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Potential Role of Nonverbal Synchrony in Psychotherapy: A Meta-Analysis

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ABSTRACT

Background: Interpersonal synchrony entails the coordination of verbal and nonverbal features underlying communicative patterns. However, the strength of the association between the synchronisation of nonverbal features (movements and vocal tones) and therapeutic alliance and outcome remains unclear.

Objectives: This meta-analysis aimed to investigate the strength of (1) the association between nonverbal synchrony and perception of alliance reported by the patients, (2) the association between nonverbal synchrony and therapeutic outcome, and (3) the moderating role of the type of psychotherapeutic approach.

Methods: This meta-analysis included 11 studies. Inclusion criteria were studies that utilised a quantitative measure of nonverbal synchrony in association with measures of therapeutic alliance and outcome.

Results: Random effects model indicated that nonverbal synchrony was significantly associated with the alliance perceived by the patient ($r = 0.19$; 95% CI: 0.02–0.35; $z = 2.18$, $p = 0.02$); however, it was not significantly associated with the therapeutic outcome ($r = 0.22$; 95% CI: –0.04 to 0.47; $z = 1.65$, $p = 0.09$). No moderating effects were observed for the type of therapeutic approach.

Conclusions: These findings support the view that nonverbal synchrony is a central aspect of psychotherapy and highlight the possible interdependence between nonverbal synchrony and therapeutic alliance.

1 | Introduction

Interpersonal synchrony is the temporal coordination of the verbal and nonverbal communication patterns that occur during interactions (Delaherche et al. 2012). Nonverbal synchrony is a specific modality of interpersonal synchrony that refers to the mutual temporal coordination between patient–therapist dyads during treatments (Altmann 2013; Koole and Tschacher 2016). Previous studies have revealed that interpersonal synchrony is associated with positive relational features. Nonverbal synchrony is associated with increased positive affect (Tschacher, Rees, and Ramseyer 2014); perceptions of similarity (Valdesolo and DeSteno 2011); and enhanced rapport, affiliation and cooperation

(Hove and Risen 2009; Miles, Nind, and Macrae 2009; Valdesolo et al. 2010). Interpersonal synchrony plays a decisive role in building rapport, sustaining communication and regulating emotions from early relationships (child–caregiver; Feldman and Eidelman 2009; Feldman 2003). Infants learn how to regulate their internal states and develop the ability to predict and anticipate others' actions in a continuous process of differentiating between the self and others during synchronised interaction (Barkalifa et al. 2023; Feldman 2017; Hoehl, Fairhurst, and Schirmer 2021). This dynamic occurs within a dyadic interaction and drives the development of emotional and affective organisation (Feldman 2003). Along these lines, interpersonal synchrony has been hypothesised to play a role in psychotherapy.

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Summary

- Implications for policy and practice
 - This meta-analysis investigates the strength of the association between nonverbal synchrony and therapeutic alliance and nonverbal synchrony and therapeutic outcomes, exploring the moderating role of psychotherapy approaches.
 - Specifically, our results show a significant association between nonverbal synchrony and therapeutic alliance perceived by the patients rather than with the therapeutic outcome.
 - Overall, such findings highlight the potential role of nonverbal synchrony in sustaining the affective and collaborative features of the therapeutic bond.
 - This study encourages the use of technologies and training (e.g., feedback systems) to foster the ability to stay in synchrony in order to facilitate the therapeutic alliance.

Theoretically (Winnicott 1971), synchrony was considered a facilitator of a patient's corrective emotional experience that could sustain the achievement of a good therapeutic relationship and promote better therapeutic outcomes. Studies have demonstrated that the interpersonal systems of the patient and therapist change over time in an ongoing interactive process of mutual co-regulation and reciprocally influence each other (Butner et al. 2014; Dahl et al. 2016; Gelo and Salvatore 2016; Mayo and Gordon 2020). This interdependence and co-occurrence of interpersonal and emotional features lead to the formation of a therapeutic alliance, an essential dimension of therapy effectiveness (Horvath and Symonds 1991; Klein et al. 2003; Koole and Tschacher 2016).

Therapeutic alliance has been considered a central feature of therapy and conceptualised as a *working* dimension that relies on three main components: (1) agreement on the therapeutic goals, (2) consensus regarding the therapeutic tasks, and (3) affective bond between the patient and therapist (Bordin 1979). It is an index of the quality of mutual collaboration during the therapeutic relationship, which fosters trustworthiness and mutual agreement, and the therapist's empathic ability to tune into their patient's emotional state (Horvath and Luborsky 1993; Laverdière et al. 2019). The therapeutic alliance and outcome are clinical components related to the psychotherapeutic process, but the link between the two still needs to be clarified. Existing meta-analyses have shown that it is not only the quality of the alliance (Horvath and Bedi 2002; Norcross 2002) that could predict the therapeutic outcome but also other personal factors related to the therapist and the patient, regardless of the type of intervention (Horvath and Luborsky 1993; Castonguay, Constantino, and Holtforth 2006).

