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Beyond Words: Language Style Matching as an Index of Therapeutic Alliance in Psychotherapy

THESIS

submitted in partial satisfaction of the requirements
for the degree of

MASTER OF ARTS

in Social Ecology

by

Anna Sanova

Thesis Committee:
Associate Professor Jessica L. Borelli, Chair
Assistant Professor of Teaching Amy L. Dent
Associate Professor Alyson K. Zalta

2022

Dedication

For Karen,

who has taught me to stay curious…

A map is not the territory it represents.

— Alfred Korzybski, *Science and Sanity*

encouraged me to face my greatest fears…

The best way out is always through.

— Robert Frost, "A Servant to Servants"

and remained by my side in darkness and light.

And so we came forth, and once again beheld the stars.

— Dante Alighieri, *Inferno*

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I thank my family for teaching me the importance of hard work and perseverance by their example, supporting my personal and professional goals, and helping me adapt to the unexpected.

Abstract

Beyond Words: Language Style Matching as an Index of Therapeutic Alliance in Psychotherapy

by

Anna Sanova

Master of Arts in Social Ecology

University of California, Irvine, 2022

Associate Professor Jessica L. Borelli, Chair

Ever increasing evidence suggests that the quality of the unique partnership between psychotherapist and client, the therapeutic alliance, might be strongly predictive of treatment outcomes. However, therapeutic alliance is a complex construct that is difficult to measure directly and objectively. Moreover, there is a lack of established measures based on concrete behavioral phenomena that capture the therapeutic alliance as a dynamic, continuously evolving process. The behavioral synchrony literature supports the pursuit of indirect measures of the quality of the therapeutic alliance, with evidence indicating that language style matching (LSM) is predictive of treatment outcomes and could serve to index therapeutic alliance. The present language analysis study of psychotherapy session transcripts from 48 therapist-client dyads examined the relation between LSM and scores on an existing observer-rated therapeutic alliance measure, the revised version of the Collaborative Interactions Scale (CIS-R). LSM during the middle of the therapy session was a moderately strong positive predictor of CIS-R score for the same portion of the session, suggesting that LSM could be phenomenologically related to therapeutic alliance. Future research should examine different aspects of the therapeutic alliance more closely in order to clarify these findings, and replicate them in other samples.

Keywords: language style matching, therapeutic alliance, linguistic synchrony

Introduction

If psychotherapy were considered a prescription drug, its route of administration might be the relationship between psychotherapist and client. Consistent empirical and meta-analytic findings have highlighted that the quality of the therapeutic relationship strongly predicts treatment outcomes across a variety of psychotherapy techniques, while techniques themselves account for only 10-15% of the variance in outcomes (Falkenström et al., 2013; Graves et al., 2017; Kaiser et al., 2021; Lambert & Barley, 2002; Martin et al., 2000; Norcross, 2002). One major element of the client-therapist relationship, specifically the unique form of partnership between therapist and client, is termed *therapeutic alliance* (also known as "working alliance," or simply "alliance"), and is itself a strong predictor of therapy outcomes (Hovarth & Bedi, 2002). For example, the quality of the therapeutic alliance has a positive association with improvement in depression symptoms even after partialling out prior improvement (Barber et al., 2000), and more recent evidence suggests that therapeutic alliance could influence depression symptoms because changes in therapeutic alliance temporally precede symptom improvement (Zilcha-Mano et al., 2014). Another recent study comparing two depression treatments found that although within-client change in therapeutic alliance is more strongly associated with treatment outcome when therapeutic alliance is a main focus during treatment, trait-like therapeutic alliance is associated with treatment outcome whether or not therapeutic alliance is the intended mechanism for therapeutic change (Zilcha-Mano & Ben David-Sela, 2022).

Defining and Measuring Therapeutic Alliance

As the psychotherapy field enthusiastically reaches for evidence that could enable causal inferences about therapeutic alliance and outcomes, there remains the challenge of empirically characterizing the therapeutic alliance. The therapeutic alliance is a complex and dynamic

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process, spanning multiple constructs whose conceptual and operational definitions are apt to vary across schools of thought. The present study adopted a working definition of therapeutic alliance offered by Horvath and Bedi (2002, p. 41) to explicitly match theoretical concepts with specific phenomena. According to this definition, the therapeutic alliance, or "the quality and strength of the collaborative relationship between client and therapist in therapy," can be divided into three general components: 1) an *affective* dimension in terms of the *emotions* the client and therapist have about the therapy and each other; 2) a *cognitive* dimension in terms of *goals* for therapy, including agreement about what they are and how to work towards them, and 3) a *collaborative* dimension of *mutual engagement* in the therapy process.

There are several issues with current measures of therapeutic alliance. A definition of therapeutic alliance that unites emotional bonds, goal consensus, and mutual engagement paints an ongoing process that fluctuates from one moment to the next throughout the therapy session; in contrast, few therapeutic alliance measures to date employ a more fine-grained unit of analysis than an entire therapy session. If we measure therapeutic alliance too coarsely, we will fail to observe within-session variation that could be necessary for understanding therapeutic change. In addition, the most widely implemented measures of therapeutic alliance are based on retrospective reports by the client, therapist, and/or observer. Examples of such assessments include the California Psychotherapy Alliance Scales (Gaston & Marmar, 1994), the Working Alliance Inventory (Hatcher & Gillaspy, 2006; Horvath & Greenberg, 1989), the Revised Helping Alliance Questionnaire (Luborsky et al., 1996), and the Vanderbilt Therapeutic Alliance Scale (Shelef & Diamond, 2008). A major issue with using reports from the client and therapist is that they each have their own personal reporting biases. Observers display much greater internal consistency on assessments of therapeutic alliance than clients and therapists (Bachelor,

2013; Fenton et al., 2001) – in other words, the perspectives of participants in the therapy relationship are less reliable sources of information about the therapeutic alliance than observers. However, observers lack direct access to the participants' felt experience. Reliance on either primary or third-party raters also limits observable patterns to those that are readily consciously perceived, failing to capture social phenomena that occur outside of conscious awareness. Examining these latent components of client-therapist interactions could provide valuable insight into the inner workings of the therapeutic alliance and the mechanisms underlying therapeutic change (Ramseyer & Tschacher, 2011; Tourunen et al., 2019; Tschacher & Meier, 2020; Wiltshire et al., 2020).

Mentalizing in the Therapeutic Alliance

One relevant and remarkable aspect of human social interaction is the ability to mentalize, or hold each other's mental states in mind (Allen & Fonagy, 2019; Freeman, 2016; Frith & Frith, 2012; Luyten & Fonagy, 2015). This ability is associated with success in interpersonal relationships, including effective collaboration (Frith, 2012) and greater relationship satisfaction and commitment (Bierstetel et al., 2020). Mentalizing deserves greater attention in psychotherapy research because it is thought to play an integral role in the psychotherapy process (Bateman & Fonagy, 2013; Fonagy & Allison, 2014). Specifically, psychotherapy's explicit attention to the client's mental states (thoughts, emotions) makes mentalizing fundamental to the practice (Allen & Fonagy, 2019; Fonagy et al., 2019). The therapeutic alliance as a combination of emotional bonding, goal agreement, and mutual contributions to the therapy process is based in part on the therapist's ability to empathize with and reflect the client's internal states, requiring mentalizing to successfully establish and maintain it (Dimaggio et al., 2013; Dimaggio & Lysaker, 2015; Fonagy & Allison, 2014; Rogan,

2011; von Below, 2020). Thus, mentalizing is a prime area for scientific exploration of the therapeutic alliance.

Behavioral Synchrony as a Sign of Mentalizing

Mentalizing has been studied within the field of behavioral synchrony, which refers to automatic "mirroring" or mimicry that arises during social interactions as a result of participants' efforts to understand each other (Baimel et al., 2015) as well as anticipate future actions and behave in a collaborative fashion (Csibra, 2008). The recruitment of this ability to mentalize in psychotherapy highlights behavioral synchrony as an area of potential progress in measuring the therapeutic alliance. There is evidence that clients and therapists display spontaneous synchrony in a variety of forms, including bodily movements and patterns of vocal pitch (Koole & Tschacher, 2016; Ramseyer & Tschacher, 2011; Reich et al., 2014). A relatively unexplored form of behavioral (specifically linguistic) synchrony of potential interest to psychotherapy research is language style matching (LSM), a pattern of similarity in the use of function words in natural conversation. Function words convey grammatical structure and relations among concepts rather than content (e.g., underlined: "John and Jane went to the store."), and are not deliberately chosen (Niederhoffer & Pennebaker, 2002). LSM is predictive of relationship quality in intimate partners (Bowen et al., 2017), child attachment security in mother-child dyads (Borelli et al., 2017), and romantic relationship initiation and stability (Ireland et al., 2011).

