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RECiPROsody: A Study Protocol for Investigating Movement and Prosodic Synchrony as Embodied Markers of Relational Attunement in Gestalt Psychotherapy

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ABSTRACT

Nonverbal synchrony supports therapeutic alliance, yet its role in Gestalt psychotherapy remains underexplored. This manuscript presents the RECiPROsody study protocol, designed to investigate how multimodal interpersonal synchrony between therapists and clients relates to embodied attunement and therapeutic outcomes. The study employs a prospective, observational design involving 30 therapist–client dyads undergoing Gestalt therapy. Video/audio recordings of the first three sessions and three additional sessions after 6 months will capture interactional patterns. Synchrony will be assessed across upper-limb movements (via inertial sensors), vocal prosody, and physiological signals (e.g., heart rate variability), alongside self-report questionnaires completed by both clients and therapists. We hypothesize that higher levels of synchrony will relate to stronger therapeutic alliance and improved client well-being. Currently in the recruitment phase, the protocol outlines methodology, data collection procedures, and a statistical analysis plan to ensure replicability. Findings may deepen understanding of embodied processes and inform clinical training and practice in Gestalt psychotherapy.

1 | Introduction

In psychotherapy, much of what is communicated beyond words conveys significant relational information. Subtle facial expressions, speech rhythm, postural shifts, and physiological coordination shape the nuanced choreography of therapeutic interaction. Although rarely verbalized, these embodied aspects are the basic building blocks of relational life and can influence both the intensity and trajectory of the therapeutic relationship. Humanistic and Gestalt psychotherapies, in particular, have traditionally emphasized presence, empathy, and intersubjective awareness as central mechanisms of change (Spagnuolo Lobb 2016; Wampold and Imel 2015).

In this context, growing interest has focused on exploring how synchrony in nonverbal movement and vocal prosody may facilitate therapeutic change. Nonverbal synchrony refers to the spontaneous temporal coordination of gestures, movements, and rhythmic patterns between interaction partners. In psychotherapy, it has been associated with stronger therapeutic alliance, improved clinical outcomes, and enhanced affective connection between therapist and client (Marci et al. 2007; Ramseyer and Tschacher 2011, 2014). The body, therefore, is not a passive medium within therapeutic exchange, but an active co-participant in meaning-making, emotional regulation, and interpersonal connection.

Although research in this area has expanded in recent years, it has mainly focused on cognitive–behavioral contexts. Less is known about how these embodied processes work in Gestalt psychotherapy, where moment-to-moment awareness and the experiential "here-and-now" are deliberately brought to the foreground of the session (Iwakabe et al. 2023; Spagnuolo Lobb 2023). Within its emphasis on phenomenological contact and co-regulated relational processes, Gestalt therapy offers a particularly rich ground for investigating sensorimotor and prosodic synchrony as potential indicators of therapeutic presence and relational attunement.

The RECiPROsody (RECording rec*i*procal PRO*s*odic and emb*o*d*i*ed s*y*nchrony) project has been conceived to investigate these processes in a naturalistic, technology-supported framework. By integrating audio/video recordings, physiological measures, and therapist- and client-reported outcomes, the project aims to elucidate how embodied synchrony develops over the course of the therapeutic relationship. Specifically, the study aims to explore whether early-session and late-session synchrony are differentially associated with therapeutic alliance, subjective experience, and therapist attunement to the relational field.

This study aligns with the broader shift in humanistic psychology toward re-integrating the body into relational and emotional process conceptualizations (Schore 2021; Koole and Tschacher 2016). At the same time, it highlights the potential of advanced technological tools to enhance, rather than replace, human sensitivity, awareness, and relational depth in psychotherapy. In therapeutic contexts, it is crucial to distinguish between reciprocity, resonance, and synchrony. Reciprocity refers to the mutual exchange of emotional and behavioral influences between therapist and client, a core dialogical principle in Gestalt therapy (Spagnuolo Lobb 2023). Resonance implies an empathic process, phenomenologically experienced as "affective resonance" (Gallese 2003), in which the therapist "feels with" the client without necessarily replicating motor patterns. Synchrony, the focus of the present study, refers to the quantifiable temporal coordination of physiological and behavioral parameters (e.g., movement and prosody). While Gestalt reciprocity emphasizes differentiation within contact (Perls' notion of "differentiating while contacting", namely maintaining one's experiential distinctness while remaining fully engaged in relational contact), synchrony captures the micropatterns emerging from these dialogical exchanges. Rather than conflating these constructs, the present study explores how synchrony may serve as an empirical indicator of relational attunement and co-regulation, processes that are central in Gestalt practice.