1.1 | Role of Synchrony in Psychotherapy

Synchrony is the continuous interpersonal coordination of non-random patterns within a temporal dimension (Atzil-Slonim and Tschacher 2020; Wiltshire et al. 2020). Koole and Tschacher (2016) proposed the Interpersonal Synchrony (In-Sync) model to provide a theoretical framework for synchrony in psychotherapy. This model highlights that the alliance emerges from

the coupling of the neural activity of the patient and therapist. However, the mutual coordination of synchronous activities (i.e., body movements) and sharing experiences allow the patient and therapist to communicate. Therefore, the model distinguishes three levels of processing and the different times at which each level operates: perceptual-motor processes, complex cognition and emotion regulation stance. It proposes that movement synchrony promotes inter-brain synchrony through the mutual sharing of subjective experiences (I-sharing) and affective co-regulation responses. This theoretical approach attempts to combine the views that interpersonal synchrony could strengthen the therapeutic alliance, which, in turn, could positively affect the patient's emotional regulation skills and therapeutic outcome.

However, synchrony can relate to many dyadic processes. Regarding body movements, six studies have reported that higher synchrony is associated with a higher positive evaluation of therapeutic alliance (Altenstein et al. 2013; Ramseyer and Tschacher 2014, 2016; Cohen et al. 2021; Nyman-Salonen et al. 2021) and self-efficacy (Ramseyer and Tschacher 2011). However, Paulick et al. (2018) found no significant associations between synchrony and therapeutic alliance. Furthermore, three studies investigated the association between vocal synchrony at vocal pitch and therapeutic alliance. Bryan et al. (2018) found a relationship between the synchrony of vocal pitch as a measure of arousal (and not temporal alignment) and therapeutic alliance. However, Reich et al. (2014) found that vocal pitch was associated with negative alliance when the therapist led. Interestingly, two studies on linguistic focus (Aafjes-van Doorn, Porcerelli, and Müller-Frommeyer 2020; Aafjes-van Doorn and Müller-Frommeyer 2020) found a negative association between language style matching (LSM) and alliance during sessions.

In addition, two studies analysed the association between physiological synchrony and alliance at the physiological level. Bar-Kalifa et al. (2019) found that synchrony of electrodermal activity (EDA) was related to alliance ratings. Moreover, Tschacher and Meier (2020) analysed participants' heart rate variability (HRV) and respiration during sessions among four dyads. In phase HRV, synchrony and respiration were associated with the client's and therapist's alliance ratings.

Other studies analysed the role of synchrony linked to psychotherapy outcomes as an overall outcome measure of the therapy. Four of these (Bos, Geerts, and Bouhuys 2002; Geerts, Bouhuys, and van den Hoofdakker 1996; Ramseyer and Tschacher 2011; Zimmermann et al. 2021) observed a negative association between movement synchrony and symptomatology. However, two observed a positive association with goal attainment (Koole and Tschacher 2016; Nyman-Salonen et al. 2021). In addition, two studies found that more robust nonverbal synchrony between the patient and therapist within sessions or interviews was related to better treatment responsiveness (Geerts et al. 2000) and lower risk of relapse (Geerts et al. 2006). Additionally, Paulick et al. (2018) observed a positive association between body synchrony and clients' symptomatology only among clients with depression but not among those with anxiety (no comorbidity). Another study found that only head movement synchrony was associated with clients' better well-being, not body movement synchrony (Ramseyer and Tschacher 2014). Furthermore, two

other studies demonstrated significant moderating effects of therapeutic approaches on the synchrony–outcome relationship (Altmann et al. 2020; Schoenherr et al. 2021).

Regarding vocal synchrony, Rocco et al. (2017) found that stronger coordination of speech rate was associated with better treatment outcomes. This result was supported by Reich et al.'s (2014) study, in which the authors observed symptoms when the therapist's vocal pitch followed the patient's vocal pitch more strongly. Subsequently, seven studies analysed the link between synchrony and empathy through vocal ($n = 3$) and physiological ($n = 4$) synchrony between the patient and therapist. The results revealed a significant association between EDA (Marci et al. 2007; Marci and Orr 2006) and higher measures of empathy. A study found that the synchrony of respiration rate was associated with higher ratings by the therapist regarding the patient's treatment progress (Tschacher and Meier 2020). Furthermore, two studies found that the coordination of the fundamental frequency of the voice, as well as the matching of linguistic categories between the patient and therapist, were associated with higher ratings of empathy (Imel et al. 2014; Lord et al. 2015). However, a large replication study failed to observe such an association (Gaume et al. 2019). Regarding physiological synchrony, Prinz et al. (2021) found that higher synchrony measured with skin conductance predicted better outcomes in the next session, moderated by the interventions used (imagery rescripting vs. cognitive behavioural).

1.2 | The Present Meta-Analysis

Although the interdisciplinary interest in synchrony is growing (see Hu et al. 2022; Mogan, Fischer, and Bulbulia 2017; Schoenherr et al. 2019; Wiltshire et al. 2020, for reviews), more research is required to clarify the phenomenon's complexity and explore the potential role of different modalities of nonverbal synchrony in psychotherapy. To date, Atzil-Slonim et al. (2023) have tried to systematically summarise the studies within the psychotherapeutic context, revealing that dyadic synchrony between the patient and the therapist is the essence of the therapeutic process that fluctuates, up-regulating and down-regulating emotions. Notably, at the meta-analytic level, this dynamic has emerged within 'authentic' pairs vs. pseudo-synchrony, sustaining the importance of synchrony within dyadic interactions (Atzil-Slonim et al. 2023). Moreover, despite the complex nature of synchrony, movement synchrony vs. vocal synchrony positively impacts the psychotherapy outcome (Atzil-Slonim et al. 2023). However, evidence about the strength of the association between nonverbal synchrony and clinical components is mixed and needs further investigation (e.g., Jennissen et al. 2024).

