* ±0.5–2 minutes; CO: *segment size* 4–8 minutes, *window size* 1 minute, *step size* 1 minute

Note. Abbreviated measures: BPSR = Bern Post-Session Report; HSCL = Hopkins Symptoms Checklist; ORS = Outcome Rating Scale; SCL-K-9 = Symptom Checklist K-9.
Abbreviated methods: CO = concordance; WCLC = windowed cross-lagged correlation; WCLC (peak) = windowed cross-lagged correlation with a peak-picking algorithm.

(*Continued*)

Table I. Continued

Empirical Studies on Synchrony and Proximal Outcomes: Results and Evaluations

Study	Year	Pseudo-synchrony	Moderator/ Mediator	Therapist Effect	Client Effect	Included in Meta-analysis	Result
Andreas et al.	2021	✓	✓	✕	✕	✕	Significant synchrony in face-to-face, $ES = 11.11^{**}$, and video-based settings, $ES = 4.48^{**}$. Moderate and negative correlation between synchrony and client symptom level in the same session in video-based setting, $r = -.38^{*}$ (+1 bs), but not in face-to-face setting, $r = .04$, *ns* (0 bs).
Prinz et al.	2021	✓	✕	✓	✓	✓	Medium-to-large effect synchrony over pseudosynchrony, $d = .72$. Synchrony did not predict client symptoms in the next session, Bs = [–.06, –.08], *ns* (0 × 2 bs).
Prinz et al.	2022	✕	✓	✓	✓	✕	Therapist *ICC* = .10 for synchrony. Higher synchrony in imagery rescripting segments predicted better outcome in the next session, $\beta = .22$, CI [.02, .41] (+1 bs), but not with cognitive behavioral segments, $\beta = .08$, CI [–.16, .33] (0 bs).
Ramseyer & Tschacher	2011	✓	✕	✓	✓	✓	Medium-effect synchrony over pseudosynchrony, ds = [.50, .59]***. Therapist *ICC* = .08. Higher synchrony was associated with higher client-rated self-efficacy in the initial sessions, $r = .35^{*}$ (+1 bs), and these two were marginally associated in the final third, $r = .26^{+}$ (0 bs).
Ramseyer & Tschacher	2014	✓	✓	✕	✕	✕	Medium-to-large effect synchrony over pseudosynchrony in head movement, $d = .74^{***}$; small effect synchrony in body movement, $d = .20^{*}$. Body synchrony positively associated with client-rated self-efficacy in the same session, $r = .304^{*}$ (+1 bs), after controlling for head synchrony. Body-and-head combined synchrony positively associated with clients' self-efficacy in the same session, $r = .388^{***}$. No association between head synchrony and clients' self-efficacy with body synchrony controlled, $r = .164$, *ns* (0 bs).
Ramseyer & Tschacher	2016	✓	✕	✕	✕	✕	Small-to-medium effect size between synchrony and pseudosynchrony, $d = .48^{*}$. Synchrony was not associated with therapist- or client-rated progress in the same session, rs = [.05, .20], *ns* (0 × 2 bs). Synchrony was not associated with client-rated wellbeing, $r = .24$, *ns* (0 bs).
Ramseyer	2020	✓	✕	✕	✓	✓	Medium-to-large effect size between synchrony and pseudosynchrony, $d = .76$. Dyad *ICC* = .123. Higher synchrony marginally predicted higher symptoms in the next session, SCL-K-9 $T = .51^{+}$, $d = .59$ (0 bs). Less therapist-rated progress associated with higher synchrony in the same session, BPSR $t(145.7) = -2.11^{*}$ (−1 bs). Higher symptoms associated with lower synchrony in the same session, SCL-K-9 $t(99.5) = -1.70^{**}$ (+1 bs).
Tschacher & Meier	2020	✓	✕	✕	✓	✕	Significant in-phase respiratory synchrony, WCLC $ES = .85^{*}$, dyad *ICC* = .09. Significant anti-phase heart rate synchrony, WCLC $ES = -1.53^{*}$. In-phase and anti-phase synchrony canceled each other out with heart rate variability, WCLC $ES = -.06$, *ns*. Higher respiratory synchrony was predicted by therapist-rated progress in the same session by some methods, WCLC ts = [1.71, 2.38*] (ave. + .5 bs); CO ts = [–.52, –.49], *ns* (ave. 0 bs). Higher heart rate synchrony was predicted by (a) higher client-rated wellbeing, CO ts = [2.63, 5.73]* (ave. + 1 bs); WCLC $t = .03$, *ns* (0 bs), (b) higher therapist-rated progress, WCLC ts = [3.15, 3.42]** (ave. + 1 bs); CO ts = [.63, .98], *ns* (ave. 0 bs), and (c) lower client-rated progress in the same session, CO ts = [−2.09*, −1.46] (ave. –.25 bs); WCLC ts = [−1.63, −1.60], *ns* (ave. 0 bs). Heart rate variability synchrony was not associated with any outcome, ts = [–.87, .87], *ns* (0 × 6 bs)