We report the protocol at this stage to enhance transparency and replicability in a technically and ethically complex multimodal framework (audiovisual, inertial, and physiological recordings), and to make analytic decisions explicit before outcome data are available.

2 | Theoretical Background and Rationale

Humans are inherently rhythmic beings. From birth, synchrony between caregiver and infant expresses itself through bodily movement, vocal prosody, facial imitation, and physiological regulation (Feldman 2007). These embodied, largely tacit forms of communication constitute the foundation of emotional development, social understanding, and relational presence. In psychotherapy, they re-emerge as implicit indicators of alliance, empathy, and mutual regulation (Gallese 2003; Koole and Tschacher 2016).

Psychological and neuroscientific research has consistently emphasized the role of implicit bodily processes in shaping co-regulation and empathic sensitivity. Mirror neuron theory, for example, proposes that observing another person's action or emotional expression triggers neural patterns similar to those involved in performing or experiencing them oneself (Gallese 2005, 2009). This process of "embodied simulation" underpins phenomena such as motor and autonomic mimicry, whereby individuals spontaneously coordinate posture, gesture, voice, and physiological rhythms (Gallese and Sinigaglia 2011). In psychotherapy, such forms of synchrony have been associated with stronger therapeutic alliance and improved treatment efficacy (Tschacher et al. 2014; Ramseyer and Tschacher 2011).

Nonverbal synchrony can manifest across multiple domains, including movement coordination, speech rhythm, respiration, and autonomic parameters such as skin conductance or heart rate variability (HRV) (Marci et al. 2007). Advances in video-based motion analysis and wearable technology have made these processes increasingly measurable, providing a potential window into the "silent language" of psychotherapy (Ramseyer and Tschacher 2011; Reinecke et al. 2020). Importantly, the feasibility of integrating physiological and behavioral measures in psychotherapy has already been demonstrated beyond Gestalt therapy. Recent studies have employed wearable psychophysiology to examine co-regulatory dynamics in emotionally focused therapy (Conroy et al. 2023), trauma-informed play therapy (Perryman et al. 2024), and relational change processes (Frawley and Dillman Taylor 2024), showing that continuous physiological monitoring can be implemented in naturalistic therapeutic settings without necessarily compromising ecological validity. These studies provide methodological precedent for the present protocol, which extends this multimodal approach to Gestalt psychotherapy by integrating wearable motion sensors, cardiovascular monitoring, and prosodic analysis within therapist–client dyads. Although synchrony has been empirically examined in cognitive–behavioral and psychodynamic therapies, relatively little attention has been paid to its role within humanistic approaches. This gap is particularly striking in Gestalt therapy, which explicitly emphasizes moment-to-moment connection, bodily presence, and co-creation of meaning from experience (Spagnuolo Lobb 2019; Wampold and Imel 2015). Gestalt therapists are trained to attend not only to what is said but also to how it is expressed, tracking variations in tone, posture, breathing, and facial expression as markers of the emotional field emerging between therapist and client.

A key theoretical contribution of Gestalt therapy is Aesthetic Relational Knowledge (ARK), defined as the therapist's intuitive, embodied ability to feel, attune to, and harmonize the relational field according to an aesthetic sense of what is experientially "right" within the dialogue (Spagnuolo Lobb et al. 2023). This phenomenological and moment-based mode of knowing resists full verbal articulation. Examining synchrony within the present

study can offer a potential link between lived relational experience and observable, measurable interactional dynamics.