Against this background, the present meta-analysis aims to explore the strength of the relationship between a specific modality of dyadic synchrony, that is, nonverbal synchrony, and micro- and macro-level processes of the psychotherapeutic context. Specifically, we investigate (1) the association between nonverbal synchrony and perception of alliance reported by patients, (2) the association between nonverbal synchrony and therapeutic outcome and (3) the moderating role of the type of therapeutic approaches in these associations.

2 | Methods

This systematic review and meta-analysis followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines (Page et al. 2021).

2.1 | Inclusion and Exclusion Criteria

Inclusion criteria were studies that presented a measure of nonverbal synchrony during therapeutic sessions and a measure of alliance and therapeutic outcome, as well as studies that examined the association between nonverbal synchrony, therapeutic alliance and outcome. Therefore, we excluded studies with no clinical intervention or psychotherapy, samples of 'remitted' patients or just one case study. If eligible articles did not report the information necessary to compute an effect size, the corresponding authors were contacted to obtain the missing information. Subsequently, one study was excluded as we did not receive the requested data. Since we aimed to analyse the role of nonverbal synchrony at the movement and vocal levels, we excluded studies that referred to other modalities of interpersonal synchrony, such as physiological and inter-brain.

2.2 | Search Method

The Scopus, PubMed, Web of Science and PsycINFO databases were searched via the key terms ('synchrony' AND 'psychotherapy' OR 'nonverbal synchrony' AND 'psychotherapy'). The search was not limited to studies published within a specific period. Review articles, conference proceedings, book chapters, thesis dissertations, case reports and non-English-language materials were excluded.

The database search identified 5474 articles. Of these, 4722 studies were considered after duplicates were removed. We further excluded 4359 articles by the title and abstract. Of the remaining 363 articles, we excluded 318 since they did not relate to psychotherapy or include a measure related to the psychotherapeutic process. Subsequently, 45 studies were potentially eligible; however, 33 were excluded for various reasons (see Figure 1 and Tables 1 and 2 for a summary of the included studies). In total, we had 1423 participants from $k = 11$ studies, of which $k = 8$ included a quantitative measure of the relationship between nonverbal synchrony and therapeutic outcome. The associations between nonverbal synchrony and (a) therapeutic alliance and (b) therapeutic outcome were analysed separately.

2.3 | Data Management

We screened the 11 studies and discussed the incongruences or difficulties in extracting the data. Studies were coded via authors, year of publication, design, type and measure of nonverbal synchrony and therapeutic variables, type of therapeutic approach, and participants' characteristics. Data presentation and analyses were organised according to the therapeutic variable: therapeutic alliance ($k = 11$) and outcomes ($k = 8$). We extracted the effect sizes for the association between synchrony and the therapeutic variables.