Notes. $^{+}p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$. *ICC* = intraclass correlation; bs = box score. For estimates reported in a range with an overall significance level, the highest *p*-value was picked. If different measures were involved in these estimates, box scores were counted separately and the total counts were reported (e.g., +1 × 2 bs). If different methods were used but on the same measures regarding the same hypotheses, the average box scores were reported (e.g., ave. –.25 bs).

Table II. Empirical studies on synchrony and distal outcomes: basic information and settings ($N = 14$).

Study	Year	Client N	Therapist N	Synchrony Type	Outcome Measures	Method of Analysis	Time Resolution
Aafjes-van Doorn et al.	2020	7	5	Use of function words (LSM)	PHI, GAF	*Synchrony:* rLSM *Outcome:* Pearson's *r*	Talk turn
Altmann et al.	2020	267	119	Body movement (MEA)	BDI, IIP	*Synchrony*: WCLC (peak) *Outcome:* Multilevel model, Multigroup analysis	*Window size*: 5 seconds, *Max time lag:* ± 5 seconds
Paulick, Deisenhofer, et al.	2018	143	27	Body movement (MEA)	BSI, IIP, OQ-30, dropout	*Synchrony*: WCLC *Outcome*: Multilevel model, *t*-test	*Window size:* 1 minute, *Max time lag*: ± 5 seconds *Step size:* 0.1 second
Paulick, Rubel, et al.	2018	93	23	Body movement (MEA)	BSI	*Synchrony*: WCLC *Outcome*: Multilevel model, *t*-test	*Window size:* 1 minute, *Max time lag*: ± 5 seconds, *Step size: 0.1* seconds
Prinz et al.	2021	175	57	Body movement (MEA)	OQ-30	*Synchrony*: WCLC (peak) *Outcome*: Multilevel model	*Window size*: 5 seconds, *Max time lag:* ± 5 seconds, *Step size*: 1 second
Prinz et al.	2022	60	6	Skin conductance	TAI	*Synchrony*: WCLC (peak) *Outcome*: Multilevel model	*Window size*: 2 minutes, *Max time lag*: ± 10 seconds
Ramseyer & Tschacher	2011	70	42	Body movement (MEA)	GAS, VEV, BSI, IIP, GSE, MAQ	*Synchrony:* WCLC *Outcome*: Multilevel model, Pearson's *r*	*Window size:* 1 minute, *Max time lag:* ± 5 seconds, *Step size*: 0.1 second
Ramseyer & Tschacher	2014	70	-	Body movement (MEA)	GAS, VEV	*Synchrony*: WCLC *Outcome*: partial Pearson's *r*	*Window size:* 1 minute, *Max time lag:* ± 5 seconds
Ramseyer	2020	12	10	Body movement (MEA)	BSI, IIP	*Synchrony*: WCLC O*utcome*: Multilevel model, Quantitative idiographic process analysis (QUIPA)	*Window size:* 1 minute, *Max time lag:* ± 5 seconds, *Step size*: 1 minute
Reich et al.	2014	52	16	Vocal pitch (f_0)	HSCL, BDI, OQ-45.2	Pearson's *r*	Talk turn
Schoenherr, Paulick, Strauss, et al.	2019	267	119	Body movement (MEA)	Dropout (binary, categorical, continuous)	*Synchrony:* WCLC (peak) *Outcome:* Point-biserial correlation, Logistic regression, Multinomial regression, Multilevel Cox regression	*Window size*: 5 seconds, *Max time lag:* ± 5 seconds, *Step size*: 0.04 seconds
Schoenherr, Paulick, Worrack, et al.	2019	84	-	Body movement (MEA)	IIP	*Synchrony*: CLC, CLR, WCC, WCLC, WCLC (peak), WCLR, CRQ *Outcome*: Partial Pearson's *r*	CLC & CLR: *step size* 0.04s; WCC: *window size* 10s, *step size* 1 second; WCLC: *window size* 1 minute; WCLC (peak): *window size* 5s, *step size* 0.04 seconds; WCLR: *window size* 5 seconds, *step size* 0.04 seconds
Schoenherr, Strauss, Paulick, et al.	2021	100	38	Body movement (MEA)	ECR, LSAS	*Synchrony*: WCLC (peak) *Outcome*: Pearson's *r*, Multilevel backward stepwise regression, Multigroup analysis	*Window size*: 5 seconds, *Max time lag:* ± 5 seconds, *Step size*: 0.04 seconds

