Nonverbal Synchrony: A New Approach to Assessing Therapeutic Alliance Ruptures

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Nonverbal synchrony is the degree to which individuals' nonverbal cues, such as body movement, implicitly coordinate in time. Within the psychotherapeutic dyad, nonverbal synchrony has been shown to correlate with therapeutic alliance and therapy outcome. However, nonverbal synchrony research has yet to address therapeutic alliance ruptures. Furthermore, many difficulties in assessing for ruptures have been identified, due to the fact that rupture assessments rely upon explicit observation of therapists, patients, and/or observers. To address this obstacle the present paper discusses the assessment of ruptures via the analysis of psychotherapy dyads' nonverbal synchrony. Motion Energy Analysis, an adjunct to the standard assessment of ruptures within the psychotherapy dyad, is described as an efficient and reliable method of therapeutic relational dynamics analysis. Motion Energy Analysis allows for an algorithmic and straightforward approach to quantifying nonverbal synchrony. Clinical applications and relevance to the extant literature are also discussed.

Keywords: nonverbal synchrony, therapeutic alliance, alliance ruptures, motion energy

It has been consistently demonstrated in psychotherapy research that the quality of the therapeutic alliance is a robust predictor of therapy outcome (e.g., Horvath, Del Re, Flückiger, & Symonds, 2011; Martin, Garske, & Davis, 2000; Samstag, Batchelder, Muran, Safran, & Winston, 1998). Weakened alliances have been shown to correlate with unilateral termination by the patient (e.g., Muran, Safran, Gorman, & Samstag, 2009; Samstag et al., 1998). In addition, hostility in therapy correlates with poor outcome (e.g., Samstag et al., 1998). As a result, one aspect of the alliance which has received increasing attention is the alliance rupture, which has been defined as "a tension or breakdown in the collaborative relationship between patient and therapist" (Safran, Muran, & Eubanks, 2011, p. 80).

The nature of rupture presentations can vary considerably. They can range in intensity from relatively minor tensions, which may be only vaguely apparent to one or both individuals, to major breakdowns in collaboration, understanding, or communication (Safran et al., 2011). Ruptures can manifest in two ways: 1) as confrontation ruptures, wherein a patient expresses resentment or hostility toward the therapist, as well as 2) withdrawal ruptures, wherein the patient expresses discontent by disengaging (Safran & Muran, 2000; Harper, 1989). Because of their pervasiveness in psychotherapy, ruptures have been described as "an ongoing relational 'push and pull'," reflective of processes which are "inherent in all relationships," and therefore a natural, ongoing component of psychotherapy (Safran, Muran, Stevens, & Rothman, 2008, p. 138).

A study by Muran, Safran, Gorman, Samstag, Eubanks-Carter and Winston (2009) analyzed the relationship between the therapeutic alliance and self-reported alliance ruptures. In addition to identifying the occurrence of the rupture, Muran and colleagues (2009) also measured rupture intensity and resolution using self-report data in post-session questionnaires. Results indicated that lower rupture intensity and higher rupture resolution were correlated with better ratings of the therapeutic alliance and session quality. Lower rupture intensity also predicted good outcome on measures of interpersonal functioning, while higher rupture resolution predicted better retention. Results also indicated that a

failure to resolve ruptures was predictive of dropout (Muran et al., 2009). Notably, the results did not indicate a significant relationship between alliance ratings and rupture occurrence. This finding, or lack thereof, provides support for the theory that ruptures are a natural component of the alliance.

Alliance ruptures have been assessed using a variety of research methods, which aim to tap the perspectives of patients, therapists, and/or observers. One method involves obtaining questionnaires from the patient and therapist regarding potential shifts in alliance quality, or perceptions of alliance rupture and degrees of resolution within a session (Muran et al., 2009). Another method is to track fluctuations in patients' alliance scores across the course of therapy (e.g., Strauss et al., 2006; Muran et al., 2009). In addition, researchers may use observer-based methods, which can involve hand-coding transcriptions and video recordings of therapy sessions (e.g., Muran et al., 2009). Observer-based assessment tools, such as the Rupture Resolution Rating System (Eubanks-Carter, Muran, & Safran, 2009), may also be used to mark potential moments of rupture exhibited by the patient's behavior and the therapist's attempts at resolution. Therefore, assessing for ruptures typically involves assessments of changes in the therapeutic alliance which rely upon the explicit, yet subjective observations of the patient, therapist, and/or observer.