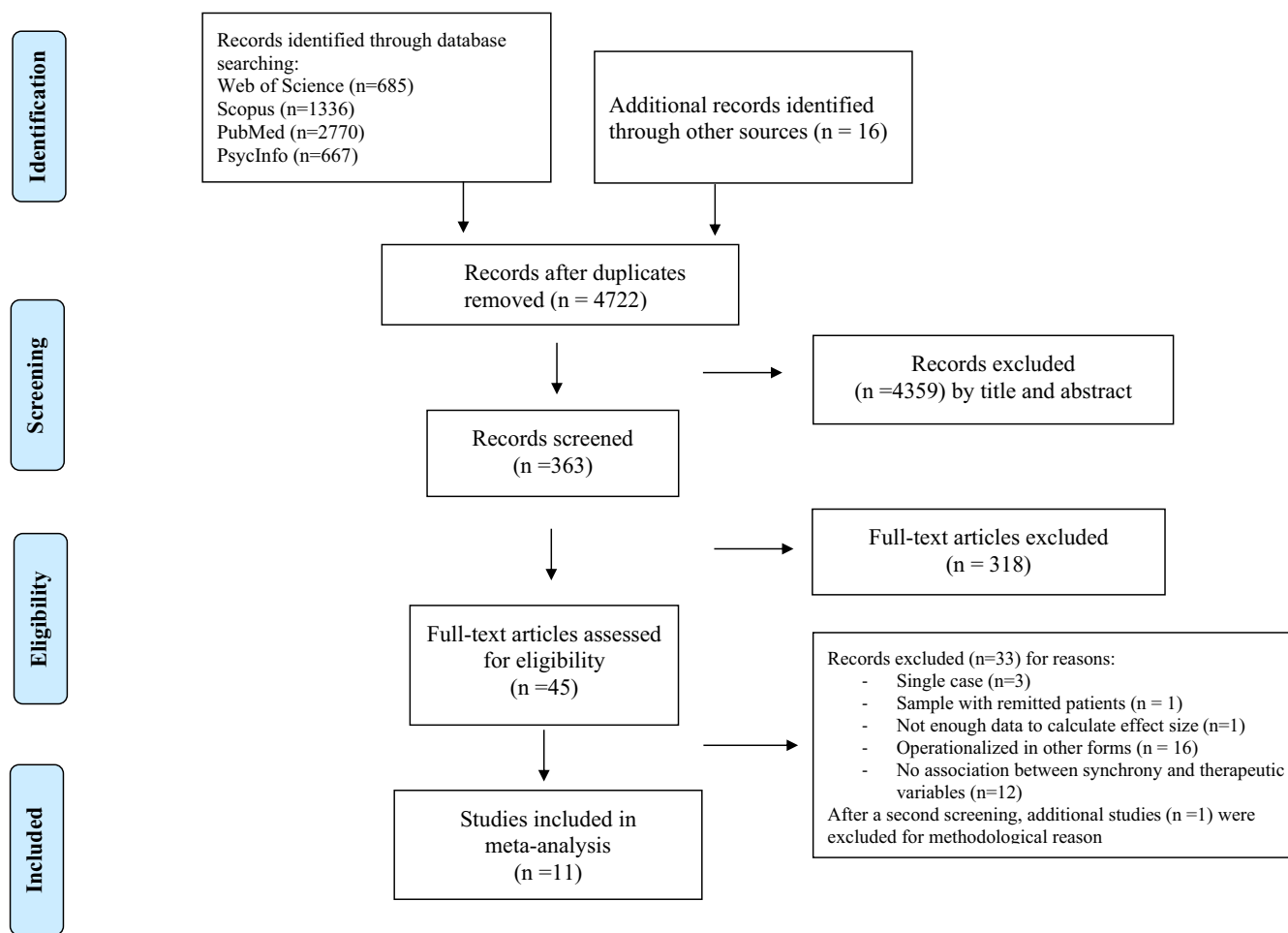


FIGURE 1 | PRISMA flow diagram and included studies.

Regarding longitudinal studies, we considered the association between synchrony and the final assessment of the association. For nonverbal synchrony, we considered the overall measure rather than the therapist–patient leading and/or following indices (Altmann et al. 2020; Reich et al. 2014). Movement synchrony was assessed via the motion energy analysis (MEA; Ramseyer 2020a), a frame-differencing programme that calculates the amount of change within a region of interest and provides a time series of this quantification. Meanwhile, vocal synchrony was measured by the fundamental frequency of acoustic features via the PRAAT software (Boersma and van Heuven 2001).

Regarding measure of therapeutic alliance, if studies included a measure from both the therapist and patient, we included only the patient's self-report measure since we were interested in their perception of the alliance (De Bolle, Johnson, and De Fruyt 2010).

To assess the therapeutic outcomes, we selected different measures of symptoms that included (a) primary outcome indicated by the authors, (b) measures more indicative of interpersonal and relational functioning, and (c) general measures of symptom assessment. This approach is coherent with the psychotherapy research context (e.g., Jennissen et al. 2018) and in line with statistical evidence (Contreras et al. 2019). For instance, through a

network analysis, symptoms of depression could be clustered together because of the connections with interpersonal symptoms related to post-traumatic stress disorder and borderline personality disorder (Contreras et al. 2019).

Therapeutic approaches were related to cognitive behavioural therapy (CBT), psychodynamic therapy (PDT), counselling and couples therapy. Based on differences in the therapeutic process of different psychotherapeutic approaches (Jones and Pulos 1993), we grouped the studies into those that conducted CBT versus PDT or other types of approaches, which were labelled as 'others'.

2.4 | Statistical Analyses

We conducted two different meta-analyses on studies that reported the associations between nonverbal synchrony and (a) therapeutic alliance and (b) therapeutic outcome. We calculated the effect sizes based on the overall measure of the relationship between nonverbal synchrony and the therapeutic variables (for more details, see Tables S1 and S2 in the Appendix S1). Data were pooled by applying random-effects models (Dettori, Norvell, and Chapman 2022). Heterogeneity was estimated via the restricted maximum-likelihood estimator (Viechtbauer 2005) and assessed via *Q* statistics, with

TABLE 1 | Study characteristics on the association between nonverbal synchrony and therapeutic alliance.

Study	Study characteristics					Sample	
	Design	Modality	Measure	Measure of alliance	Therapeutic approach	N	Type of sample
Altmann et al. (2020)	L	MS	MEA	HAQ	CBT and PDT	267	C
Bryan et al. (2018)	CS	VS	PRAAT	WAI-SF	CRISIS INTERVENTION	54	C
Cohen et al. (2021)	L	MS	MEA	WAI	PDT	86	C
Deres-Cohen et al. (2021)	L	MS	MEA	3RS	PDT	75	C
Nyman-Salonen et al. (2021)	L	MS	MEA	SRS	COUPLES THERAPY	11	NC
Paulick et al. (2018)	L	MS	MEA	HAQ	CBT	143	C
Ramseyer and Tschacher (2011)	CS	MS	MEA	BPSR-P	CBT	70	C
Ramseyer and Tschacher (2014)	L	MS	MEA	BPSR-P	CBT	70	C
Ramseyer (2020b)	L	MS	MEA	BPSR-P	CBT	12	C
Reich et al. (2014)	CS	VS	PRAAT	CWAI-SF	COUNSELLING	52	NC
Zimmermann et al. (2021)	L	MS	MEA	SEQ	AIT	16	C

