Measuring Therapist–Client Synchrony to Forecast Change Dynamics: EMA-based Protocol Pilot

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Abstract

We examine the feasibility and utility of a therapist–client monitoring protocol based on Ecological Momentary Assessment (EMA), designed to detect synchrony and forecast change dynamics in routine psychotherapy. Using the Synergetic Navigation System (SNS), we combined daily client reports with brief pre-/post-session questionnaires from therapists and clients. N=7 (3 therapists, 4 clients) participated over 4–9 weeks, completing daily TPQ-SA surveys and pre/post EMPIS-Q ratings; end-of-study evaluations assessed feasibility and user experience. Usability and perceived data safety were rated highly, while perceived usefulness was mixed. Clients often experienced EMA as obligatory and of limited immediate value; therapists noted missing alliance items and requested side-by-side access to clients' post-session responses. Notification glitches and limited uptake of feedback interviews further reduced engagement. Findings indicate that daily and session-based monitoring is feasible, but its value depends on workflow integration, a stronger relational focus, and reliable implementation. The very small sample and reliance on self-report limit generalizability. Future work will run a larger feasibility trial, refine questionnaires (including alliance items and paired therapist–client views), and pilot multimodal synchrony measures (session audio/video and physiology) toward scalable process–outcome monitoring.

Keywords

psychotherapy, change dynamics, synergetic navigation system, protocol, pilot

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Information Society 2025, Ljubljana, Slovenia

https://doi.org/10.70314/is.2025.cogni.10

1 Introduction

Mental disorders contribute substantially to the global burden of disease. Recent estimates suggest that ~1 in 8 people were living with a mental disorder in 2019, with sustained growth in disability-adjusted life years through 2021, underscoring the need for scalable, higher-resolution care processes [15]. Psychotherapy remains a cornerstone of treatment; beyond specific techniques, robust evidence points to common therapeutic factors, especially the working alliance—being consistently linked to outcomes [25, 6]. Feedback-oriented psychotherapy (routine outcome monitoring and in-session process feedback) attempts to surface change signals early enough for course corrections, though effect sizes vary by context and tool [4, 14]. Parallel advances in mobile sensing and AI (e.g., digital phenotyping, multimodal modeling) enable dense, real-world measurement and interpretation of change processes at the individual (idiographic) level [3, 9].

The broader study we are building toward leverages these trends via a digital-twin approach that fuses session audio/video and physiology with ecological momentary assessments (EMA) to detect interpersonal synchrony, forecast tipping points, and inform just-in-time guidance to therapists [8].

This paper reports a focused pre-study, an EMA-based protocol pilot in three therapists and four clients—primarily to validate instruments, apps, and workflows, and to de-risk the methodological core for the larger study.

2 Related Work

High-frequency, routine monitoring of psychotherapy using the Synergetic Navigation System (SNS) and the Therapy Process Questionnaire (TPQ) has been piloted in several small studies. Concept and feasibility papers report that equidistant, daily self-ratings can be integrated into clinical settings with good compliance, especially when coupled to regular feedback sessions. Case-based work in suicide prevention, for example, showed near-perfect adherence across a 90-day period and emphasized that structured feedback, rather than the mere act of monitoring, appears critical for sustained engagement. More recent feasibility studies using personalized, daily process items in outpatient populations similarly found high perceived usefulness, alongside

caution about burden over longer durations (ie, signs of response fatigue). Together, these pre-studies suggest feasibility in routine care, but also highlight the importance of how data are fed back to patients and clinicians–so they can adjust focus or goals before progress falters or therapy discontinues [19, 23, 5, 12].

A second stream of pre-studies has tested EMA and feedback as an adjunct to therapy. In depressed outpatients, randomized trials of experience-sampling with weekly, personalized feedback reported that the add-on was both feasible and associated with symptom improvements versus controls; follow-on protocols have focused on pragmatic implementation and personalization. Broader EMA reviews in mental health consistently conclude that adherence is acceptable when sampling is purposeful, notifications are reliable, and feedback is built in—while also warning that implementation details (timing, prompt load, and integration into care) strongly determine perceived value [10, 1, 13].