LSM in Psychotherapy

LSM in the psychotherapeutic relationship is relatively unexplored. Preliminary research on LSM between psychotherapists and clients has found a relation between LSM and reduction in post-treatment psychiatric distress partialling out pre-treatment distress (Borelli et al., 2019). A recent exploratory study (Aafjes-van Doorn et al., 2020) examined the relation of LSM to

scores on the Working Alliance Inventory Observer scales as well as treatment outcomes in 7 long-term psychotherapy clients, and found that session-level LSM at the beginning of treatment was positively related to observed symptom reduction years later at the end of treatment. This study also explored the variation of LSM between speaking turns, termed "reciprocal LSM," and found that while reciprocal LSM was unrelated to psychopathology and treatment outcomes, it was positively related to scores on the Working Alliance Inventory Observer subscales relevant to tasks and goals requiring collaboration between the therapist and client. These results highlight LSM as a potentially useful and clinically relevant indicator of the quality of the therapeutic alliance with respect to therapist-client agreement and cooperation. To advance this area of research, what is needed now is replication in larger samples from a variety of types of psychotherapy, and a closer look at variation in the general quality of the therapeutic alliance over time within the therapy session. It is important to consider variation in LSM and therapeutic alliance over time within the session because certain aspects of the therapist-client interaction change over the course of the session. In general, the beginning of the session may include a greater focus on rapport building and goal setting, the middle of the session typically involves working through the client's issues and towards therapeutic goals, and the end of the session involves bringing the current interaction to a natural close before separation. As the focus of the therapist-client interaction changes, so might LSM, the quality of the therapeutic alliance, and/or the nature of the relation between the two constructs.

Assessing LSM in Psychotherapy

The existence of connections among LSM, therapeutic alliance, and treatment outcomes suggests that it might be possible to indirectly quantify the quality of the therapeutic alliance through LSM. LSM is methodologically appealing because it captures behavior that occurs

outside of conscious control (Gonzales et al., 2010) and can be measured with de-identified transcripts alone, making data collection less intrusive and reducing privacy risks relative to behavioral coding methods that require audio and video. There is preliminary research showing relations between LSM and therapeutic alliance, but in very small samples (Aafjes-van Doorn et al., 2020; Aafjes-van Doorn & Müller-Frommeyer, 2020). The present study therefore aimed to assess the strength of LSM as a predictor of therapeutic alliance in a larger sample of therapist-client dyads.

Word Count as a Potential Moderator of the Relation Between LSM and Therapeutic Alliance

Therapy session transcripts are apt to vary in word count (WC) between dyads and between partners within the dyad. Because LSM is calculated based on proportions of function words that are used, greater WC effectively allows a more precise measure of LSM, potentially affecting its validity and sensitivity to variation as an indirect measure of therapeutic alliance. The present study therefore also examined WC as a potential moderator of the strength of the relation between LSM and therapeutic alliance.

Current Study

The current study aimed to assess the relation between LSM and therapeutic alliance within therapist-client dyads as measured by the revised version of the Collaborative Interactions Scale (CIS-R, discussed further below; Colli, Gentile, Condino, & Lingiardi, 2019a), with WC as a potential moderator of the relation between LSM and CIS-R scores. Following recommendations from Colli and colleagues for use of the CIS-R, the therapy session was split into three segments of equal length (number of speaking turns). Each segment was analyzed separately for both LSM and therapeutic alliance. In all three segments, I expected LSM to be

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positively associated with therapeutic alliance as measured by CIS-R. I also expected that WC would be positively associated with the strength of the relation between LSM and CIS-R, such that greater WC would be associated with a stronger relation between LSM and CIS-R.

Method

Sample

Data were obtained from a preexisting online database (*Counseling and Psychotherapy Transcripts, Client Narratives, and Reference Works*, 2007), accessible with an institutional license held by the University of California, Irvine. The database included over two thousand anonymized transcripts of interactions between mental health service providers and clients and/or patients. The secondary analysis of de-identified transcripts was not research involving human subjects as defined by the United States Department of Health and Human Services and the Institutional Review Board of the University of California, Irvine.

Transcripts were excluded from the dataset for the current study if the recorded interaction was not psychotherapy (e.g., medication management). Therapy sessions with children and adolescents were excluded due to developmental differences. Therapy sessions with couples, families, and groups were excluded because of the additional interdependence of observations multiple clients would have introduced, and because group size appears to moderate relations between behavioral synchrony and outcome measures of positive affect and collaboration (Mogan et al., 2017). Unique therapists were identified by name if available, or from unique combinations of therapist characteristics (e.g., gender, degree level, years of experience), yielding 56 individual therapists. To avoid a nested data structure (i.e., interdependence of sessions within clients within therapists), one client was randomly selected from each therapist, resulting in 56 independent (non-overlapping) therapist-client dyads, then

one session was randomly selected from each dyad. Eight of these 56 transcripts were later

excluded because they were found to involve duplicate clients and/or therapists, were not of

psychotherapeutic content (e.g., medical appointments), or did not contain the entire therapy

session.

The final sample consisted of 48 complete therapy session transcripts from unique

therapist-client dyads. Of 48 dyads, 29 therapists (60.42%) and 22 clients (45.83%) were male;

16 therapists (33.33%) and 25 clients (52.08%) were female; gender was not reported for 3

therapists (6.25%) and 1 client (2.08%). Client and therapist genders were matched in 24 dyads

(50%), different in 20 dyads (41.67%), and could not be determined in 4 dyads (8.33%) due to

missing data. Client age was treated as a categorical variable with separations by decade (i.e., 21-

30, 31-40, and so on). Half of clients ($n = 24$; 50%) were reported to be 40 years of age or

younger; 10 (20.83%) were 41 or older; 14 (29.17%) were not reported. The median reported

client age was 31-40 years (minimum ≤20; maximum ≥81). Therapist years of experience was

treated as a categorical variable with separations by decade (i.e., ≤10, 11-20, 21-30, and so on).

The median reported level of therapist experience was 11 to 20 years (minimum ≤10; maximum

≥41). Of the 48 therapists, 14 (29.17%) had 10 or fewer years of experience, 16 (33.33%) had 11

or more years of experience, and 18 (37.5%) were missing this data. Most therapists ($n = 32$;

66.67%) held a doctorate degree (Ph.D., Psy.D., or M.D.), 5 (10.42%) held a master's degree,

and 11 (22.92%) were unreported. Of the 48 therapy sessions, 9 (18.75%) were some form of

cognitive/behavioral treatment, 11 (22.92%) were humanistic, 14 (29.17%) were

psychodynamic, 11 (22.92%) were other forms of psychotherapy (e.g., EMDR), and 3 (6.25%)

were not reported. Transcript publication year was reported for 35 (72.92%) of the transcripts,

and ranged from 1962 to 2012, with a median reported publication year of 1999.

Measures

Language Style Matching (LSM)

Psychotherapy session transcripts were cleaned and edited for compatibility with Linguistic Inquiry and Word Count (LIWC) language analysis software (Pennebaker et al., 2007). The language analysis returned the frequency (as a percentage) of nine functional parts of speech that are relevant to the construct of language style matching: 1) auxiliary verbs [e.g., have to, must be], 2) articles [e.g., the, a], 3) common adverbs [e.g., sometimes, always], 4) personal pronouns [e.g., I, you, they], 5) indefinite pronouns [e.g., that, it], 6) prepositions [e.g., before, within], 7) negations [e.g., no, never], 8) conjunctions [e.g., and, or, but], and 9) quantifiers [e.g., few, dozen, many] (Niederhoffer & Pennebaker, 2002). LSM was computed for each function word category according to an established algorithm (Gonzales et al., 2010) by calculating the percentage of total words in each function word category for client and therapist separately, then dividing the absolute value of the difference between client and therapist by their total, and subtracting the result from 1 to yield the percentage of matched function word use. For example, to calculate LSM for auxiliary verbs (aux) from therapist and client percentages:

$$LSM_{aux} = 1 - \frac{|aux_{client} - aux_{therapist}|}{aux_{client} + aux_{therapist}}$$

The average LSM across function word categories served as the composite LSM score for the therapist-client dyad.