Note: Design: CS, cross-sectional; L, longitudinal. Modality: MS, movement synchrony; VS, vocal synchrony. Measure: MEA, motion energy analysis; PRAAT, software for analysis of phonetic and speech features. Measure of alliance: 3RS, The Rupture Resolution Rating System; BPSR-P, Bern Post-Session Report patient; CWAI-SF, Client Working Alliance Inventory-Short Form; HAQ, Helping Alliance Questionnaire; SEQ, Session Evaluation Questionnaire; SRS, Session Rating Scale; WAI, Working Alliance Inventory; WAI-SF, Working Alliance Inventory-Short Form. Therapeutic approach: AIT, Adolescent Identity Treatment; CBT, Cognitive Behavioural Therapy; PDT, Psychodynamic Therapy. Type of sample: C, clinical; NC, non-clinical.

TABLE 2 | Study characteristics on the association between nonverbal synchrony and therapeutic outcome.

Study	Study characteristics					Sample	
	Design	Modality	Measure	Therapeutic outcome	Therapeutic approach	N	Type of sample
Altmann et al. (2020)	L	MS	MEA	IIP	CBT and PDT	267	C
Nyman-Salonen et al. (2021)	L	MS	MEA	CORE-OM	COUPLES THERAPY	11	NC
Paulick et al. (2018)	L	MS	MEA	IIP-12	CBT	143	C
Ramseyer and Tschacher (2011)	CS	MS	MEA	IIP	CBT	70	C
Ramseyer and Tschacher (2014)	L	MS	MEA	GAS	CBT	70	C
Ramseyer (2020b)	L	MS	MEA	IIP	CBT	12	C
Reich et al. (2014)	CS	VS	PRAAT	BDI-II	COUNSELLING	52	NC
Zimmermann et al. (2021)	L	MS	MEA	LoPF-Q 12–18	AIT	16	C

Note: Design: CS, cross-sectional; L, longitudinal. Modality: MS, movement synchrony; VS, vocal synchrony. Measure: MEA, motion energy analysis; PRAAT, software for analysis of phonetic and speech features. Therapeutic outcome: BDI, Beck Depression Inventory; CORE-OM, Clinical Outcomes in Routine Evaluation-Outcome Measure; GAS, Goal Attainment Scaling; IIP/IIP-12, Inventory of Interpersonal Problems; LoPF-Q 12–18, Levels of Personality Functioning Questionnaire. Therapeutic approach: AIT, Adolescent Identity Treatment; CBT, Cognitive Behavioural Therapy; PDT, Psychodynamic Therapy. Type of sample: C, clinical; NC, non-clinical.

a significant p -value (Cochran 1954). I^2 (measure of heterogeneity) indicated the proportion of observed variance that reflected fundamental differences in effect size (Higgins et al. 2003). Influential outliers were detected based on

Cook's distance index (Cook 1977). Publication bias was evaluated in the funnel plot asymmetry and with trim-fill analysis to assess whether additional studies were required (Duval and Tweedie 2000; Lin and Chu 2018). We assessed