The clinical relevance of synchrony in Gestalt therapy lies in its capacity to illuminate co-regulation processes in disorders characterized by affective dysregulation. The present study specifically focuses on clients presenting with depressive and anxiety symptoms (e.g., generalized anxiety disorder, major depressive disorder), conditions in which contact flexibility and co-regulatory capacity are often compromised (Koole and Tschacher 2016). In Gestalt practice, such clients often show interrupted contact patterns (e.g., resistances, desensitization) that manifest at both physiological and motor levels. Synchrony is therefore not conceptualized as a therapeutic goal per se, but rather as a process marker that may indicate (a) moments of authentic contact, (b) repair of relational ruptures, and (c) emergence of new spontaneous expressive patterns. These physiological markers of synchrony are increasingly recognized as potential mechanisms underlying relational change in experiential approaches, linking moment-to-moment bodily coordination with therapeutic outcomes (Frawley and Dillman Taylor 2024). This study explores how Gestalt therapy, with its emphasis on phenomenological awareness and the "here-and-now," may facilitate transitions from states of asynchrony, which may reflect dysregulation or relational disconnection, to more flexible and adaptive forms of interpersonal coordination.

The RECiPROsody project emerged from the need to empirically explore how motor synchrony, prosodic attunement, and physiological entrainment may support, or at times constrain, therapeutic presence in Gestalt psychotherapy. Rather than imposing strict models, the study attempts to honor the complexity of human contact by employing technological tools to make visible processes that typically remain implicit within therapy. This perspective is particularly relevant for training and supervision, where heightened sensitivity to nonverbal processes may enhance the therapist's capacity for co-regulation, spontaneity, and sustained relational presence.

Lastly, the present study does not aim to reduce the therapeutic process to synchrony metrics, but to explore its aesthetic, experiential, and potentially transformative role within psychotherapy. In doing so, it aligns with the foundational values of humanistic counseling and its respect for the lived, embodied experience of being in relation.

2.1 | Objectives and Research Questions

The RECiPROsody project aims to explore the relational, embodied, and nonverbal dimensions of the psychotherapeutic relationship, with a specific focus on movement synchrony, vocal prosody, and autonomic physiological coordination between client and therapist.

The primary objectives of the study are (1) to characterize temporal shifts in embodied synchrony from early to later therapy phases; (2) to examine whether synchrony predicts clinical outcomes after controlling for relevant covariates; and (3) to assess therapists' awareness of and responsiveness to embodied processes, and to evaluate their moderating role in the association between synchrony and therapeutic outcomes.

To address these aims, we formulated the following research questions: (i) How does synchrony in movement, vocal prosody, and HRV change from the early phase (Sessions 1–3) to later sessions conducted after 6 months? (ii) Do higher levels of sensorimotor and prosodic synchrony predict greater reduction in client-reported distress (CORE-OM), controlling for baseline severity, therapy duration, and therapist effects? (iii) How do therapists perceive and interpret moments of synchrony, asynchrony, and bodily resonance, and does therapist attunement (ARK-T, TRQ) moderate the association between observed synchrony and clinical outcomes?

Participants are recruited through the Clinical and Research Center HCC Italy's outpatient referral network and community mental health services in Palermo, Sicily. Potential clients receive a study information sheet during intake screening and are subsequently contacted by an independent research assistant. Eligibility is confirmed through a preliminary anamnestic session conducted by a licensed clinician who is not involved in the participant's therapy. The planned analyzable sample consists of 30 therapist–client dyads. Sample size was determined through power analysis for multilevel modeling (MLM), assuming a small-to-medium effect size ($f^2 = 0.10$), statistical power of 0.80, and alpha = 0.05. Because an attrition rate of approximately 15% is anticipated, recruitment will continue beyond the initial enrollment target, if necessary, until at least 30 dyads have completed the required recording schedule. This strategy ensures that the final dataset retains sufficient power to detect synchrony–outcome associations while preserving the ecological validity of the naturalistic clinical setting.

3 | Methods

3.1 | Study Design and Participants

This study adopts a prospective, observational, and single-center design conducted in a naturalistic clinical setting. It is currently ongoing and involves therapist–client dyads engaged in Gestalt psychotherapy at the dedicated Clinical and Research Center HCC Italy, a specialized outpatient facility for mild-to-moderate anxiety, depressive symptoms, and relational difficulties.