Many issues in identifying ruptures have been realized, in part due to difficulties in defining the concept of a therapeutic alliance rupture (Safran & Muran, 2000). There has been much disagreement on how intense a rupture needs to be in order to be considered a rupture (Safran & Muran, 2006). Similarly, there has been considerable variability on how significant the quantitative fluctuations in alliance ratings must be in order to signify a rupture (Samstag et al., 1998). Another criticism of the assessment for ruptures is that traditional conceptualizations of the alliance may overemphasize the role of conscious collaboration between therapist and patient, while underestimating the pervasive role of unconscious factors in both patients' and therapists' participation in the relationship (Safran & Muran, 2006). Therefore, there remains considerable opportunity to refine methods of assessing for ruptures, particularly with regard to processes that may be subtle or difficult to identify from anyone's subjective perspective.

Nonverbal Synchrony

There is another approach to observing the relational dynamics between a therapist and patient, which involves an assessment of nonverbal synchrony. Synchrony refers to a natural interpersonal phenomenon in which individuals' behavioral, physiological, and/or affective experiences and responses spontaneously occur at the same time (Koole & Tschacher, 2016). Because it is an implicit, relational phenomenon, studying synchrony in the context of psychotherapy can allow for objective observation of aspects of the therapeutic relationship, which would be difficult or even impossible to study using most other alliance measures.

In order to understand the unique role of nonverbal synchrony in the therapeutic relationship, it is beneficial to conceptually differentiate synchrony from other similar constructs, such as contingency. One distinction is that synchrony, coming from the Greek roots *syn* ("same") and *chronos* ("time"), refers to a spontaneous simultaneity of phenomena between two individuals (Koole & Tschacher, 2016); contingency describes "the temporal process of relating from moment-to-moment" (Beebe et al., 2016, p. 2). With this consideration in mind, contingency may be described as a type of synchronous behavior, and therefore studies in other domains which assess contingency should be included under the umbrella of synchrony research (Koole & Tschacher, 2016).

Studying *nonverbal* synchrony (the synchrony of the dyad's nonverbal cues, such as body movement) is an effective way to observe nonverbal patterns in the alliance, which receive far less attention in psychotherapy research than the verbal aspects (Koole & Tschacher, 2016). Psychotherapy studies have measured a variety of manifestations of nonverbal synchrony, such as body position matching (e.g., Scheflen, 1964; Trout & Rosenfeld, 1980), imitation of mannerisms (Chartrand & Bargh, 1999), matching of nonverbal emotional display (Hatfield, Cacioppo, & Rapson, 1994), matching of vocal tonality (Reich, Berman, Dale, & Levitt, 2014), and matching of body movement (Ramseyer & Tschacher, 2011). The aforementioned studies demonstrate a variety of ways in which nonverbal synchrony has been addressed in psychotherapy research.

The relevance of nonverbal synchrony in the context of psychotherapy research has been thoroughly demonstrated by studies which link synchrony to many key facilitative interpersonal processes. For example, nonverbal synchrony has been linked to establishing rapport (Vacharkulksemsuk & Fredrickson, 2012), promoting feelings of social connectedness (Marsh, Richardson, &

Schmidt, 2009), encouraging perspective taking (Wheatley, Kang, Parkinson, & Looser, 2012), positive affect (Tschacher, Rees, & Ramseyer, 2014), developing adaptive emotion-regulation (Feldman, 2007), and mutual experiences of being in the here-and-now (Tschacher, Ramseyer, & Koole, 2018). It has also been shown to predict diagnostic features such as depression and anxiety (Paulick et al., 2017). Nonverbal synchrony has even been shown to positively correlate with social competence and social functioning in schizophrenic patients (Kupper, Ramseyer, Hoffmann, & Tschacher, 2015). The existing research in which nonverbal synchrony has been included shows that it is an increasingly important area of study.

In the context of psychotherapy research, higher nonverbal synchrony is generally linked to better psychotherapy outcome (e.g., García & Di Paolo, 2018; Ramseyer & Tschacher, 2011; Kupper et al., 2015; Reich et al., 2014; Galbusera, Finn, & Fuchs, 2016). This finding has been identified across a wide range of clinical populations, such as those diagnosed with social anxiety disorder (e.g., Altmann et al., 2019; Schoenherr et al., 2019), psychosis (Dean, Samson, Newberry, & Mittel, 2018), and schizophrenia (Galbusera et al., 2016). Interestingly, in one recent study by Paulick and colleagues (2017), nonverbal synchrony was shown to have a curvilinear relationship with therapy outcome. The results indicated that cases with high synchrony showed higher rates of non-improvement and consensual termination, cases with low synchrony led to more non-improvement and dropout, and cases with medium synchrony showed the most improvement. Paulick and colleagues described this finding as coinciding with the mutual regulation model of dyadic meaning making, wherein interactions are characterized by alternating matching, mismatching, and reparation (Tronick & Beeghly, 2011; Paulick et al., 2017).