Finally, dyadic, session-by-session monitoring has been moving toward "dual-perspective" designs that track both sides of the interaction (e.g., alliance after each session) and complement end-of-treatment measures with qualitative interviews. These studies foreground the clinical utility of post-session reflections and alliance tracking—elements our pilot also probes via therapist pre/post 5-factor ratings and client post-session reports alongside daily EMA [16].

3 Research Objectives

Overall aim of the larger program: To model psychotherapeutic change as a nonlinear, dyadic system and to forecast clinically actionable dynamics (e.g., ruptures, sudden gains) by integrating daily EMA with session-level synchrony and standardized questionnaires, grounded in Schiepek's five-factor model of change (EMPIS: **e**motions, **m**otivation to change, therapeutic **p**rogress/success, **i**nsight, problem **s**everity) [18]. To correlate observable behavioural and physiological signals, alongside textual data (transcripts, diaries), to aforementioned change dynamics, using state-of-the-art multi-modal deep learning approaches.

Specific objectives of this pre-study: i) Feasibility and fidelity. Verify day-to-day adherence, app stability, and data completeness for therapist/client EMA and session questionnaires (therapist pre/post "planned vs. enacted" five-factor ratings; client post-session intervention perceptions); ii) User experience and ethics. Collect end-of-month evaluations from both groups to surface burden, privacy, and workflow issues to remediate before scale-up (and align with transparency and equity safeguards) [3].

4 Materials and Methods

4.1 Ecological Momentary Assessment (EMA)

We used EMA to obtain equidistant, high-frequency measurements of clients' therapy-process states during everyday life. Limiting assessment to in-session ratings risks irregular or low-frequency sampling; in contrast, brief daily EMA increases ecological validity and yields time series suitable for detecting nonlinear change features and feeding back clinically meaningful signals [20]. In this pilot, clients completed one short smartphone survey per day for approximately one month, targeting core state variables and change-relevant markers aligned with the five-factor framework. This design supports forecasting/early-warning analyses and provides material for collaborative reflection in subsequent sessions [20].

4.2 Synergetic Navigation System (SNS)

Data collection and real-time monitoring were implemented with the SNS, a secure, web-based platform that schedules questionnaires at arbitrary intervals, supports Likert-type and V/A inputs across devices, and visualizes raw time-series for therapist and client use. It includes built-in analyses enabling process-oriented feedback and individualized decision-making [20, 21]. In this study we deployed the shortened TPQ for ambulatory use (TPQ-SA) for clients' daily reports and custom five-factor pre-/post-session forms for therapists and clients; accounts were protected via HTTPS with anonymized usernames and passwords, and outputs were available for optional feedback discussions [20, 21].

4.3 EMPIS questionnaire (EMPIS-Q)

The therapist pre-/post-session instruments were developed via a theory-driven item-generation and expert-consensus workflow grounded in Schiepek's five-factor change model EMPIS [18]. Concretely, three domain experts independently drafted candidate items to operationalize each factor for a pre-session "planned influence" pass and a post-session "realized influence/valence" pass. We then conducted iterative expert panel review to judge content relevance, clarity, and redundancy, reconciling wording by consensus—an approach consistent with standard content-validity procedures (e.g., expert-judge review, or modified Delphi-style consensus). Drafts were piloted internally to check interpretability and response burden, and response formats were simplified to Likert-type scales to fit the session workflow. Because the study operated bilingually, the final Slovenian versions were translated and back-translated to secure conceptual equivalence before deployment. This sequence aligns with recommended steps in scale development (theory-driven item generation → expert review for content validity → small-scale pretest) and with cross-cultural adaptation guidelines [2, 11].

4.4 Single-item Outcome Measure

EPO-1 is a single-item instrument, evaluating the responders' current emotional and psychological well-being [7]. It is used dimensionally with a visual analog scale (0: "Very poorly; I can barely manage to deal with things" to 100: "Very well; I have no important complaints").

4.5 Therapy Process Questionnaire – Short Ambulatory Use (TPQ-SA)

Daily measurements using the TPQ-SA [21, 17] (shortened version with 24 items for ambulatory use) yield time series data of psychotherapies that allow for capturing and identifying diversity and complexity of cases, as well as critical instabilities and nonstationarities. Unpredictability and complexity of change processes thus make close monitoring important.