Thirty adult clients (aged 20–60 years) who voluntarily initiate psychotherapy are being recruited, with the aim of obtaining a final analyzable sample of 30 therapist–client dyads. Inclusion criteria comprise the capacity to provide informed consent, fluency in Italian, and sufficient clinical stability to participate in sensor-based recording sessions. Exclusion criteria include (a) psychiatric hospitalization within the past 6 months (to ensure post-acute stabilization); (b) initiation or modification of psychotropic medication within the past 3 months (to ensure pharmacological stability and minimize confounding effects on physiological measures); and (c) presence of severe paranoid or psychotic symptoms that would compromise the capacity to consent or engage in outpatient Gestalt therapy (e.g., active hallucinations, severe delusional ideation, or current risk of harm to self or others requiring acute intervention). These exclusions

are consistent with the naturalistic scope of our clinical setting, whose outpatient structure is designed for individuals capable of engaging in the "here-and-now" experiential work without requiring intensive or specialized care.

Participating psychotherapists affiliated with the Clinical and Research Center HCC Italy are also enrolled in the study. They provide informed consent and agree to adhere to the research protocol, including being recorded during sessions and completing self-report measures related to their therapeutic experience. Given the focus on synchrony, the primary unit of analysis is conceptualized as therapist–client dyads rather than the individual participant.

3.2 | Data Collection

Each therapist–client dyad is audio- and video-recorded across six psychotherapy sessions: three early in the course of therapy and three additional sessions approximately 6 months later.

Video and audio are captured using two tablet devices positioned in an oblique, lateralized configuration to minimize intrusiveness and reduce reactivity. Specifically, the tablet recording the client is placed slightly lateral and behind the therapist (to the therapist's left), oriented toward the client; conversely, the tablet recording the therapist is placed slightly lateral and behind the client (to the client's left), oriented toward the therapist. Each tablet thus records the face and upper body (mid-torso to head) of the person it is facing, providing an oblique-frontal view that preserves facial information for contextual interpretation and potential exploratory analyses (high-definition video; 30 fps). Both tablets record audio (48 kHz/24 bit). The two video streams do not consist of a single lateral view capturing both interactants within the same frame; rather, each stream primarily captures one participant. The tablets used for recording have been tested during pilot sessions of comparable duration, and no overheating, recording interruption, or participant discomfort was observed. Tablets were selected to minimize intrusiveness and visual salience in the therapeutic setting. While mirrorless cameras connected to laptops were considered as an alternative, they were deemed less feasible due to increased setup complexity and greater potential to disrupt the naturalistic clinical environment.

To ensure synchronous acquisition of multimodal signals, a custom recording application developed at the SAInce Lab (Data Science Research Laboratory, Institute for Biomedical Research and Innovation - CNR IRIB, Messina, Italy) was used to collect multiple data streams under a unified timestamp. The system enables simultaneous recording of video, HRV, and inertial measurement unit (IMU) signals from up to seven devices and has been previously validated and employed in other experimental and clinical research settings (Bruschetta et al. 2024). Due to current hardware and software constraints, only the client-facing video stream is directly integrated into the custom acquisition application together with the physiological and IMU streams. The client-facing video stream is therefore natively synchronized with physiological and kinematic signals. The therapist-facing video stream is recorded independently and subsequently aligned with the shared temporal reference through a standardized session-onset calibration procedure, based on an audible clap and device-trigger marking. Synchronization accuracy is then verified offline through post hoc cross-modal signal matching.

Recordings capture a broad range of visible nonverbal behavior, including posture and facial expressivity. Facial expressions are retained for contextual interpretation and quality checks; exploratory facial expression analyses may be conducted as secondary aims, contingent on video quality and feasibility, and will be reported as exploratory. Quantitative primary analyses focus on movement, vocal prosody, and HRV-derived measures as specified below.

During recorded sessions, both clients and therapists wear synchronized physiological and movement sensors. HRV data are acquired using Polar H10 chest straps (RR interval resolution ±1 ms). Movement data are recorded with Xsens DOT wearable motion sensors (IMUs) positioned bilaterally on the wrists (dominant and non-dominant), sampling tri-axial (3D) acceleration at 30 Hz (measurement range ±16 g).