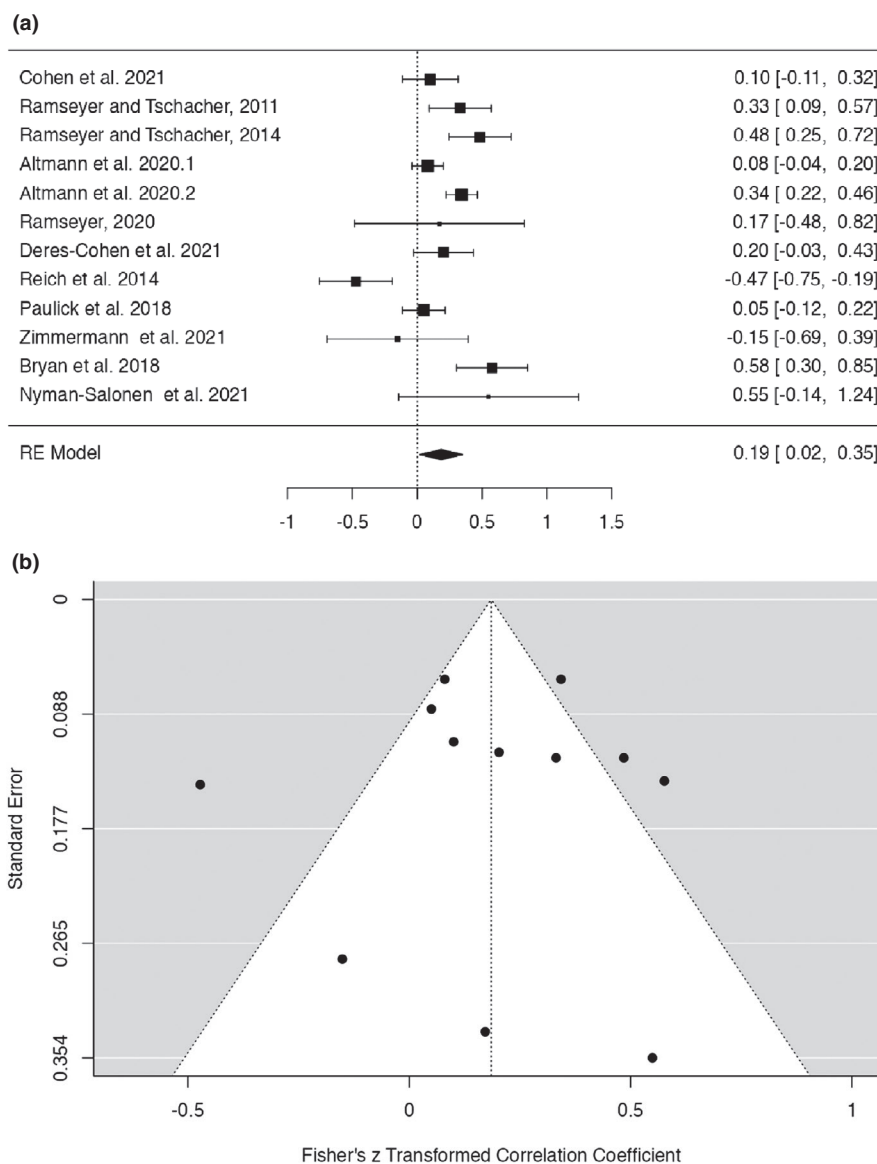


FIGURE 2 | (a) Forest plot of nonverbal synchrony and therapeutic alliance. (b) Funnel plot for asymmetry in the studies on the relationship between nonverbal synchrony and therapeutic alliance.

the moderation effect of the therapeutic approach (CBT vs. others) as a categorical moderator in the relationship between nonverbal synchrony and the therapeutic variables. Jamovi (version 1.6) was used for all data analyses. Sensitivity analysis was conducted for both meta-analyses (see [Supporting Information](#)).

3 | Results

3.1 | Association Between Nonverbal Synchrony and Therapeutic Alliance

Of the included studies, 11 analysed the effect of nonverbal synchrony on therapeutic alliance (Table 1). Of these, eight and three had a longitudinal and cross-sectional design, respectively. Furthermore, nine included a measure of movement synchrony via the MEA, and two studies included a measure of vocal synchrony via the PRAAT. All

the studies measured therapeutic alliance via self-report assessments, such as the Working Alliance Inventory (WAI), Working Alliance Inventory-Short Form (WAI-SF; Hatcher and Gillaspay 2006), Client Working Alliance Inventory-Short Form (CWAI-SF; Tracey and Kokotovic 1989), Helping Alliance Questionnaire (HAQ; Luborsky et al. 1996), Rupture Resolution Rating System (3RS; Eubanks et al. 2019), Bern Post-Session Report—Patient (BPSR-P; Flückiger et al. 2010), Session Evaluation Questionnaire (SEQ; Stiles 1980) and Session Rating Scale (SRS; Duncan et al. 2003). In $k=4$, CBT was used as a therapeutic approach; $k=1$ used CBT and PDT; $k=2$ used PDT; $k=1$ used adolescent identity treatment; $k=1$ used couples therapy; $k=1$ used counselling and $k=1$ used crisis intervention (specific for emergency clinical encounters; Bryan et al. 2018).

Figure 2 presents the forest plot. The correlation coefficient based on the random-effects model reported a small yet significant effect size ($r=0.19$; 95% CI: 0.02–0.35; $z=2.18$, $p=0.02$).