(*Continued*)

Table II. Continued.

Study	Year	Client N	Therapist N	Synchrony Type	Outcome Measures	Method of Analysis	Time Resolution
Schoenherr, Strauss, Stangier, et al.	2021	64	31	Vocal pitch (f_0), Range of vocal frequency, Body movement (MEA)	ECR, LSAS, IIP	*Synchrony:* WCLC (peak) *Outcome:* Forward stepwise regression, Multilevel model	Vocal: Interpausal unit (talk turn); Body: *window size* 5 seconds, *max time lag* ±5 seconds, *step size* 0.04 seconds

Notes. Abbreviated measures: BDI = Beck Depression Inventory; BSI = Brief Symptom Inventory; ECR = Experiences in Close Relationship Scale; GAF = Global Assessment of Functioning; GAS = Goal Attainment Scaling; GSE = General Self-Efficacy Scale; HSCL = Hopkins Symptom Checklist; IIP = Inventory of Interpersonal Problems; LSAS = Liebowitz Social Anxiety Scale; MAQ = Measure of Attachment Quality; OQ-30 = Outcome Questionnaire-30; OQ-45.2 = Outcome Questionnaire—Interpersonal Relationship subscale; PHI = Personality Health Index; TAI = Test Anxiety Inventory; VEV = Questionnaire to Assess Changes in Experiencing and Behavior.

Abbreviated methods: CO = concordance; CLC = cross-lagged correlation; CLR = cross-lagged regression; CRQ = cross-recurrence quantification; rLSM = reciprocal LSM; WCC = windowed cross-correlation; WCLC = windowed cross-lagged correlation; WCLC (peak) = windowed cross-lagged correlation with a peak-picking algorithm; WCLR = windowed cross-lagged regression.

Empirical studies on synchrony and distal outcomes: results and evaluations

Study	Year	Pseudo-synchrony	Moderator/ Mediator	Therapist Effect	Client Effect	Included in Meta-analysis	Result
Aafjes-van Doorn et al.	2020	✗	✗	✗	✗	✗	No significant correlation between talk-turn level synchrony and change in either measure of functioning, PHI $r = .21$, *ns* (0 bs); GAF $r = -.02$, *ns* (0 bs).
Altmann et al.	2020	✗	✓	✓	✗	✗	Higher synchrony predicted lower interpersonal problem, IIP βs = [–.16, –.20]** (+1 × 2 bs), but not depression, BDI βs = [–.10, .02] (0 × 2 bs). The association between synchrony and interpersonal problem was stronger in manualized PDT group than manualized CBT group, $\Delta B = .03$*. No other comparisons of therapeutic approaches reached significance.
Paulick, Deisenhofer, et al.	2018	✓	✗	✓	✗	✓	Large-effect synchrony over pseudosynchrony, $t(141) = 15.27$***, $d = 1.67$. Therapist *ICC* = .14. Synchrony was not a significant predictor of outcomes: OQ-30 $\beta = -.02$, *ns*; BSI $\beta = -.02$, *ns*; IIP $\beta = .01$, *ns* (0 × 3 bs). Synchrony predicted dropout with marginal significance, $\beta = -.02^{+}$ (0 bs). Compared to non-improvement & consensual termination group, synchrony was lower in non-improvement & dropout group, OQ-30 $M = -2.14$*; BSI $M = -1.46^{+}$; IIP $M = -1.58^{*}$ (+1 × 2 + 0 bs), and was slightly lower in improvement group, OQ-30 $M = -1.79$**; BSI $M = -.69$; IIP $M = -.21$ (−1 + 0 × 2 bs).
Paulick, Rubel, et al.	2018	✓	✓	✓	✗	✗	Medium-effect synchrony over pseudosynchrony across diagnostic types and time of assessment, *d*s = [.33, .57]. Therapist *ICC* = .02. Synchrony was significantly lower in clients with depression than anxiety, $B = -3.46$**. Synchrony increased over time in depressed clients but decreased in anxious clients, interaction $B = 2.19$**. Synchrony positively predicted symptom reduction in clients with depression, $B = .13$* (+1 bs), but not in clients with anxiety, $B = -.06$, *ns* (0 bs).
Prinz et al.	2021	✓	✗	✓	✓	✓	Medium-to-large effect synchrony over pseudosynchrony, $d = .72$. No association between synchrony and outcome, $F(2, 130) = 21.34$, *ns* (0 bs).