Device selection was guided by accuracy and feasibility in seated therapeutic contexts. The Polar H10 provides reliable RR-interval acquisition in ambulatory conditions, while Xsens DOT IMUs support stable multisensor synchronization and dyadic movement tracking. Sensor data are transferred wirelessly to the acquisition system during the session and are stored on secure institutional servers (see Section 4.3); no data are stored permanently on the wearable devices.

To minimize visual salience and potential reactivity, the Polar H10 chest strap is worn under clothing, and the wrist sensors are placed within wristbands worn by both participants at the beginning of the session; therefore, wearable devices are generally not visible in the video recordings. Movement artifacts and signs of equipment-related discomfort are monitored throughout each session.

Although recording equipment may initially influence behavior, prior naturalistic psychotherapy studies (e.g., Marci and Orr 2006; Koole and Tschacher 2016) and pilot observations indicate that behavioral habituation typically occurs within the first 3–5 min of the session.

3.3 | Offline Preprocessing and Feature Extraction

Preprocessing follows procedures consistent with the Kubios HRV methodological framework; implementation may use custom scripts to reproduce these steps, and all parameters will be fully reported to ensure reproducibility. All preprocessing, feature extraction, and synchrony analyses will be conducted offline following completion of data acquisition according to a prespecified analytical pipeline.

Prosodic features (continuous fundamental frequency, F0, and vocal intensity) will be extracted using Praat (autocorrelation method; 10-ms frames; gender-adjusted pitch floor and ceiling settings). Unvoiced segments will be identified using standard detection procedures, and short gaps may be interpolated where appropriate. The resulting time series will be resampled to a common temporal resolution and standardized (z-scored) within each session.

RR interval time series will undergo artifact detection and correction using the robust automatic algorithm proposed by Lipponen and Tarvainen (2019). To ensure data integrity, the percentage of corrected beats will be maintained below 5% per subject, in accordance with established HRV preprocessing recommendations (Tarvainen et al. 2014). Following artifact removal, detrending will be applied using the smooth priors method (Tarvainen et al. 2002; $\lambda = 500$) to remove slow nonstationary components. Interbeat interval (IBI) series will then be interpolated using cubic splines and resampled at 4 Hz to obtain an evenly spaced time series suitable for synchrony analysis. Standard HRV indices (e.g., RMSSD and frequency domain metrics) will be derived. HRV metrics provide noninvasive indicators of autonomic regulation and are commonly used to index physiological arousal, with reduced variability typically reflecting increased autonomic activation.

Movement signals will be band-pass-filtered (0.5–8 Hz) to isolate voluntary upper-limb movement dynamics while attenuating slow drift (<0.3 Hz) and high-frequency noise (>10–15 Hz). Relative Motion Energy (RME), computed as the vector norm of tri-axial acceleration, will provide a continuous index of gross motor activation. Movement time series will be standardized within each session.

3.4 | Synchrony Computation and Temporal Alignment

Windowed cross-correlation (WCC) will serve as the primary synchrony metric due to its interpretability and established use in psychotherapy process research for quantifying short-term interpersonal coordination. Complementary nonlinear or time–frequency approaches may be explored in secondary or sensitivity analyses where theoretically and empirically warranted.

Time series will be segmented into sliding windows (30-s windows, 50% overlap), and cross-correlations will be computed within a lag range of ±5 s. Synchrony indices will be summarized as (i) the maximum absolute cross-correlation within the lag range per window and (ii) the mean cross-correlation across windows within each session.

For movement signals, peak-picked windowed cross-correlation (PPWCC) will be computed to capture transient coordination peaks, consistent with prior research linking movement synchrony to psychotherapy outcomes (Ramseyer and Tschacher 2014).

To reduce spurious associations due to autocorrelation or shared structure, synchrony estimates may be compared against surrogate or pseudo-pair controls in sensitivity analyses. All parameter choices will be fully reported.

As described in Section 3.2, physiological, kinematic, and client-facing video streams are acquired under a shared timestamp, while the therapist-facing video stream is aligned offline using the standardized session-onset calibration procedure. This temporally synchronized multimodal framework enables fine-grained analysis of embodied interpersonal dynamics.

3.5 | Psychometric Measures

In addition to observational and physiological data, both clients and therapists complete a set of standardized self-report measures at prespecified time points.