Word Count (WC)

I originally proposed to compute a word count matching (WCM) variable as a potential moderator of the relation between LSM and CIS-R score, as follows:

$$WCM = 1 - \frac{|WC_{client} - WC_{therapist}|}{WC_{client} + WC_{therapist}}$$

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The above calculation would have yielded the percentage of WCM by subtracting the ratio of therapist-client difference in WC to total WC from 1. However, further discussion revealed a logical flaw in this idea: WCM could be high whether the two parties speak at length or hardly at all, so WCM out of context is not necessarily more indicative of measurement precision than simple WC. Instead, I pursued WC as a potential moderator of the relation between LSM and therapeutic alliance, with the rationale that higher WC would yield LSM scores that are more precise and more consistently predictive of slight differences in therapeutic alliance.

Therapeutic Alliance (CIS-R)

Therapeutic alliance was measured with the observer-rated Collaborative Interactions Scale – Revised version (CIS-R; Colli, Gentile, Condino, & Lingiardi, 2019a). This measure was selected for its demonstrated psychometric strength (Colli et al., 2019a), its systematic, fine-grained approach to coding information about bonds, goals, and engagement for both client and therapist, and its design for use with therapy session transcripts without accompanying audio or video. This measure has been used previously in several other studies of the therapeutic alliance examining the process of treatment (Locati et al., 2019) and applying the measure to the treatment of several different mental disorders, including depression (Del Giacco et al., 2020) and panic disorder (Rocco et al., 2013). The CIS-R yields scores of therapist and client contributions to the therapy process over the course of each third of the therapy session. Therapist and client speaking turns are coded for the presence or absence of specific contributions to the therapy process as defined by their quality (collaboration vs. non-collaboration) and content (e.g., affect, goals). Each contribution type is scored on a scale of 0-4 reflecting incidence, with 0 representing the absence of the contribution type and 4 representing four or more occurrences. For the present study, incidence of each contribution type was instead

scored as a raw count of the number of instances and converted to a ratio (the number of instances divided by total speaking turns).

One Psychological Science graduate student performed CIS-R coding of 48 psychotherapy session transcripts. As recommended by the instrument's creators (Colli et al., 2019b), transcripts were divided into three segments of equal length to maximize psychometric validity. Composite therapeutic alliance scores were obtained for each segment by subtracting the ratio of non-collaborative behavior from the ratio of collaborative behavior.

Inter-Rater Reliability. One volunteer post-baccalaureate research assistant coded 10 of the 48 session transcripts. Raw and composite therapeutic alliance scores obtained for this rater in the same manner as the original rater were used for inter-rater reliability analyses.

Procedure

Language Analysis

As with the CIS-R coding procedure, psychotherapy session transcripts were divided into three segments of equal length. Client and therapist utterances were saved in separate Microsoft Word document files. Undergraduate research assistants cleaned and edited these files for compatibility with LIWC software's dictionary (e.g., changing nonverbals such as "Mm-hmm" to "Um"). Research assistants used the "Track Changes" feature in Microsoft Word to enable quality control. Copies of edited files with changes accepted were then analyzed with LIWC. This yielded WC and the prevalence of each part of speech that is relevant to LSM for each session segment for the client and the therapist. LSM scores were then computed in SPSS from these data.

Therapeutic Alliance (CIS-R)

The original graduate student rater performed CIS-R coding based on the instructions and example items provided in the CIS-R coding manual. After having coded the full dataset, this rater trained the second volunteer rater during in-person and remote meetings held one to two times per week for two months, accompanied by both supervised and independent practice. The second rater's training began with reviewing the CIS-R coding manual, discussing the rationale for the different subscales of the CIS-R, highlighting the characteristics of and distinctions among the coded behaviors, and instructing the second rater in coding and data handling procedures. During supervised practice with one session transcript, the graduate student rater was available to answer the trainee's questions about the coding procedure and assist the trainee in learning to categorize therapist and client behaviors according to the CIS-R manual. The trainee completed independent practice with four additional session transcripts, each followed by a meeting to review coding errors and address remaining concerns. After this training, the second rater coded 10 transcripts without aid or supervision from the original rater.

Analytic Strategy

Statistical analyses were conducted in SPSS version 26, separately for each of the three transcript segments. It was confirmed that the data reasonably met the assumptions of OLS regression. Two outliers (>3 standard deviations from the sample mean) were Winsorized: one for LSM and one for CIS-R. Missing demographic data were addressed by performing 40 imputations by fully conditional specification based on the data that were present, and then aggregating (i.e., averaging) the imputed data into a single dataset. Hierarchical regression analyses were performed for each segment of the therapy session, with composite LSM (combining all 9 relevant parts of speech) as the predictor of interest, WC as a moderator, and

composite CIS-R score (combining all coded behaviors) as the criterion variable. To reduce

nonessential covariation, all continuous predictor variables (including LSM and WC) were mean

centered by subtracting the sample mean from all scores.

Covariates. Statistical models included several covariates in addition to the variables of

interest. *Transcript publication year* was included to account for the evolution of psychotherapy

practice over the course of the late 20th and early 21st centuries, during which time the

therapeutic alliance has received substantial research attention and been incorporated into

therapist training. *Therapist-client gender matching* (dummy coded with 1 = different genders)

was included because research findings regarding the effects of gender matching on differences

in therapeutic alliance are ambivalent (as discussed by Behn, Davanzo, & Errázuriz, 2018).

Psychotherapy type (dummy coded variables for psychodynamic, humanistic,

cognitive/behavioral, and other, with cognitive/behavioral as the reference group) was included

in case differences in therapeutic techniques, or in the modalities' attitudes towards the role of

the therapeutic alliance in treatment, resulted in differences in LSM or CIS-R scores. *Therapist*

experience (dummy coded with 1 = ≤10 years and 0 = >10 years) was included because

inexperienced therapists could be less successful at building a strong therapeutic alliance or

might need to exert greater cognitive effort to do so, which could lead to therapist differences in

CIS-R scores or differences in LSM reflecting cognitive effort to relate to the client.

Statistical Models. For each segment, a hierarchical regression model including 3 sets of

predictors of therapeutic alliance was conducted, with CIS-R as the criterion variable. The first

set of predictors consisted of covariates and the potential moderator WC. The second set

consisted of the main predictor of theoretical interest: LSM. The third set contained the

interaction term for (i.e., mathematical product of) WC and LSM (WC x LSM) to address the potential moderating role of WC in the relation between LSM and CIS-R.

If the simple slope of the interaction term WC x LSM were statistically significant at an alpha level of .05 (i.e., the strength of LSM as a predictor of CIS-R varied significantly as a function of WC), the regression analysis would be repeated two more times: first with WC re-centered one standard deviation below the sample mean (low WC), then with WC re-centered one standard deviation above the sample mean (high WC), each time with corresponding interaction terms. These additional analyses would enable observation of variation in the strength of LSM as a predictor of CIS-R score at different WCs.

Inter-Rater Reliability

To compute inter-rater reliability, intra-class correlation analyses were conducted for each segment and overall. These were 2-way mixed effects models with rater agreement defined in terms of consistency. Because raw (count-based) CIS-R scores were converted to ratios for hypothesis testing, separate analyses were performed for raw CIS-R scores and ratio-converted scores for comparison.

Results

WC, LSM, and CIS-R each displayed significant correlations among all three segments of the therapy session, but the three variables were not necessarily correlated with one another (See Table 2). While LSM for segments 1, 2, and 3 were significantly correlated, only LSM for segment 2 was significantly correlated with CIS-R for the same segment. WC was significantly correlated with LSM only within segments 2 and 3. CIS-R scores were not significantly related to treatment type, transcript publication year, therapist-client gender matching, or therapist experience. In segments 1 and 3 of the session, therapist experience of ≤10 years was correlated

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with greater LSM, but not with CIS-R (See Table 2). Therapist experience emerged as a strong linear predictor of CIS-R scores only in the middle segment of the therapy session (see Table 4).