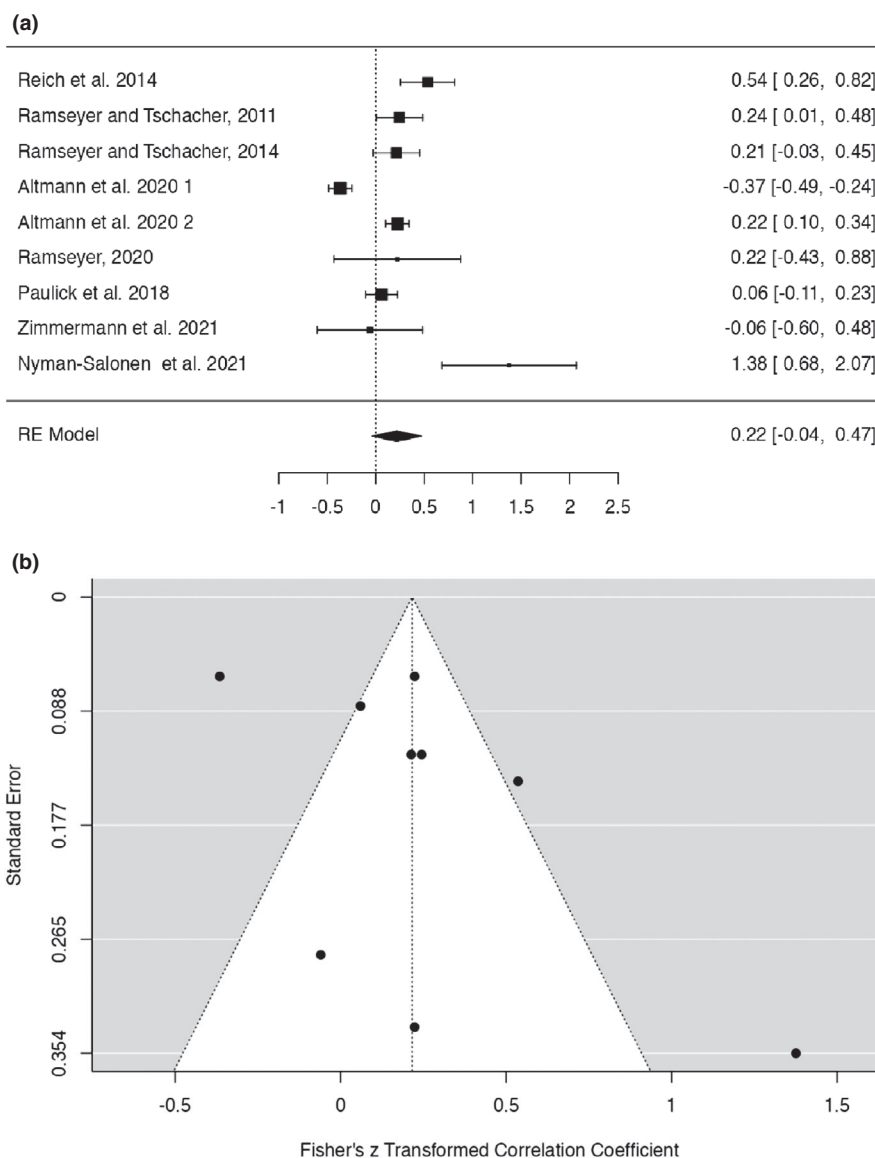


FIGURE 3 | (a) Forest plot of nonverbal synchrony and therapeutic outcome. (b) Funnel plot for asymmetry in the studies on the relationship between nonverbal synchrony and therapeutic outcome.

Heterogeneity was observed between the studies ($Q_{(11)} = 51.58$, $p < 0.001$, $\tau^2 = 0.06$, $I^2 = 83.91\%$). Neither the rank correlation ($p = 0.67$) nor the regression test ($p = 0.98$) indicated funnel plot asymmetry. The trim-and-fill analysis did not detect any missing studies (Figure S1 in the Appendix S1). The moderating effect of the type of therapeutic approach (CBT vs. others) was assessed. No significant effect was observed for the relationship between synchrony and therapeutic alliance ($b = -0.04$, $SE = 0.16$, $p = 0.79$, $CI: -0.37$ to 0.28). Finally, since Cook's distance detected that one study (Reich et al. 2014) overly influenced the overall outcome, the analysis was re-conducted after this study was excluded. Results showed a larger and still significant effect size ($r = 0.24$; 95% $CI: 0.12$ – 0.37 ; $z = 3.94$, $p < 0.001$; Figure S2 in the Appendix S1). According to the Q -test, the studies were heterogeneous ($Q_{(11)} = 29.08$, $p < 0.001$, $\tau^2 = 0.02$, $I^2 = 66.74\%$). Neither the rank correlation nor regression test indicated funnel plot asymmetry ($p = 0.40$ and $p = 0.96$, respectively).

3.2 | Association Between Nonverbal Synchrony and Therapeutic Outcome

Of the 11 included studies, eight assessed the association between nonverbal synchrony and therapeutic outcomes (Table 2). Of these, six and two had a longitudinal and cross-sectional design, respectively. These studies presented a measure of movement synchrony ($k = 7$) measured with the MEA, and vocal synchrony ($k = 1$) assessed with the PRAAT. Therapeutic outcomes were assessed with the Inventory of Interpersonal Problems (IIP and IIP-12-Short Form; Horowitz et al. 1988; Lutz et al. 2006), Beck Depression Inventory (BDI-II; Beck, Steer, and Brown 1996) and other measures of global outcomes, such as Goal Attainment Scaling (GAS; Kiresuk, Smith, and Cardillo 2014), Levels of Personality Functioning Questionnaire (LoPF-Q; Goth, Birkhölzer, and Schmeck 2018) and Clinical Outcomes in Routine Evaluation-Outcome Measure (CORE-OM; Duncan et al. 2003). Regarding

the therapeutic approach, $k=4$ studies used CBT, $k=1$ used CBT and PDT, $k=1$ used adolescent identity treatment, $k=1$ used couples therapy and $k=1$ used counselling. Figure 3 presents the forest plot. The selected studies showed an overall medium yet insignificant effect size ($r=0.22$; CI: -0.04 to 0.47 ; $z=1.65$, $p=0.09$). The studies were heterogeneous ($Q_{(8)}=83.91$, $p<0.001$, $\tau^2=0.12$, $I^2=91.32\%$). According to Cook's distances, no studies with negative effect sizes were overly influential. Neither the rank correlation nor regression test indicated any funnel plot asymmetry ($p=0.29$ and $p=0.06$, respectively; Figure S3 in the Appendix S1). CBT versus other therapies did not moderate the relationship between nonverbal synchrony and therapeutic outcome ($b=0.39$, $SE=0.24$, CI: -0.08 to 0.86 , $p=0.10$).