While correlations between nonverbal synchrony and outcome have been demonstrated, research assessing links between synchrony and the therapeutic alliance remains sparse and heterogenous (Paulick et al., 2017). Some researchers have identified a positive correlation between therapeutic alliance quality and nonverbal synchrony (e.g., Paulick et al., 2017; Ramseyer & Tschacher, 2011; Ramseyer & Tschacher, 2008). However, another study found a negative relationship between therapeutic alliance quality and prosodic synchrony (vocal tonality patterns; Reich et al., 2014). Thus, further research in this area is certainly warranted. To date, no psychotherapy study has specifically addressed links between nonverbal synchrony and therapeutic alliance ruptures (Paulick et al., 2017).

Motion Energy Analysis

Conventional methods for assessing synchrony have involved analyzing video recordings of therapy sessions and measuring specific elements of the interaction. For example, in one study, researchers measured nonverbal synchrony by manually coding the amount of movement between teachers and students as observed frame-by-frame (Bernieri, 1988). Many synchrony studies have involved similar coding methods, which are often highly labor-intensive. However, recent technological advances have allowed for methods of assessing nonverbal synchrony by automatically analyzing therapy session recordings using computer algorithms (e.g., Ramseyer & Tschacher, 2011). Therefore, this proposed methodology can significantly reduce workload and increase intercoder reliability.

One new and increasingly popular method of calculating nonverbal synchrony involves the usage of a software program called Motion Energy Analysis (MEA; e.g., Dean et al., 2018; Kupper et al., 2015; Paulick et al., 2017; Ramseyer & Tschacher, 2011). MEA quantifies on-screen motion by converting a video to a grey scale, capturing frames at a predetermined frame rate, and then counting the number of pixel changes as the video advances from frame to frame (defined as motion energy by Grammer, Honda, Juette, & Schmitt, 1999). Thus, a small movement on the screen causes a small number of pixels to change, and a large movement causes a large number of pixels to change.

After importing a video, the user sets the frame rate and a minimum threshold for movement detection to automatically exclude video noise. The user then manually highlights regions of interest (ROIs), or areas within which they want to track motion. For example, on a split-screen video, the user can select one ROI for the patient and one ROI for the therapist. MEA allows for up to eight ROIs, which could allow for measuring motion energy in various body parts simultaneously. The software then analyzes the video and uses an algorithm to quantify a time series of motion energy within each ROI. In order to control for differing ROIs and body sizes, the time series data are z-transformed in the statistical analysis stage (Ramseyer & Tschacher, 2011; Grammer et al., 1999).

These corrected motion energy time series are then used to quantify synchrony values using a statistical process of windowed cross-lagged correlation (Boker, Rotondo, Xu, & King, 2002; Ramseyer & Tschacher, 2011; Schoenherr et al., 2019). Time series are cross-correlated within 1-minute window segments. For each window, cross-correlations are computed for positive and negative time lags of up to 5 seconds, using incremental steps of 0.1 seconds. This allows for a realistic flexibility in participants' nonverbal responses to one another, such that their bodies do not have to be exactly-simultaneously mirroring one another in order to qualify as synchrony (Ramseyer & Tschacher, 2010). These cross-correlations are then standardized, and their absolute values are taken (allowing for positive lags and negative lags to have an equal effect). Finally, these values' correlational coefficients are used to constitute quantifications of nonverbal synchrony (Ramseyer & Tschacher, 2011).

By operationalizing nonverbal synchrony as gross bodily movement, this approach provides a means of objectively quantifying nonverbal synchrony in a way that minimizes the importance of interrater reliability. Because the software uses an algorithm to automatically analyze videos, labor intensity is minimized. This aspect of the methodology presents a considerable advantage over most classical nonverbal synchrony research methods, which are typically very labor intensive and requiring of a great deal of time-consuming, tedious work. However, only a small handful of studies have begun to apply using automatic video analysis software in nonverbal synchrony research.

Discussion

In addition to its novel contribution to the literature, there are many clinical applications which can be derived from studying the nonverbal synchrony of psychotherapy dyads. Firstly, assessing psychotherapy session videos for nonverbal synchrony can be used not only for research, but also as a means of evaluation or as a tool during clinical supervision. Tapping into nonverbal synchrony can illuminate aspects of the dynamic between a therapist and patient, which may help facilitate clinical progress. Nonverbal synchrony data gathered from video analysis could then be applied clinically, encouraging the clinician to consider nonverbal cues when interacting with the patient. It may also convey predictive information, which could help identify early in an intervention whether a certain therapist is a good match for a patient. This speaks to the potential impact of the results reported by Paulick and colleagues (2017). The authors suggest that it may be possible to use nonverbal synchrony data to prevent dropout, promote a strong therapeutic alliance, and facilitate successful therapeutic outcome.

In summary, we may be entering a technological revolution in nonverbal synchrony research, and there remains considerable opportunity for novel research in this field. The clinical applications of this research are indeed promising. Therefore, future research should adopt and advance automatic video analysis-based research methods, particularly in the context of studying the therapeutic alliance and alliance ruptures.

Acknowledgements

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