Differences Over the Course of the Therapy Session

Based on dependent means *t*-tests comparing mean LSM scores among segments of the therapy session, LSM was not significantly different among segments [segment 1 vs. segment 2: $t(47) = -1.18$, $p = .24$; segment 1 vs. segment 3: $t(47) = -.66$, $p = .51$; segment 2 vs. segment 3: $t(47) = .56$, $p = .58$].

Based on dependent means *t*-tests comparing mean CIS-R scores among segments of the therapy session, CIS-R scores significantly decreased from segment 1 to segment 2 [$t(47) = -2.30$, $p = .03$] and remained significantly lower than segment 1 during segment 3 [$t(47) = -2.90$, $p = .01$]. There was no significant difference in CIS-R between segments 2 and 3 [$t(47) = -.30$, $p = .77$].

Based on dependent means *t*-tests comparing mean WC (for therapist and client, respectively) among segments, therapists uttered significantly more words on average in segment 3 than in segments 1 and 2 [segment 3 vs. segment 1: $t(47) = 3.09$, $p = .003$; segment 3 vs. segment 2: $t(47) = 3.44$, $p = .001$], while clients uttered significantly fewer words on average in segment 3 than in segments 1 and 2 [segment 3 vs. segment 1: $t(47) = -3.24$, $p = .002$; segment 3 vs. segment 2: $t(47) = -2.47$, $p = .02$]. Clients also uttered marginally significantly fewer words in segment 2 than in segment 1 [$t(47) = -1.90$, $p = .06$].

Inter-Rater Reliability

Raw Scores

Overall inter-rater reliability for raw (count-based) CIS-R scores across all segments (30 pairs of observations, 2 raters) was poor but significantly greater than 0 [$\kappa = .20$, CI (.20, .21), *p*

< .001]. Reliability for segment 1 (10 pairs of observations) was poor but significantly greater than 0 [κ = .36, CI (.35, .36) p < .001]. Reliability for segment 2 (10 pairs of observations) was extremely poor [κ = .03, CI (.03, .04) p = .70]. Reliability for segment 3 was very poor [κ = .14, CI (.14, .15) p = .08].

Ratio Scores

Overall inter-rater reliability for ratio-converted CIS-R scores across all segments (30 pairs of observations, 2 raters) was very poor [κ = .07, CI (.07, .08), p = .21]. Reliability for segment 1 (10 pairs of observations) was extremely poor [κ = .03, CI (.02, .04) p = .83]. Reliability for segment 2 (10 pairs of observations) was extremely poor [κ = .00, CI (-.01, .01) p = 1.00]. Reliability for segment 3 was extremely poor [κ = .05, CI (.04, .06) p = .68].

Hypothesis Testing

Segment 1

For the first third of the therapy session, covariates and WC alone did not significantly explain variation in CIS-R [R^2 = .14, adj. R^2 = -.01, $F(7, 40)$ = .93, p = .50]. Adding LSM did not significantly improve the proportion of variation explained in CIS-R [ΔR^2 = .01, $\Delta F(1, 39)$ = .39, p = .53]. Adding WC x LSM thereafter did not significantly improve the proportion of variation explained in CIS-R [ΔR^2 = .001, $\Delta F(1, 38)$ = .05, p = .82] (See Table 2).

The final hierarchical regression model including all three sets of predictors did not explain a significant proportion of variation in CIS-R scores [R^2_{all} = .15, adj. R^2_{all} = -.05, $F(9, 38)$ = .74, p = .67]. Specifically, covariates, WC, LSM, and WC x LSM interaction together explained none of the observed variation in therapeutic alliance as measured by the CIS-R.

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Segment 2

For the middle segment of the therapy session, covariates and WC alone did not

significantly explain variation in CIS-R [R^2 = .26, adj. R^2 = .13, $F(7, 40)$ = 2.00, p = .08]. Adding

LSM significantly improved the proportion of variation explained in CIS-R [ΔR^2 = .10, $\Delta F(1,$

39) = 5.72, p = .02]; specifically, the inclusion of LSM explained 10% additional variation in

CIS-R. Adding WC x LSM did not further significantly improve the proportion of variation

explained in CIS-R [ΔR^2 = .03, $\Delta F(1, 38)$ = 1.93, p = .17] (See Table 3).

The final hierarchical regression model including all three sets of predictors explained a

significant proportion of variation in CIS-R scores [R^2_{all} = .39, adj. R^2_{all} = .24, $F(9, 38)$ = 2.65, p

= .02]. Specifically, covariates, WC, LSM, and WC x LSM interaction together explained 24%

of the observed variation in therapeutic alliance as measured by the CIS-R.

LSM was a positive, significant linear predictor of therapeutic alliance partialling out

covariates and WC [$b_{y2.1}$ = 1.41, 95% CI$_{boot}$ (-.33, 2.57), $t(39)$ = 2.39, p = .02]. Specifically, after

partialling out publication year, client-therapist gender matching, therapist experience, type of

therapy, and WC, every 1% increase in LSM predicted a 1.4% increase in therapeutic alliance as

measured by the CIS-R. An increase in LSM strongly predicted an increase in therapeutic

alliance given the partial standardized regression coefficient .35, a moderate effect size.

Segment 3

For the final third of the therapy session, covariates and WC alone did not significantly

explain variation in CIS-R [R^2 = .14, adj. R^2 = -.01, $F(7, 40)$ = .91, p = .51]. Adding LSM did not

significantly improve the proportion of variation explained in CIS-R [ΔR^2 = .01, $\Delta F(1, 39)$ = .51,

p = .48]. Adding WC x LSM thereafter did not significantly improve the proportion of variation

explained in CIS-R [ΔR^2 = .02, $\Delta F(1, 38)$ = .71, p = .41] (See Table 4).

The final hierarchical regression model including all three sets of predictors did not explain a significant proportion of variation in CIS-R scores [R^2_{all} = .16, adj. R^2_{all} = -.03, $F(9, 38)$ = .83, p = .59]. Specifically, covariates, WC, LSM, and WC x LSM interaction together explained none of the observed variation in therapeutic alliance as measured by the CIS-R.

Discussion

Consistent with my primary hypothesis, greater LSM predicted greater CIS-R scores during the middle segment of the therapy session, suggesting that LSM could be an indirect indicator of therapeutic alliance. This is consistent with an earlier study showing relations among LSM, treatment outcomes, and a different therapeutic alliance measure. These findings are important for the future of psychotherapy research because they represent the possibility of measuring the quality of the therapeutic alliance objectively and without time-intensive observer rating procedures. The finding that LSM is positively correlated with therapeutic alliance is consistent with prior behavioral synchrony literature showing that psychotherapists and clients display a variety of forms of nonverbal synchrony (Koole & Tschacher, 2016; Ramseyer & Tschacher, 2011; Reich et al., 2014; Tschacher & Meier, 2020), and that LSM is associated with a variety of desirable relationship qualities and dynamics in multiple types of interpersonal relationships. The current study contributes to the growth of the more specific area of scientific literature concerning LSM in the psychotherapy relationship, building on prior research (Aafjes-van Doorn et al., 2020; Borelli et al., 2019) by examining a larger sample encompassing a variety of therapeutic approaches and using a different measure of therapeutic alliance. This study is the first to correlate LSM with scores on the CIS-R, and it has the largest sample size of studies so far examining the relation of LSM with therapeutic alliance.

Contrary to my moderation hypothesis, the interaction term between LSM and WC was not statistically significant, indicating that the strength of the relation between LSM and CIS-R does not significantly vary with WC. This suggests that low WC does not necessarily come at the cost of accuracy of LSM as an index of therapeutic alliance. It should be noted, however, that greater WC – in other words, talking more – was highly correlated with CIS-R during the middle segment of the therapy session, which is consistent with the conceptualization of psychotherapeutic collaboration as mutual engagement in the consideration and discussion of the client's mental and emotional states and behaviors. It is also important to consider that the theoretical traditions underlying different types of psychotherapy encourage different amounts of conversation and different proportions of therapist and client speech (e.g., the therapist as a largely silent "blank slate" in psychoanalytic psychotherapy), so future research should explore whether the connection between LSM and therapeutic alliance is moderated by therapy type.