Prinz et al.	2022	✕	✓	✓	✓	✕	Therapist *ICC* = .10 for synchrony. Higher synchrony in imagery rescripting segments predicted lower post-treatment test anxiety, $\beta = -.25$, CI [–.50, –.01] (+1 bs), but not in cognitive behavioral segments, $\beta = -.09$, CI [–.34, .16] (0 bs).
Ramseyer & Tschacher	2011	✓	✕	✓	✓	✓	Moderate-effect synchrony over pseudosynchrony, *d*s = [.50, .59]***. Therapist *ICC* = .08. Positive correlations between synchrony in the initial third of treatment and some outcome changes (by Cohen's *d*): IIP $r = .35^{*}$ (+1 bs); BSI $r = .35^{*}$ (+1 bs); GSE $r = .27^{+}$ (0 bs); MAQ $r = .25^{+}$ (0 bs); overall $r = .45^{**}$. Positive correlations between synchrony in the final third and some outcome changes, IIP $r = .24^{+}$ (0 bs); BSI $r = -.03$ (0 bs); GSE $r = .27^{*}$ (+1 bs); MAQ $r = .16$ (0 bs); overall $r = .24^{+}$. Positive correlations between synchrony in the initial third of treatment and overall retrospective outcome, VEV + GAS $r = .32^{*}$ (+1 bs). No significant correlations in the final third, $r = .20$, *ns* (0 bs).
Ramseyer & Tschacher	2014	✓	✓	✕	✕	✕	Medium-to-large effect synchrony over pseudosynchrony in head movement, $d = .74^{***}$; small effect size in synchrony of body movement, $d = .20^{*}$. Head synchrony was positively associated with clients' goal attainment, GAS $r = .30^{*}$ (+1 bs), and marginally with changes in experiencing and behavior, VEV $r = .22^{+}$ (0 bs). No significant correlations between outcomes and body synchrony *r*s = [.01, .04], *ns* (0 × 2 bs).
Ramseyer	2020	✓	✕	✕	✓	✓	Medium-to-large effect synchrony over pseudosynchrony, $d = .76$. Dyad *ICC* = .12. Pre-to-post improvement in interpersonal problems marginally and negatively associated with synchrony, IIP $t(54.9) = -1.78^{+}$ (0 bs). No significant association between pre-post symptom change and synchrony, BSI *ns* (0 bs).
Reich et al.	2014	✕	✕	✓	✕	✕	Small-effect overall synchrony, $r = .12^{**}$. Therapist *ICC* = .78. No significant difference between therapist-led synchrony ($r = .15$, therapist *ICC* = .70) and therapist-followed synchrony ($r = .09$, therapist *ICC* = .52), $t(15) = 1.33$, *ns*. Moderate and positive correlation between client-led synchrony and depression, $r = .69^{*}$ (−1 bs). No significant correlations between synchrony and other outcomes, *r*s = [.03, .41], *ns* (0 × 5 bs).
Schoenherr, Paulick, Strauss, et al.	2019	✓	✓	✓	✕	✕	Marginally significant correlation between synchrony (session 3) and dropout, $r = -.18^{+}$ (0 bs) Higher synchrony predicted lower risk of dropout, Cox regression $B = -.05^{*}$, *OR* = .95 (+1 bs); logistic regression $B = -.06^{*}$, *OR* = .94 (+1 bs); multinomial regression $B = -.22^{***}$, *OR* = .80 (+1 bs). Treatment type marginally moderated the relationship between synchrony and risk of dropout, integrative CBT: *OR* = .97, *ns*; manualized CBT *OR* = 1.02, *ns*; manualized PDT $OR = .91^{+}$. Gender match of client and therapist moderated this effect, mixed-sex dyad $OR = .94^{*}$; same-sex dyad *OR* = .97, *ns*.