For clients, psychological distress and well-being are assessed at baseline (T_0), prior to the beginning of psychotherapy, and after 6 months (T_1) using the Clinical Outcomes in Routine Evaluation—Outcome Measure (CORE-OM; Barkham et al. 1998, Barkham et al. 2001, Barkham et al. 2006; Evans et al. 2002; Palmieri et al. 2009). The CORE-OM is a 34-item self-report scale comprising four domains: subjective well-being (four items), problems/symptoms (12 items), functioning (12 items), and risk (six items). This measure provides a standardized index of change in psychological distress over the course of therapy.

Participating therapists complete the Aesthetic Relational Knowledge for Therapists Scale (ARK-T; Spagnuolo Lobb et al. 2024, 2025), a 21-item self-report inventory completed by each therapist on a single occasion. Rated on a 5-point Likert scale (1 = *strongly disagree*, 5 = *strongly agree*), the ARK-T assesses aesthetic relational knowledge across three dimensions: empathy, resonance, and bodily awareness. The multidimensional construct reflects therapists' phenomenological responsiveness to the relational field and conceptually aligns with theoretical perspectives on therapeutic attunement, reciprocity, and synchrony.

In addition, therapists complete the Therapist Response Questionnaire (TRQ; Zittel et al. 2003; Colli et al. 2014), a 79-item measure designed to assess patterns of countertransference. The TRQ evaluates therapists' thoughts, emotions, and behavioral tendencies in response to clients, identifying eight empirically derived dimensions: overwhelmed/disorganized, helpless/inadequate, positive, special/overinvolved, sexualized, disengaged, parental/protective, and criticized/mistreated.

Both the ARK-T and the TRQ are administered immediately after the fourth treatment session. The first three sessions constitute the "early" wave of recorded encounters. Administering therapist-report measures at this point allows clinicians to reflect on the therapeutic relationship as it has developed across the initial recorded sessions, while the interactional experience remains sufficiently recent to preserve ecological validity.

3.6 | Statistical Analysis Plan

Each modality (movement, prosody, HRV) is conceptualized as a dynamic dyadic time series exhibiting potential time-lagged coupling. Lagged cross-correlations will initially be examined to identify plausible synchrony latencies. WCC will then provide time-resolved synchrony estimates, consistent with prior psychotherapy process research on interpersonal coordination (e.g., Ramseyer and Tschacher 2011, 2014). Synchrony predictors will be summarized at the session level and, where relevant, aggregated into early (Sessions 1–3) and late (6-month follow-up sessions) indices.

Core parameter choices, including window length, overlap, and lag range, are specified a priori. Any minor adjustments required by signal quality or sampling constraints will be documented transparently and evaluated through sensitivity analyses.

Synchrony indices will be related to client-reported outcomes using hierarchical multilevel models (sessions nested within dyads). The primary endpoint will be modeled as CORE-OM at follow-up (T_1), adjusting for baseline CORE-OM (T_0), and therapist identity will be modeled as a random effect.

Given the naturalistic design, the following covariates will be included to account for relevant therapeutic and extratherapeutic influences: (a) baseline psychological distress (CORE-OM T0); (b) therapy duration (months between first and last recorded session); (c) psychotropic medication status (stable use vs. initiation/discontinuation between T_0 and T_1); and (d) significant life events occurring between T_0 and T_1, as reported by the therapist. While severe psychotic symptoms and recent hospitalization constitute exclusion criteria (Section 3.1), medication use is retained analytically as a covariate to preserve the representativeness of the outpatient sample.

Secondary sensitivity analyses will exclude participants who initiated or discontinued psychotropic medication or experienced major life events during the study period to assess the robustness of synchrony–outcome associations.

False discovery rate (FDR) correction will be applied to control Type I error. Questionnaire missing data will be handled via Multiple Imputation by Chained Equations (MICE; van Buuren and Groothuis-Oudshoorn 2011); physiological segments exceeding 20% artifact load will be excluded. Sensitivity analyses will evaluate robustness using pseudo-pair/surrogate comparisons.

Analyses will be implemented in R, Python, and MATLAB as appropriate.