One major question raised by the current findings is why the results were not consistent across segments of the therapy session – the positive association between LSM and therapeutic alliance was only present in the middle segment of therapy session. There could be several factors contributing to this irregularity. For instance, the naïve therapist is worthy of further research attention because therapist inexperience was correlated with greater LSM for segments 1 and 3 only. This might indicate that inexperienced therapists exert great effort to connect with the client throughout the session, while more experienced therapists are able to rely more on cognitive shortcuts formed over the course of their training and practice. Another interesting question is why the middle of the therapy session did not show the same difference between experienced and inexperienced therapists as the beginning and end – one possibility is that the middle segment of the transcripts encompasses the portion of the therapy session where the

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substantive therapeutic "work" takes place (Dobson & Dobson, 2013), demanding greater conscious attention and cognitive effort from experienced and inexperienced practitioners alike. Another possibility is that, consistent with the recent findings of Aafjes-van Doorn and colleagues (2020), LSM is positively related to the tasks/goals subscales of existing observer-rated therapeutic alliance measures, and behavior related to tasks/goals forms the bulk of the observable therapeutic alliance during the middle segment of the therapy session. It is therefore important for future research to examine the relations of LSM to the subscales of observer-rated therapeutic alliance measures.

The general process of the therapy session is also worth exploring as a possible source of variation in the relation between LSM and therapeutic alliance. Generally, the beginning of the session includes a greater focus on rapport building, the middle of the session is devoted to working through the client's problems and concerns, and the latter part of the session involves preparation for the impending separation between therapist and client as the session ends (Dobson & Dobson, 2013). Differences between specific therapeutic techniques may also contribute to the observed variation. For example, cognitive-behavioral therapy may focus on reviewing prior "homework" at the beginning of the session and assigning new "homework" at the end of the session, which is not the case with some other approaches (e.g., psychodynamic). Given these aspects of the practice of psychotherapy generally as well as techniques specific to different types of therapy, it is possible that the relation between LSM and therapeutic alliance is moderated by a variety of factors at the beginning and end of the session, which should be explored further. Future research should aim to replicate the current findings in a variety of samples that represent the use of different therapeutic techniques.

The current dataset has much more to offer linguistically and in terms of client, therapist, and contextual information. Future research with the current dataset could pursue more complex questions about variation in LSM and therapeutic alliance within the therapy session, between speaking turns, over the course of treatment in clients with multiple session transcripts available, and in connection with other factors that can be measured using text analyses (e.g., emotional awareness; Barchard, Bajgar, Leaf, & Lane, 2010). Some of the therapists in the database have multiple clients and/or multiple sessions within clients. This would enable repeated measures studies of LSM and therapeutic alliance over the course of treatment, with the ability to partial out prior LSM and therapeutic alliance to explore whether LSM is a useful indicator of therapeutic alliance quality in the moment.

In addition to future research delving deeper into the present dataset, similar research should be done with other large samples to replicate the present findings in various clinical populations and examine their consistency across treatment techniques. Future studies could focus on samples from specific types of psychotherapy and examine any differences associated with the presence of specific forms of psychopathology, such as depression. This would further clarify the range of applicability of LSM as a potentially useful and clinically relevant indicator of therapeutic alliance quality. Future research in this direction should also assess the relation of LSM with a variety of therapeutic alliance measures to clarify the dimensions of the therapeutic alliance best indexed by LSM.

Limitations

Design

With respect to the relation between LSM and therapeutic alliance, the current study consists of correlational assessments and does not allow inferences about the existence or

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directionality of influence. In order to clarify the role of LSM in the therapeutic alliance, future studies using this and other similar datasets should be designed to assess whether LSM temporally precedes therapeutic alliance in a given session. For example, an extension of the current study could model the relation of LSM and therapeutic alliance partialling out prior therapeutic alliance.

Data Quality and Analyses

The transcripts examined in the present study originated from diverse primary sources, resulting in inconsistencies and sometimes missing data. Without access to original recordings of many of the therapy sessions, there was no way to assess transcription quality. The study also could not account for the point in treatment when each analyzed session occurred, because this information was usually unavailable. Differences in time of measurement (beginning vs. middle vs. end of treatment) could have introduced variation with the potential to obscure existing effects.

The present study made use of multiple imputation methods to fill in missing data; however, the final analyses were performed on an aggregated (averaged) dataset, as opposed to analyzing the 40 imputed datasets independently and pooling the results of the analyses. The latter process has greater internal validity (Sinharay et al., 2001), and should be performed to confirm the present findings prior to submitting them for formal peer review and publication.

Although data were often available for multiple sessions within clients and multiple clients within therapists, the present study analyzed only one randomly selected session per unique therapist-client dyad. This approach greatly reduced the number of available observations, placing potentially impactful limits on statistical power. It is also possible that the results of the study would have been different if other sessions had been analyzed instead. An

alternative approach to this study would be to include all available sessions and analyze the nested data using multi-level modeling instead of hierarchical regression.

CIS-R Ratings and Internal Validity

The primary CIS-R coder in the current study was a graduate student without clinical psychology training, raising the potential for differences from ratings made by clinically experienced raters. Inter-rater reliability for CIS-R scores was poor for each segment and overall, potentially calling the study's findings into question. This study did not achieve adequate inter-rater reliability despite closely mirroring the rater training methods described by the scale's authors (Colli et al., 2019a). This is likely due to a variety of factors, including the two raters not receiving the same training simultaneously, the raters' lack of clinical experience, the highly complex structure of the CIS-R, and the challenge of attempting to capture a spectrum of social processes through behavioral categorization. In addition, when a recorded psychotherapy session is reduced to a written transcript, there is a significant loss of information about important nuances of the interaction (e.g., humor, sarcasm, warmth) that are typically conveyed through audiovisual cues such as tone of voice and body language. Because only one session was analyzed per dyad, there was no additional context for understanding the idiosyncrasies and implicit understandings specific to each therapist-client relationship (e.g., "inside jokes"), at times resulting in ambiguity that made therapeutic alliance ratings difficult. Researchers who use the CIS-R in their work should be mindful of the recommended level of clinical expertise for carrying out the measure and the potential for measurement error due to differences in raters' interpretations of the client-therapist interactions.

External Validity

The data in the present study were voluntarily contributed to a database by psychotherapy practitioners. There are factors not addressed within the present study that may have affected the ability to obtain these data in the first place (e.g., clients' consent to be recorded), the data's availability years after acquisition, and practitioners' awareness of this database and their willingness and ability to contribute materials. These factors potentially limit the external validity of the study to settings in which therapy sessions are recorded specifically for the purpose of research, therapist training, and/or clinical supervision. The practice of recording sessions for supervision would be consistent with a large proportion of therapists in the present sample having ten or fewer years of experience. Conversely, multiple sessions in the sample were conducted by expert therapists and recorded to serve as training materials that demonstrate psychotherapeutic techniques. There are few naturally occurring circumstances in psychotherapy practice that demand recording sessions conducted by therapists of average experience, so these therapists may be underrepresented in the current sample.

The present dataset lacks a variety of demographic and cultural information about most therapists and/or clients, including race/ethnicity, nationality, sexual identity and orientation, relationship status, education level, and socioeconomic status and background. This makes it impossible to assess the sample's representativeness of real-world populations of psychotherapy clients and practicing therapists, especially in research with minority or underserved populations who are underrepresented in the research literature. This also does not allow statistical models to account for therapist-client matching on demographic and cultural factors that could affect the process of building rapport and account for some variation in LSM and/or CIS-R. In addition, the results of the current study may not generalize beyond the English-speaking population. Future

research should aim to replicate the current findings in culturally diverse samples and samples representative of underserved clinical populations that deserve greater attention from the scientific community.