(*Continued*)

Table II. Continued.

Empirical studies on synchrony and distal outcomes: results and evaluations

Study	Year	Pseudo-synchrony	Moderator/ Mediator	Therapist Effect	Client Effect	Included in Meta-analysis	Result
Schoenherr, Paulick, Worrack, et al.	2019	✕	✕	✕	✕	✕	Varied synchrony strengths measured by different methods, rs = [.036, .115]. R^2s = [.005, .269]. Exploratory factor analysis revealed three different types of synchrony measure: Frequency of synchrony, strength of synchrony within identified synchronization intervals, and strength of synchrony of total dyadic interaction. Second-order confirmatory factor analysis revealed a single synchrony factor loaded on the three types of synchrony measures, βs = [.67, .88]. Only 3 out of 7 metrics significantly correlated with interpersonal problem: windowed cross-correlation by average $r = -.27^{*}$ (+1 bs); windowed cross-lagged correlation (peak) by ratio $r = -.26^{*}$ (+1 bs); windowed cross-lagged regression by ratio $r = -.28^{*}$ (+1 bs). Others were insignificant, rs = [–.20, .08], *ns* (0 × 4 bs).
Schoenherr, Strauss, Paulick, et al.	2021	✕	✓	✓	✕	✕	On average, synchrony interval made up 20.77% of the total time being assessed. Therapist *ICC* = .40 for CBT group, and .07 for PDT group. Overall synchrony negatively correlated with attachment anxiety, $r = -.21^{*}$. Therapist-led synchrony negatively correlated with attachment anxiety, $r = -.25^{*}$ (+1 bs). Client-led synchrony was not associated attachment anxiety, $r = -.16$, *ns* (0 bs). No synchronies were associated with attachment avoidance, social anxiety, or social avoidance rs = [–.10, .12], *ns* (0 × 6 bs). Higher synchrony in session 8 predicted lower attachment anxiety, overall $\beta = -.66^{*}$, therapist-led $\beta = -.75^{**}$ (+1 bs). Therapeutic approach moderated the relationship between synchrony and attachment anxiety, overall $\beta = .53^{*}$, therapist-led $\beta = .58^{**}$.
Schoenherr, Strauss, Stangier, et al.	2021	✓	✕	✓	✕	✕	Medium-to-large effect therapist-led vocal synchrony over pseudosynchrony (so as below), average $d = .72^{***}$; Large-effect client-led vocal synchrony, average $d = 1.39^{***}$. Large-effect therapist-led vocal-range synchrony, average $d = 1.17^{***}$; large-effect client-led vocal-range synchrony, average $d = 1.68^{***}$. Higher therapist-led vocal synchrony predicted higher interpersonal problem, $\beta = .37^{*}$ (−1 bs), and lower attachment anxiety, $\beta = -.27^{*}$ (+1 bs), but was not associated with social anxiety, βs = [.12, .26], *ns* (0 × 2 bs). Higher therapist-led vocal range synchrony predicted higher attachment avoidance, $\beta = .28^{*}$ (−1 bs), and attachment anxiety, $\beta = .32^{*}$ (−1 bs). Higher client-led vocal synchrony predicted greater social anxiety and avoidance, βs = [.24, .34]* (−1 × 3 bs), and greater attachment avoidance, $\beta = .25^{*}$ (−1 bs), but was not associated with other outcomes, βs = [.16, .23], *ns* (0 × 3 bs). Higher client-led vocal range synchrony predicted lower social avoidance, $\beta = -.29^{*}$ (+1 bs). Higher client-led body movement synchrony predicted lower interpersonal problem, $\beta = -.29^{*}$ (+1 bs).

Notes. $^{+}p < .10$; $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$. *ICC* = intraclass correlation; bs = box score. For estimates reported in a range with an overall significance level, the highest *p*-value was picked. If different measures were involved in these estimates, box scores were counted separately and the total counts were reported (e.g., +1 × 2 bs). If different methods were used but on the same measures regarding the same hypotheses, the average box scores were reported (e.g., ave. –.25 bs).