4 | Discussion

This meta-analysis investigated the strength of the relationship between nonverbal synchrony and therapeutic alliance and outcome. Regarding therapeutic alliance, nonverbal synchrony was significantly associated with patients' perceived sense of alliance, even though the effect was relatively small. Differences in effect sizes across studies were moderate. Furthermore, significant heterogeneity was indicated as the effect sizes ranged from small to large. Regarding the studies that investigated the association between movement synchrony and therapeutic alliance, we found a negative association in only one study (Zimmermann et al. 2021). Moreover, consistent with studentised residuals and Cook's distances, one study that presented a relationship between vocal synchrony and therapeutic alliance showed a robust negative effect size that influenced the overall result (Reich et al. 2014). Hence, we conducted an additional analysis without that study which resulted in a medium-sized association between synchrony and alliance.

Furthermore, the sensitivity analysis revealed the centrality of synchrony in building the therapeutic alliance, regardless of the therapeutic intervention, highlighting the association of nonverbal synchrony with the perception of collaboration, reciprocity and patient involvement. Therefore, this result gives insight into the potential role of the relational alignment within the patient-therapist bond, which could reinforce patients' ability to explore and process their emotions (Koole and Tschacher 2016). In this sense, nonverbal synchrony could work synergistically to facilitate therapeutic alliance and, in turn, sustain the emotional experience (Fisher et al. 2016). Therefore, such a process proceeds through a 'we mode' interactive space as a pathway that might sustain the epistemic trust (Fisher et al. 2023; Zilcha-Mano 2024). Additionally, our findings suggest that different forms of nonverbal synchrony could play specific and distinct roles in psychotherapeutic settings. Indeed, vocal synchrony was potentially less satisfactory than movement synchrony, aligning with the idea that it could be considered a by-product of the relationship rather than a mechanism related to promoting the affective dimensions of the therapeutic relationship (Reich et al. 2014).

However, the results revealed no significant association between nonverbal synchrony and therapeutic outcomes. This result could be interpreted within the context of the study's

limitations and concerning the implication of additional factors that might impact the effects of psychotherapy, such as the severity of the patient's psychopathology (Marble, Høglend, and Ulberg 2019) and the therapist's characteristics (Ackerman and Hilsenroth 2003; Parolin et al. 2017). Our findings suggest that nonverbal synchrony could strengthen the therapeutic process at the micro-level (therapeutic alliance), sustaining mutual agreement and patient collaboration, rather than at the macro-level (therapeutic outcome). Regarding the moderating role of different therapeutic approaches, synchrony could be further influenced by dynamic features related to qualitative and affective relational features rather than the therapeutic approach.

4.1 | Limitations

Despite the potential contribution of this meta-analysis, we need to acknowledge some limitations. As Delaherche et al. (2012) have shown, synchrony is a multidimensional phenomenon that could be studied from different perspectives (e.g., psychological studies, signal processing) and using various techniques of analysis (e.g., correlation, windowed cross-lagged regression). However, this manifold nature of synchrony could reduce the possibility of summarising information for a specific research context. In line with this, here we selected studies that presented an overall measure of synchrony, maintaining coherence regarding how nonverbal synchrony was measured (movement and vocal). Moreover, since one of our aims was to explore the strength of the association between nonverbal synchrony and the formation of the alliance and the global effects in psychotherapy, for the alliance, we just selected the patient's perception, keeping homogeneity among the measurements. Regarding the therapeutic outcomes, we did not adopt any restrictions about the selection in coherence with our research context and in line with a previous meta-analysis (Jennissen et al. 2018).

Overall, as existing studies have pointed out (Atzil-Slonim et al. 2023; Wiltshire et al. 2020), this meta-analysis reveals methodological issues due to the limited number of studies, especially for the outcome, the limited size of samples and the characteristics. Furthermore, the therapeutic alliance and outcome measures were selected without specific restrictions. Specifically, we included measures on therapeutic outcomes related to different constructs that could increase the complexity. However, since we aimed to investigate the independent strength of the association of nonverbal synchrony at the micro- and macro-levels, our meta-analysis did not allow a comparison of the two effect sizes. Finally, we included all the therapeutic approaches that might affect the overall results and the moderation analysis for both meta-analyses.

5 | Conclusion and Future Perspectives

This is the first meta-analysis to analyse the strength of the association between nonverbal synchrony and therapeutic variables. Our findings revealed that nonverbal synchrony played a central role in therapeutic relationships and in sustaining the therapeutic alliance related to patient perception rather than therapeutic outcome. Overall, these findings provide insights for future studies. Further research should investigate (1) the role

of other modalities of synchrony, (2) the individual characteristics of the therapist, (3) whether nonverbal synchrony indirectly improved and promoted therapeutic outcomes regarding symptom reduction through alliance and (4) the role of synchrony in repairing ruptures. Moreover, technologies and training (feedback systems) might foster the awareness of being in and out of synchrony and increase the ability to modulate such relational features to enhance the therapeutic bond.

Conflicts of Interest

The authors declare no conflicts of interest.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.