Conclusion

Research over the past several decades has highlighted and consistently underscored the importance of the therapeutic alliance for effective psychotherapy. However, as with many social and psychological phenomena, the role of the therapeutic alliance in therapeutic change has yet to be empirically confirmed and fully explained. Incorporating LSM into the methodological repertoire as an indirect measure of therapeutic alliance would improve the efficiency of psychotherapy research. The only equipment required for raw data collection is an audio recording device, and recordings could be destroyed after transcription to minimize privacy risks to research participants. The use of LSM as a therapeutic alliance metric would facilitate unobtrusive data collection in naturalistic settings, computerized scoring of larger datasets, and assessment of variation in therapeutic alliance throughout the therapy session. This advancement in methodology would enable great strides forward in research efforts to understand the dynamics of the therapeutic relationship and its role in successful mental health treatment. Information gleaned from future research in this direction could eventually be applied to therapist training and practice in both clinical and private settings. The application of this research would serve to enhance the positive effects of psychotherapy in a variety of treatment populations, aiming to maximize potential improvements in psychological wellbeing.

References

Aafjes-van Doorn, K., & Müller-Frommeyer, L. (2020). Reciprocal language style matching in psychotherapy research. *Counselling and Psychotherapy Research*, *20*(3). https://doi.org/10.1002/capr.12298

Aafjes-van Doorn, K., Porcerelli, J., & Müller-Frommeyer, L. C. (2020). Language style matching in psychotherapy: An implicit aspect of alliance. *Journal of Counseling Psychology*, *67*(4). https://doi.org/10.1037/cou0000433

Allen, J., & Fonagy, P. (2019). Mentalizing in Psychotherapy. In *The American Psychiatric Association Publishing Textbook of Psychiatry*. https://doi.org/10.1176/appi.books.9781615372980.lr35

Bachelor, A. (2013). Clients' and Therapists' Views of the Therapeutic Alliance: Similarities, Differences and Relationship to Therapy Outcome. *Clinical Psychology and Psychotherapy*, *20*(2), 118–135. https://doi.org/10.1002/cpp.792

Baimel, A., Severson, R. L., Baron, A. S., & Birch, S. A. J. (2015). Enhancing "theory of mind" through behavioral synchrony. *Frontiers in Psychology*, *6*. https://doi.org/10.3389/fpsyg.2015.00870

Barber, J. P., Connolly, M. B., Crits-Christoph, P., Gladis, L., & Siqueland, L. (2000). Alliance predicts patients' outcome beyond in-treatment change in symptoms. *Journal of Consulting and Clinical Psychology*, *68*(6), 1027–1032. https://doi.org/10.1037/0022-006X.68.6.1027

Barchard, K. A., Bajgar, J., Leaf, D. E., & Lane, R. D. (2010). Computer scoring of the levels of emotional awareness scale. *Behavior Research Methods*, *42*(2), 586–595. https://doi.org/10.3758/BRM.42.2.586

Bateman, A., & Fonagy, P. (2013). Mentalization-based treatment. *Psychoanalytic Inquiry*,

33(6), 595–613. https://doi.org/10.1080/07351690.2013.835170

Behn, A., Davanzo, A., & Errázuriz, P. (2018). Client and therapist match on gender, age, and income: Does match within the therapeutic dyad predict early growth in the therapeutic alliance? *Journal of Clinical Psychology*, *74*(9). https://doi.org/10.1002/jclp.22616

Bierstetel, S. J., Farrell, A. K., Briskin, J. L., Harvey, M. W., Gable, S. L., Ha, T., Ickes, W., Lin, W. F., Orina, M. M., Saxbe, D., Simpson, J. A., Ta, V. P., & Slatcher, R. B. (2020). Associations between language style matching and relationship commitment and satisfaction: An integrative data analysis. *Journal of Social and Personal Relationships*, *37*(8–9). https://doi.org/10.1177/0265407520923754

Borelli, J. L., Ramsook, K. A., Smiley, P., Kyle Bond, D., West, J. L., & Buttitta, K. H. (2017). Language Matching Among Mother-child Dyads: Associations with Child Attachment and Emotion Reactivity. *Social Development*, *26*(3), 610–629. https://doi.org/10.1111/sode.12200

Borelli, J. L., Sohn, L., Wang, B. A., Hong, K., Decoste, C., & Suchman, N. E. (2019). Therapist-client language matching: Initial promise as a measure of therapist-client relationship quality. *Psychoanalytic Psychology*, *36*(1), 9–18. https://doi.org/10.1037/pap0000177

Bowen, J. D., Winczewski, L. A., & Collins, N. L. (2017). Language Style Matching in Romantic Partners' Conflict and Support Interactions. *Journal of Language and Social Psychology*, *36*(3), 263–286. https://doi.org/10.1177/0261927X16666308

Colli, A., Gentile, D., Condino, V., & Lingiardi, V. (2019a). Assessing alliance ruptures and resolutions: Reliability and validity of the Collaborative Interactions Scale-revised version. *Psychotherapy Research*, *29*(3), 279–292. https://doi.org/10.1080/10503307.2017.1414331

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Colli, A., Gentile, D., Condino, V., & Lingiardi, V. (2019b). *Collaborative Interactions Scale –*
Revised CIS – R Coding Manual.

Counseling and Psychotherapy Transcripts, Client Narratives, and Reference Works. (2007).
Alexander Street Press, Sage Publications.
https://asp6new.alexanderstreet.com/psyc/psyc.index.map.aspx

Csibra, G. (2008). Action mirroring and action interpretation: An alternative account.
Sensorimotor Foundations of Higher Cognition. Attention and Performance XXII.

Del Giacco, L., Anguera, M. T., & Salcuni, S. (2020). The Action of Verbal and Non-verbal
Communication in the Therapeutic Alliance Construction: A Mixed Methods Approach to
Assess the Initial Interactions With Depressed Patients. *Frontiers in Psychology*, *11*.
https://doi.org/10.3389/fpsyg.2020.00234

Dimaggio, G., & Lysaker, P. H. (2015). Metacognition and mentalizing in the psychotherapy of
patients with psychosis and personality disorders. *Journal of Clinical Psychology*, *71*(2).
https://doi.org/10.1002/jclp.22147

Dimaggio, G., Nicolò, G., Semerari, A., & Carcione, A. (2013). Investigating the personality
disorder psychotherapy process: The roles of symptoms, quality of affects, emotional
dysregulation, interpersonal processes, and mentalizing. In *Psychotherapy Research* (Vol.
23, Issue 6). https://doi.org/10.1080/10503307.2013.845921

Dobson, D. J. G., & Dobson, K. S. (2013). In-Session Structure and Collaborative Empiricism.
Cognitive and Behavioral Practice, *20*(4). https://doi.org/10.1016/j.cbpra.2012.11.002

Falkenström, F., Granström, F., & Holmqvist, R. (2013). Therapeutic alliance predicts
symptomatic improvement session by session. *Journal of Counseling Psychology*, *60*(3),
317–328. https://doi.org/10.1037/a0032258

Fenton, L. R., Cecero, J. J., Nich, C., Frankforter, T. L., & Carroll, K. M. (2001). Perspective Is Everything The Predictive Validity of Six Working Alliance Instruments. *The Journal of Psychotherapy Practice and Research*, *10*(10), 262–268.

Fonagy, P., & Allison, E. (2014). The role of mentalizing and epistemic trust in the therapeutic relationship. *Psychotherapy*, *51*(3), 372–380. https://doi.org/10.1037/a0036505

Fonagy, P., Luyten, P., Allison, E., & Campbell, C. (2019). Mentalizing, Epistemic Trust and the Phenomenology of Psychotherapy. In *Psychopathology*. https://doi.org/10.1159/000501526

Freeman, C. (2016). What is Mentalizing? An Overview. *British Journal of Psychotherapy*, *32*(2), 189–201. https://doi.org/10.1111/bjp.12220

Frith, C. D. (2012). The role of metacognition in human social interactions. In *Philosophical Transactions of the Royal Society B: Biological Sciences* (Vol. 367, Issue 1599). https://doi.org/10.1098/rstb.2012.0123

Frith, C. D., & Frith, U. (2012). Mechanisms of social cognition. *Annual Review of Psychology*, *63*. https://doi.org/10.1146/annurev-psych-120710-100449

Gaston, L., & Marmar, C. R. (1994). The California Psychotherapy Alliance Scales. In *The Working Alliance: Theory, Research, and Practice* (pp. 85–108).