Physiological Synchrony. The weighted box score for physiological synchrony was .479, implying a positive association with proximal outcomes. However, only two studies were found for this analysis, including 64 clients and seven therapists. The result may be limited by low statistical power. In the only study that used SC as the measure of synchrony (Prinz et al., 2022), higher synchrony predicted better outcomes in the next session (Outcome Rating Scale, ORS), which was moderated by the interventions used (imagery rescripting vs. cognitive behavioral). In particular, imagery rescripting segments showed an association, but not in the segments with cognitive behavioral interventions. In another study that assessed respiratory, electrocardiogram, and heart rate synchronies (Tschacher & Meier, 2020), respiratory synchrony was positively associated with therapist-rated progress in the same session. Higher heart rate synchrony was associated with higher therapist-rated progress and client-rated wellbeing, but lower client-rated progress in the same session.

Summary. Studies on session-level outcomes yielded mixed results. The neutral to mildly positive overall box score could mean that synchrony might associate with positive outcomes, but without sufficient evidence. This finding could also mean that the relation between synchrony and outcomes is complex and is moderated by many factors. This is evidenced by several significant moderators in these studies (e.g., types of methods used, interviewing settings, or body parts of movement synchrony). If these moderators were not considered, the cumulative evidence could show spurious insignificance.

Synchrony and distal treatment outcomes. A total of 14 studies examined how synchrony relates to the distal, end of treatment outcomes of therapy (Table II) covering 786 clients and 282 therapists in total, spanning the United States and Europe. Some studies drew samples from the same databases. To avoid duplicates, the study with the largest sample size was used to represent the other studies. Synchrony was assessed in four ways: MEA, voice, SC, and LSM. Similar to proximal outcomes, a weighted score analysis revealed that the overall association of synchrony and distal outcomes was neutral to mildly positive (*weighted box score* = .343).

Movement Synchrony. Ten studies employed MEA, involving 667 clients and 255 therapists. The weighted box score of this modality was .389, showing a neutral but mildly positive association of movement synchrony and distal outcomes. The findings were mixed. For example, four studies found that more movement synchrony was associated with less posttreatment interpersonal dysfunction (Altmann et al., 2020; Ramseyer & Tschacher, 2011; Schoenherr, Paulick, Worrack, et al., 2019; Schoenherr, Strauss, Stangier et al., 2021), including a large study that involved 267 clients (Altmann et al., 2020). However, another large study with 143 clients could not replicate this result (Paulick, Deisenhofer, et al., 2018).

Moderators were important in determining where the association between synchrony and distal outcomes occurred. For example, Paulick, Rubel, et al. (2018) found that the positive association between body synchrony and clients' posttreatment distress only appeared in clients with depression, but not anxiety (no comorbidity). Another study found that head movement synchrony was associated with clients' better wellbeing, but not with body movement synchrony (Ramseyer & Tschacher, 2014). Two other studies showed significant moderating effects of therapeutic approaches in the synchrony-outcome relation (Altmann et al., 2020; Schoenherr, Strauss, Paulick, et al., 2021). The mildly positive box score in this modality implies that there might be a positive association between movement synchrony and distal outcomes, but this association could have been heavily masked by many moderators.

Vocal Synchrony. In two studies using vocal pitch (Reich et al., 2014; Schoenherr, Strauss, Stangier, et al., 2021), we found a neutral but mildly negative association between synchrony and distal outcomes (*weighted box score* = –.222). The two studies featured 116 clients and 47 therapists. This result implies that more vocal synchrony may be detrimental to distal outcomes. Mixed associations were found based on the way that pitch was estimated (e.g., fundamental frequency vs. the range of fundamental frequency), how outcomes were assessed, and who led the synchrony. Therapist-led pitch synchrony was found to predict higher posttreatment interpersonal dysfunction, but lower attachment anxiety (Schoenherr, Strauss, Stangier, et al., 2021). Client-led pitch synchrony was found to predict higher posttreatment social anxiety and avoidance, attachment avoidance (Schoenherr, Strauss, Stangier, et al., 2021), and depression (Reich et al., 2014), but had no association with interpersonal dysfunction (Reich et al., 2014). In the only study with pitch range synchrony (Schoenherr, Strauss, Stangier, et al., 2021), therapist-led pitch range synchrony predicted higher posttreatment attachment avoidance and anxiety, but client-led pitch range synchrony predicted lower posttreatment social avoidance.

Physiological Synchrony. Prinz et al. (2022) tested the associations between SC and outcomes.