3.7 | Ethics and Data Protection

The study is conducted in accordance with the principles of the Declaration of Helsinki and established ethical guidelines for observational research. The protocol was reviewed and approved by the Palermo 1 Local Ethics Committee (CEL 1, approval No. 03/2024 – February 8, 2024) and registered on ClinicalTrials.gov (ID: NCT06463951). As a prospective observational cohort study, it does not involve the administration of pharmacological treatments or investigator-driven interventions.

Participants receive comprehensive information regarding the study aims, procedures, and data handling practices, including audiovisual and physiological recordings. Written informed consent is obtained prior to participation, with specific authorization for biosignal and video data acquisition. Participants may withdraw at any time without consequences for their clinical care.

All collected data are stored and processed securely in full compliance with the European Union General Data Protection Regulation (GDPR, 2016/679). Pseudonymization procedures are implemented to protect participant identity, and audiovisual recordings are used exclusively for research purposes. No identifiable information will be disclosed or published without additional explicit consent.

3.8 | Study Status and Timeline

The study is currently in the active recruitment phase (started December 2024, estimated completion December 2026). During this period, therapist–client dyads will be enrolled through the Clinical and Research Center HCC Italy referral network until at least 30 dyads have completed the required recording schedule. This sample size was determined to provide adequate statistical power for the planned multilevel analyses while preserving the naturalistic integrity of the therapeutic setting. Eligibility screening includes an initial anamnestic session and baseline assessment using the CORE-OM. Informed consent procedures include explicit authorization for audiovisual recording and physiological data acquisition.

4 | Implementation and Quality Assurance

4.1 | Therapist Training and Characteristics

The five participating therapists have between 5 and 10 years of clinical experience ($M = 8.4$, SD $= 3.2$). All regularly attend monthly group and individual supervision to support clinical reflection and professional development. Prior to study initiation, each therapist completed a 2-h preparatory workshop entitled "RECiPROsody: Awareness of Nonverbal Process in Gestalt Therapy." The workshop aimed to increase awareness of nonverbal interactional processes and to familiarize therapists with the data collection procedures, while emphasizing the importance of preserving naturalistic clinical practice. To minimize potential measurement reactivity, therapists wore physiological and movement sensors during mock sessions in order to experience the procedure from the participant's perspective before engaging in actual study recordings.

Therapist fidelity to naturalistic practice will be monitored through monthly review meetings and ongoing contact with the research team. In addition, therapists' postsession reflections and relevant TRQ dimensions, such as disengaged or overwhelmed responses, will be considered to monitor whether participation in the research protocol may have influenced the perceived naturalness of the therapeutic process.

The clinician pool comprises five therapists (four female, one male; aged 30–45), each of whom maintains independent private caseloads outside the study. This structure helps ensure that participation in the research does not interfere with or unduly influence their broader therapeutic practice.

4.2 | Video-Based Movement Extraction and Reproducibility

In addition to wrist-worn IMU-derived movement signals, video-based Motion Energy Analysis (MEA) will be used as a complementary measure of visible nonverbal movement. Whereas IMU data provide fine-grained information on upper-limb motor

activity, MEA allows the extraction of broader head and torso movement dynamics from session videos. Fixed, rectangular regions of interest (ROIs) will be defined for the head and upper body/torso of both interlocutors. Frame-differenced pixel changes will be spatially smoothed and normalized within each session to obtain a continuous motion energy time series. MEA has been widely adopted in psychotherapy process research to distinguish head- and body-related coordination and relate synchrony patterns to therapeutic processes and outcomes (Ramseyer and Tschacher 2011, 2014).

Because movement extraction is fully automated, reliability is addressed in terms of computational reproducibility rather than interrater agreement. Three robustness procedures are implemented:

ROI reproducibility—a second analyst independently applies the ROI template to a stratified 10% of sessions. Spatial overlap (Dice coefficient ≥ 0.85) and time-series concordance (Pearson's $r \geq 0.90$) are required.

Pipeline stability—The same sessions are reprocessed on an independent computing instance using identical parameters. Differences in derived synchrony metrics must remain numerically negligible (<5% variation at the session level).

Occlusion quality control—Automated diagnostics identify frames affected by major occlusion or camera instability. Sessions exceeding predefined thresholds are excluded from movement-based analyses.