Gonzales, A. L., Hancock, J. T., & Pennebaker, J. W. (2010). Language style matching as a predictor of social dynamics in small groups. *Communication Research*, *37*(1), 3–19. https://doi.org/10.1177/0093650209351468

Graves, T. A., Tabri, N., Thompson-Brenner, H., Franko, D. L., Eddy, K. T., Bourion-Bedes, S., Brown, A., Constantino, M. J., Flückiger, C., Forsberg, S., Isserlin, L., Couturier, J., Paulson Karlsson, G., Mander, J., Teufel, M., Mitchell, J. E., Crosby, R. D., Prestano, C., Satir, D. A., … Thomas, J. J. (2017). A meta-analysis of the relation between therapeutic

alliance and treatment outcome in eating disorders. In *International Journal of Eating Disorders* (Vol. 50, Issue 4). https://doi.org/10.1002/eat.22672

Hatcher, R. L., & Gillaspy, J. A. (2006). Development and validation of a revised short version of the Working Alliance Inventory. *Psychotherapy Research*, *16*(1), 12–25. https://doi.org/10.1080/10503300500352500

Horvath, A. O., & Greenberg, L. S. (1989). Development and Validation of the Working Alliance Inventory. *Journal of Counseling Psychology*, *36*(2), 223–233. https://doi.org/10.1037/0022-0167.36.2.223

Hovarth, A. O., & Bedi, R. P. (2002). The Alliance. In J. C. Norcross (Ed.), *Psychotherapy Relationships That Work: Therapist Contributions and Responsiveness to Patients* (pp. 37–69). Oxford University Press.

Ireland, M. E., Slatcher, R. B., Eastwick, P. W., Scissors, L. E., Finkel, E. J., & Pennebaker, J. W. (2011). Language style matching predicts relationship initiation and stability. *Psychological Science*, *22*(1), 39–44. https://doi.org/10.1177/0956797610392928

Kaiser, J., Hanschmidt, F., & Kersting, A. (2021). The association between therapeutic alliance and outcome in internet-based psychological interventions: A meta-analysis. *Computers in Human Behavior*, *114*. https://doi.org/10.1016/j.chb.2020.106512

Koole, S. L., & Tschacher, W. (2016). Synchrony in Psychotherapy : A Framework for Understanding the Therapeutic Alliance. *Frontiers in Psychology*, *7*. https://doi.org/10.3389/fpsyg.2016.00862

Lambert, M. J., & Barley, D. E. (2002). Research summary on the therapeutic relationship. In J. C. Norcross (Ed.), *Psychotherapy Relationships That Work: Therapist Contributions and Responsiveness to Patients* (pp. 17–32). Oxford University Press.

Locati, F., Rossi, G., & Parolin, L. (2019). Interactive dynamics among therapist interventions, therapeutic alliance and metacognition in the early stages of the psychotherapeutic process †. *Psychotherapy Research*, *29*(1). https://doi.org/10.1080/10503307.2017.1314041

Luborsky, L., Barber, J. P., Siqueland, L., Johnson, S., Najavits, L. M., Frank, A., & Daley, D. (1996). The Revised Helping Alliance Questionnaire (HAq-II) : Psychometric Properties. *The Journal of Psychotherapy Practice and Research*, *5*(3), 260–271. http://www.ncbi.nlm.nih.gov/pubmed/22700294%0Ahttp://www.pubmedcentral.nih.gov/art iclerender.fcgi?artid=PMC3330423

Luyten, P., & Fonagy, P. (2015). TThe Neurobiology of Mentalizing. *Personality Disorders: Theory, Research, and Treatment*, *6*(4). https://doi.org/10.1037/per0000117

Martin, D. J., Garske, J. P., & Katherine Davis, M. (2000). Relation of the therapeutic alliance with outcome and other variables: A meta-analytic review. *Journal of Consulting and Clinical Psychology*, *68*(3), 438–450. https://doi.org/10.1037/0022-006X.68.3.438

Mogan, R., Fischer, R., & Bulbulia, J. A. (2017). To be in synchrony or not? A meta-analysis of synchrony's effects on behavior, perception, cognition and affect. *Journal of Experimental Social Psychology*, *72*, 13–20. https://doi.org/10.1016/j.jesp.2017.03.009

Niederhoffer, K. G., & Pennebaker, J. W. (2002). Linguistic style matching in social interaction. *Journal of Language and Social Psychology*, *21*(4), 337-360+454. https://doi.org/10.1177/026192702237953

Norcross, J. C. (2002). Empirically supported therapy relationships. In J. C. Norcross (Ed.), *Psychotherapy Relationships That Work: Therapist Contributions and Responsiveness to Patients* (pp. 3–16). Oxford University Press.

Pennebaker, J. W., Chung, C. K., Ireland, M., Gonzales, A., & Booth, R. J. (2007). The

Development and Psychometric Properties of LIWC2007. *Development*, *1*(2), 1–22. https://doi.org/10.1068/d010163

Ramseyer, F., & Tschacher, W. (2011). Nonverbal synchrony in psychotherapy: Coordinated body movement reflects relationship quality and outcome. *Journal of Consulting and Clinical Psychology*, *79*(3). https://doi.org/10.1037/a0023419

Reich, C. M., Berman, J. S., Dale, R., & Levitt, H. M. (2014). Vocal Synchrony in Psychotherapy. *Journal of Social and Clinical Psychology*, *33*(5), 481–494. https://doi.org/10.1521/jscp.2014.33.5.481

Rocco, D., Gennaro, A., De Bei, F., Zanelli, D., & Condino, V. (2013). Development and characteristics of the therapeutic alliance in a short-term dynamic psychotherapy: A descriptive case study. *Research in Psychotherapy: Psychopathology, Process and Outcome*, *16*(1). https://doi.org/10.7411/RP.2013.005

Rogan, R. G. (2011). Linguistic style matching in crisis negotiations: A comparative analysis of suicidal and surrender outcomes. *Journal of Police Crisis Negotiations*, *11*(1), 20–39. https://doi.org/10.1080/15332586.2011.523302

Shelef, K., & Diamond, G. M. (2008). Short form of the revised vanderbilt therapeutic alliance scale: Development, reliability, and validity. *Psychotherapy Research*, *18*(4), 433–443. https://doi.org/10.1080/10503300701810801

Sinharay, S., Stern, H. S., & Russell, D. (2001). The use of multiple imputation for the analysis of missing data. *Psychological Methods*, *6*(3). https://doi.org/10.1037/1082-989x.6.4.317

Tourunen, A., Kykyri, V. L., Seikkula, J., Kaartinen, J., Tolvanen, A., & Penttonen, M. (2019). Sympathetic Nervous System Synchrony: An Exploratory Study of Its Relationship With the Therapeutic Alliance and Outcome in Couple Therapy. *Psychotherapy*.

https://doi.org/10.1037/pst0000198

Tschacher, W., & Meier, D. (2020). Physiological synchrony in psychotherapy sessions. *Psychotherapy Research*, *30*(5). https://doi.org/10.1080/10503307.2019.1612114

von Below, C. (2020). "We Just Did Not Get on". Young Adults' Experiences of Unsuccessful Psychodynamic Psychotherapy – A Lack of Meta-Communication and Mentalization? *Frontiers in Psychology*, *11*. https://doi.org/10.3389/fpsyg.2020.01243

Wiltshire, T. J., Philipsen, J. S., Trasmundi, S. B., Jensen, T. W., & Steffensen, S. V. (2020). Interpersonal Coordination Dynamics in Psychotherapy: A Systematic Review. *Cognitive Therapy and Research*, *44*(4). https://doi.org/10.1007/s10608-020-10106-3

Zilcha-Mano, S., & Ben David-Sela, T. (2022, August 4). Is alliance therapeutic in itself? It depends. *Journal of Counseling Psychology*. Advance online publication. https://doi.org/10.1037/cou0000627