The Test Anxiety Inventory (TAI) was used to assess clients' anxiety levels. Higher synchrony during image rescripting interventions predicted lower post-treatment test anxiety, but there was no significant association between synchrony during cognitive–behavioral interventions and test anxiety. Hence, a + .5 box score was assigned to this modality.

Linguistic Synchrony. In the only study that involved LSM (Aafjes-van Doorn et al., 2020), Personality Health Index (PHI) and Global Assessment of Functioning (GAF) were used as indicators of outcomes, and the overall synchrony was quantified by the average synchrony aggregated across talk turns. There were no significant correlations between LSM and outcomes, giving a zero box score to this modality.

Summary. The number of studies involved in this area allowed for a more comprehensive synthesis of the findings. This overall pattern may mask differences based on the measure of synchrony and the outcome measures used. For example, the overall association between synchrony and distal outcomes was neutral to mildly positive. When looking at individual modalities, movement synchrony showed a similar neutral to mildly positive association with outcomes, but vocal synchrony came with a neutral to mildly negative association with outcomes. Similar to studies with proximal outcome, the results may have been masked by many moderators that need to be differentiated.

Meta-Analysis of Synchrony vs. Pseudo-Synchrony

Eight studies compared the synchrony between therapist and client dyads and simulated pairings of random dyads (i.e., synchrony versus pseudo-synchrony; Tables I and II). The means, standard deviations, and effect sizes (Cohen's *d*) were extracted. For studies where the mean and standard deviation of the sample were missing, *d* reported in the primary study and sample size were utilized to compute the effect size variance. All analyses were conducted in R (Team, 2016) using the *MAd* package (Del Re & Hoyt, 2014). Across the 8 studies, the total number of clients was 557 (Mean = 69.63; $SD = 60.10$; range 12–175) and the total number of therapists was 174 ($M = 24.86$; $SD = 18.62$; range 8–57; one study did not report the number of therapists). The total number of sessions included in the meta-analysis was 1162 ($M = 179$; $SD = 155.87$; median 132), with the number ranging from 10 to 423 sessions.

The effect sizes of each study are listed in the forest plot in Figure S3 (see supplemental material). As predicted, there was a significant difference between the effect size of synchrony and pseudo-synchrony, $d = 1.01$, 95% CI [0.56, 1.47], $p < 0.001$. This large effect size indicated a higher level of synchrony in real dyads vs. simulated dyads. The effect of synchrony as compared to pseudosynchrony remained significant ($d = 0.86$, 95% CI [0.60, 1.11], $p < 0.001$) also after removing from the analysis one study with a substantial effect size (Marci et al., 2007). We tested for publication bias and found that the sample would require 135 non-significant studies to render the result null. Across this set of studies, authentic pairs exhibited synchronized patterns to a much greater extent than shuffled pairs. This provides evidence for the presence of synchrony in psychotherapy interactions.

Limitations of Research

Synchrony is not always associated with favorable therapy outcomes (e.g., Reich et al., 2014; Schoenherr, Strauss, Stangier, et al., 2021). Unfortunately, there are very few studies examining how therapists facilitate dyadic synchrony in ways that lead to beneficial outcomes. There is an obvious need for more studies that consider how therapists successfully facilitate synchrony, as well as studies that include client, therapist and or situational moderators in which synchrony leads to better (or worse) therapeutic outcomes.

Our systematic review and meta-analyses point to the need for standardization in the research. As indicated in previous studies (Kleinbub, 2017; Koole et al., 2020; Palumbo et al., 2017; Wiltshire et al., 2020), the lack of consensus in the synchrony literature with respect to terminology and methodology impedes cross-study comparisons and makes it difficult to derive robust conclusions as to the associations between synchrony and outcomes. The research community should aim for a consensus on common terminologies and practices. Another issue that may have contributed to the inconclusive results is the heterogeneity of settings to assess synchrony and the small number of studies within each setting, as shown in Table I. In addition, the ways the results are presented limited our ability to synthesize the findings into a full meta-analysis on the association between synchrony and outcomes. Since the synchrony literature addresses complex questions of mutual influence over time, complex models should be standard in most studies. At the same time, it is important to report the basic descriptive statistics such as effect sizes, the correlation between the clients' and the therapists' signals, and the associations with outcome variables. Synchrony

studies should also include a clearer report of the estimates of synchrony versus pseudo-synchrony. Additionally, few studies specified when and for whom synchrony leads to positive results. Of the 25 studies included in our review, only five studies had some form of moderators (20%) and none included mediators. Further, the studies reviewed here lacked client and therapist diversity in terms of cultural identities and no study examined cultural and identity variables that may impact therapist facilitation of synchrony. Synchrony may be one of the processes impacted by differences in cultural and identity differences within dyads and may differ as a function of gender, race/ethnicity, immigration status, body size, ability status, and other lived experiences. Future studies should address how these dimensions of diversity affect synchrony in psychotherapy and moderate its association with treatment outcome.