4.3 | Data Management and Quality Control

All data handling procedures comply with the European General Data Protection Regulation (GDPR). Personal data are minimized and protected by design and by default under informed consent, and data subject rights are respected. Audiovisual and sensor files are pseudonymized at acquisition using study identifiers, while the re-identification key is stored separately with restricted access. All data are stored on an encrypted server (AES-256) within the IRIB-CNR secure infrastructure. De-identified derivatives, processing code, and metadata are organized according to FAIR data principles. Automated weekly scripts verify data integrity, including file completeness, timestamp continuity, and signal quality indicators. Enrollment progress and any adverse events are reviewed quarterly by a researcher and a statistician. As this is an observational study, no formal stopping rules apply. If recording procedures generate participant discomfort, the session is clinically managed by the therapist and the corresponding data are excluded from analysis.

5 | Anticipated Clinical Impact

This protocol is expected to enable a rigorous, multimodal characterization of embodied synchrony in Gestalt psychotherapy. By combining time-resolved synchrony indices with standardized outcomes and therapist-reported measures, the study may clarify how nonverbal coordination relates to alliance quality, co-regulation, and symptom change. Beyond its scientific contribution, the methodology is intended to inform supervision and training by making implicit interactional processes more observable and discussable in reflective practice. No empirical results are reported in this protocol.

As data collection progresses toward the target of $N = 30$ dyads, we will evaluate whether stable patterns of synchrony and attunement emerge in Gestalt psychotherapy dyads. In particular, we will test whether nonverbal coordination, primarily indexed through bodily movement, vocal prosody, and physiological measures, increases in later sessions compared to early sessions. Facial expressions may be considered in exploratory analyses, contingent on video quality and feasibility. If observed, such an increase would be interpreted cautiously as potentially consistent with a strengthening of the therapeutic bond. Such synchrony patterns are hypothesized to correlate with client-reported improvements in well-being and reductions in psychological distress, as well as with increased therapist sensitivity to implicit relational processes (Ramseyer and Tschacher 2011, 2014).

The clinical implications may be substantial: embodied synchrony can represent a latent but informative indicator of relational presence and alliance quality. Enhanced sensorimotor awareness may help therapists recognize and work with moments of emotional resonance, rupture, or disconnection, facilitating interventions aligned with humanistic principles of congruence and contact (Tschacher et al. 2014; Spagnuolo Lobb 2023).

For training and supervision, the study envisions a constructive integration of technology. Multimodal feedback in reflective practice may support collaborative exploration between supervisors and trainees of how therapeutic processes are co-constructed through nonverbal interaction (Heckler et al. 2025). Reviewing session recordings alongside physiological signals may enhance meta-awareness and strengthen trainees' capacity to perceive and regulate embodied responses (Reinecke et al. 2020).

Furthermore, instruments like the ARK-T and TRQ offer promising approaches for assessing core therapeutic skills—intuitive attunement, affective resonance, and relational responsiveness (Spagnuolo Lobb et al. 2025)—which are central to humanistic practice yet typically remain outside language-based assessment. Although not currently integrated into routine clinical training, the RECiPROsody methodology may support future supervision practices. Reviewing selected video segments together with synchrony measures could enhance therapists' awareness of embodied relational dynamics and improve training outcomes.

Ultimately, RECiPROsody aims to illuminate the embodied richness of the therapeutic process by bringing attention to its rhythmic, pre-reflective, and bodily dimensions while remaining consistent with psychotherapy's humanistic tradition as a lived relational experience.

Author Contributions

All authors contributed to the conceptualization, design, and implementation of the study. They jointly participated in the drafting and critical revision of the manuscript and approved the final version for submission.

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Disclosure

All data collected in the study are the property of the research centers involved. The authors are committed to disseminating the study results in national and international conferences and peer-reviewed journals, regardless of whether the outcomes are positive, negative, or inconclusive.

Ethics Statement

The study protocol was reviewed and approved by the Palermo 1 Local Ethics Committee (approval No. 03/2024 – February 8, 2024). The study is registered on ClinicalTrials.gov (ID: NCT06463951) and, as a prospective observational cohort study, did not involve the administration of any drugs or other investigator-driven interventions.

Conflicts of Interest

The authors declare no conflicts of interest.

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