Zilcha-Mano, S., Dinger, U., McCarthy, K. S., & Barber, J. P. (2014). Does alliance predict symptoms throughout treatment, or is it the other way around? *Journal of Consulting and Clinical Psychology*, *82*(6), 931–935. https://doi.org/10.1037/a0035141

Table 1

Descriptive Statistics for LSM, WC, and CIS-R

	Mean	Std. Dev.	Minimum	Maximum
LSM				
Segment 1	0.85	0.05	0.69	0.91
Segment 2	0.86	0.06	0.65	0.93
Segment 3	0.85	0.12	0.21	0.93
WC				
		Therapist		
Segment 1	674.19	401.00	33	1840
Segment 2	700.02	416.25	27	1728
Segment 3	871.17	555.61	4	2692
		Client		
Segment 1	1438.02	814.75	125	4724
Segment 2	1260.56	591.98	109	2472
Segment 3	1034.19	504.12	93	2092
		Total		
Segment 1	2112.21	841.59	293.00	4783.00
Segment 2	1960.58	691.59	500.00	3519.00
Segment 3	1905.35	804.18	493.00	4695.00
CIS-R				
Segment 1	0.85	0.20	0.15	1.00
Segment 2	0.78	0.25	-0.22	1.00
Segment 3	0.77	0.24	-0.06	1.00

Note. LSM = language style matching; WC = word count; CIS-R = Collaborative Interactions Scale – Revised, composite ratio-converted scores.

Table 2

Pearson Correlations

	LSM 1	LSM 2	LSM 3	Year	Gender matching	Therapist exp. <10 years	WC 1	WC 2	WC 3	CIS-R 1	CIS-R 2	CIS-R 3
LSM 1	1	.361*	.701**	-.055	-.085	.325*	.186	.334*	.441**	.126	.215	-.013
LSM 2	.361*	1	.358*	-.081	-.105	.245	.364*	.419**	.238	.259	.419**	.173
LSM 3	.701**	.358*	1	.148	-.150	.308*	.084	.228	.330*	.085	-.074	-.066
Publication Year	-.055	-.081	.148	1	-.128	-.136	.075	-.065	-.068	.246	-.022	.154
Gender matching	-.085	-.105	-.150	-.128	1	.013	.013	-.106	-.170	.130	.102	.083
Therapist experience ≤10 years	.325*	.245	.308*	-.136	.013	1	.163	.400**	.066	.040	-.126	-.122
WC 1	.186	.364*	.084	.075	.013	.163	1	.689**	.295*	.205	.304*	.029
WC 2	.334*	.419**	.228	-.065	-.106	.400**	.689**	1	.394**	.266	.348*	.100
WC 3	.441**	.238	.330*	-.068	-.170	.066	.295*	.394**	1	.176	.193	.152
CIS-R 1	.126	.259	.085	.246	.130	.040	.205	.266	.176	1	.610**	.701**
CIS-R 2	.215	.419**	-.074	-.022	.102	-.126	.304*	.348*	.193	.610**	1	.663**
CIS-R 3	-.013	.173	-.066	.154	.083	-.122	.029	.100	.152	.701**	.663**	1

Note. LSM = language style matching; WC = word count; CIS-R = Collaborative Interactions Scale – Revised, composite ratio-converted scores. Labels 1, 2, and 3 refer to segments 1, 2, and 3 of the psychotherapy session, respectively.

* Correlation is significant at the 0.05 level (2-tailed). ** Correlation is significant at the 0.01 level (2-tailed).

Table 3

Results of Hierarchical Regression Predicting Segment 1 of CIS-R Scores

Predictors	Model 1		Model 2			Model 3			ΔR²	ΔF
	b	β	b	95% CIᵃ Lower, Upper	β	b	95% CIᵃ Lower, Upper	β		
Step 1										
Publication year	.004	.310	.004	-.002, .010	.304	.004	-.003, .010	.313		
Gender matching	.058	.153	.061	-.050, .185	.162	.057	-.062, .179	.152		
Therapist experience	.034	.076	.018	-.134, .201	.041	.016	-.139, .202	.036		
Therapy type[#]										
Psychodynamic	-.047	-.118	-.036	-.220, .115	-.091	-.032	-.226, .125	-.080		
Humanistic	.021	.049	.019	-.174, .186	.045	.022	-.184, .192	.052		
Other	-.008	-.018	.004	-.151, .159	.009	.005	-.149, .164	.013		
WC 1	.000	.160	.000	.000, .000	.147	.000	-.001, .002	-.287	.139	.497
Step 2										
LSM 1	-	-	.394	-1.211, 1.809	.105	.144	-2.647, 3.939	.039	.009	.534
Step 3										
WC 1 x LSM 1	-	-	-	-	-	.000	-.002, .001	.455	.001	.819

Note. LSM = language style matching; WC = word count; CIS-R = Collaborative Interactions Scale – Revised, composite ratio-converted scores. R^2_{all} = .15; adj. R^2_{all} = -.05. ᵃ Bootstrapped with 2,500 resamples. [#] vs. cognitive/behavioral.

Table 4

Results of Hierarchical Regression Predicting Segment 2 of CIS-R Scores

Predictors	Model 1		Model 2			Model 3			ΔR²	ΔF
	b	β	b	95% CI[a] Lower, Upper	β	b	95% CI[a] Lower, Upper	β		
Step 1									.259	1.999
Publication year	.001	.063	.001	-.005, .007	.081	.001	-.006, .007	.038		
Gender matching	.067	.149	.082	-.029, .205	.182	.066	-.040, .196	.147		
Therapist experience	-.171	-.315	-.201	-.369, -.038	-.372*	-.190	-.359, -.020	-.351*		
Therapy type#										
Psychodynamic	-.033	-.068	-.003	-.186, .156	-.006	-.019	-.190, .135	-.039		
Humanistic	.072	.139	.084	-.106, .260	.164	.054	-.129, .256	.105		
Other	-.030	-.060	-.027	-.210, .136	-.054	-.039	-.225, .129	-.076		
WC 2	.000	.459	.000	.000, .000	.339*	.001	-.001, .002	3.273		
Step 2									.095	5.722*
LSM 2	-	-	1.408	-.330, 2.569	.346*	2.885	-1.858, 5.231	.709*		
Step 3									.031	1.929
WC 2 x LSM 2	-	-	-	-	-	-.001	-.003, .001	-3.110		

Note. LSM = language style matching; WC = word count; CIS-R = Collaborative Interactions Scale – Revised, composite ratio-converted scores. R^2_{all} = .39; adj. R^2_{all} = .24. [a] Bootstrapped with 2,500 resamples. # vs. cognitive/behavioral.

* Significant at the .05 level.

Table 5

Results of Hierarchical Regression Predicting Segment 3 of CIS-R Scores

Predictors	Model 1 b	Model 1 β	Model 2 b	Model 2 95% CI[a] Lower, Upper	Model 2 β	Model 3 b	Model 3 95% CI[a] Lower, Upper	Model 3 β	ΔR²	ΔF
Step 1										
Publication year	.003	.197	.004	-.003, .009	.223	.004	-.003, .010	.228		
Gender matching	.062	.135	.057	-.082, .189	.124	.042	-.098, .182	.091		
Therapist experience	-.009	-.017	.020	-.153, .215	.036	-.001	-.177, .207	-.002		
Therapy type[#]										
Psychodynamic	-.156	-.317	-.173	-.432, .021	-.351	-.156	-.455, .048	-.318		
Humanistic	-.070	-.133	-.067	-.279, .132	-.127	-.065	-.288, .137	-.124		
Other	-.048	-.093	-.054	-.268, .127	-.103	-.055	-.272, .121	-.105		
WC 3	.000	.162	.000	.000, .000	.209	.001	-.001, .002	2.457	.138	.913
Step 2										
LSM 3	-	-	-.435	-1.826, 1.131	-.132	.396	-2.732, 2.536	.120	.011	.508
Step 3										
WC 3 x LSM 3	-	-	-	-	-	-.001	-.002, .001	-2.370	.016	.709

Note. LSM = language style matching; WC = word count; CIS-R = Collaborative Interactions Scale – Revised, composite ratio-converted scores. R^2_{all} = .16; adj. R^2_{all} = -.03. [a] Bootstrapped with 2,500 resamples. [#] vs. cognitive/behavioral.