Several directions could contribute to a better understanding of the role of synchrony in psychotherapy. Effective synchrony may depend on the therapists' ability to induce coregulation patterns, perhaps through their capacity to self-regulate their own emotions in the session (see Paz et al., 2021). Future studies could account for emotional context as a possible state-like moderator and examine, for example, whether in situations of intrapersonal or interpersonal distress, synchrony leads to poorer results, while in situations of emotional pain or positive emotions synchrony leads to beneficial results. Future studies can also examine whether clients' traits (for example, diagnosis) or therapists' traits (for example, emotion regulation capabilities) moderate the association between synchrony and outcome. Differences in patterns of synchrony can also be considered (Butler, 2015). Synchrony is commonly examined as a positive association between two persons' stream of bio-behavioral signals. One disadvantage of this approach is that it overlooks the fact that successful interpersonal coordination requires partners to dynamically move toward and away from each other (Mayo & Gordon, 2020). Recent models of synchrony suggest that people tend to move in and out of synchrony while they interact, and that these interpersonal dynamics are complementary and adaptive (Feldman, 2021; Mayo & Gordon, 2020). Future studies should examine whether flexible movement between synchronized and unsynchronized states is associated with beneficial outcomes. Finally, most research on client-therapist synchrony has focused on one modality of synchrony and have measured synchrony on a single-session or pooled sampled session basis. However, assessment of a client's broader biopsychosocial context at multiple time points during treatment could better capture the complexity of the therapeutic process. It is crucial to include a multi-method assessment of synchrony that takes different behavioral and biological processes into account.

Training Implications

Supervisors and educators can help trainees pay more attention to what occurs at the non-verbal level between their clients and themselves (Ogden et al., 2006), and teach them to identify moments of synchrony, dis-synchrony, and avoidance in their responses (Feldman, 2012). The maturation of innovative technologies for monitoring the therapeutic process, along with the development of advanced feedback systems, may allow therapists and their supervisors to detect moments of increased or decreased synchrony and explore the context in which these dynamics occurred and their consequences (Paulick, Rubel, et al., 2018). Supervisors can encourage trainee therapists to utilize their own emotional arousal cues in response to the clients' signals (e.g., Knox & Hill, 2003). Therapists can be trained to identify moments in a session in which they unintentionally synchronized with their clients in a way that escalated ineffective regulatory process. They can learn to strengthen their ability to down-regulate unproductive emotional processes and to up-regulate productive emotional processes (Geller, 2009). For example, a therapist and a supervisor could explore the segment of a video in which the client and the therapist were vocally synchronized in a moment of distress, which, based on the client's self-reports at the end of the session, led to more distress. This exploration may lead to a better understanding of when it is important for the therapist to let herself be touched by the client's emotions, and how at the same time she can down-regulate herself to help her client tolerate her own emotions and eventually achieve better well-being. We encourage training programs to use automatically measured synchrony in multiple modalities (text, audio, video, physiology, etc.) along with psychometric feedback. These will help therapists to be more aware of their own verbal and non-verbal behavior in contacts with their clients.

Therapeutic Practices

- Attend to what occurs at the non-verbal level between clients and yourself, since this provides important information about clients' mental states. Be aware of your own affective and

bodily states that change in response to clients' non-verbal behavior.
- Consider the emotional context in which synchrony occurs. Some contexts probably call for high synchrony (e.g., when clients experience adaptive emotions) while other contexts probably call for relatively low levels of synchrony (e.g., when clients experience maladaptive emotions).
- Aim to detect the intensity and the quality of the dyadic emotional dynamic by upregulating adaptive emotions and down-regulating maladaptive emotions.
- Consider clients' culture and identity, and how these might impact your interpretations or assumptions about the therapeutic interaction and synchrony.
- Allow yourself to move flexibly in and out of synchrony, knowing that flexible dynamic movements between synchronization and separation may prove adaptive.

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* Studies included in the research review are indicated by an asterisk

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