4.6 Evaluation Questionnaire

Upon completion of data collection, tailored evaluation questionnaires were distributed to therapists and clients to gather feedback on study participation. Sections covered general research information (use of personal data, voluntariness, support availability, and need for additional information or training; for clients, also how the therapist presented the research objectives), therapist evaluation of pre- and post-session questionnaires (clarity, relevance of the five client variables, perceived influence

on session conduct, question quantity, and post-session usefulness; with space for comments), client evaluation of post-session and daily questionnaires (clarity, contribution to session comprehension, relevance, question quantity, response difficulty, utility, completion time, app prompt suitability, reference period, mode of completion, feedback interview experience if relevant, and comments), user experience (app/website usability, input preferences, timing, technical issues), and demographics (gender, age range). A separate free-text field allowed participants to provide additional comments to the research team.

4.7 Participants

The sample comprised two groups: three therapists, who were selected through convenience sampling based on prior knowledge and experience with SNS, and their four clients, who were identified through snowball sampling from therapists' current caseloads, with inclusion criteria of an established therapeutic alliance and therapist-assessed likelihood of consent to participate (see Table 1). Some authors also served as therapists in this study. Participation was voluntary and was not compensated. All the participants signed an informed consent form.

4.8 Feedback Interviews

In feedback interviews, therapist and client review visualisations of collected questionnaire data, with the therapist following rather than interpreting [22].

4.9 Procedure

EMPIS-Q was adapted for pre- and post-session use, translated into Slovenian, reviewed by four authors, and back-translated for accuracy. The Slovenian translation of the TPQ-SA was employed. All measures were implemented in the SNS. The visual analogue scale was replaced with Likert scales to assess perceived influence and valence, and a free-text field was added for optional comments. The EPO-1 was later included in the post-session client questionnaire.

Therapists familiar with SNS were invited (four approached; three consented). The research team did not rehearse client presentations or review questionnaires with them, and conducting feedback interviews was recommended (not mandatory). Therapists recruited clients, explained the study, obtained written informed consent, introduced SNS and questionnaires, and forwarded installation instructions and login credentials provided by the research team, which also activated client accounts in SNS. During data collection, clients received daily smartphone notifications to complete the TPQ-SA.

At study completion, EMPIS-Qs were deactivated; however, therapist–client dyads could continue using TPQ-SA voluntarily (two did). Therapists thanked clients, and the research team expressed appreciation to therapists. Clients and therapists each completed separate evaluation questionnaires.

5 Results

5.1 Evaluation Questionnaire - Therapists

Three therapists completed the evaluation (see Table 2). Perceived data safety was high (M=4.6/5). The pre-session instrument was rated comprehensive and relevant (both M=4.0) but had mixed impact on session conduct (ratings 2–4), reflecting unpredictable session topics and overlap among categories. The post-session instrument scored higher on comprehensiveness/relevance (M=4.6) with moderate perceived usefulness (M=4.0). Therapists asked to add items on alliance, emotions, and session atmosphere; they also requested side-by-side access to clients' post-session response. App usability was high (M=4.6); preferences included optional free-text and push notifications. One minor display issue was noted (line breaks for long Likert labels).

5.2 Evaluation Questionnaire - Clients

Four clients completed the evaluation (see Table 3). Presentation clarity was moderate (purpose $M = 3.5$, procedure $M = 3.75$), while perceived data safety was very high ($M = 5$). The daily TPQ-SA was seen as moderately comprehensive ($M = 4.25$) and moderately difficult ($M = 3.75$) but of limited immediate usefulness ($M = 2.75$), with comments about obligation and notification timing; typical completion time was 3–4 minutes. The post-session questionnaire was rated comprehensive ($M = 4.5$) and moderately helpful ($M = 4.0$), with slightly lower perceived relevance ($M = 3.75$); most clients found the item count appropriate. App ease of use was high ($M = 4.75$), though clients noted irregular/missing prompts and requested notification timing control; one initial login issue was reported. One feedback interview was conducted and described as yielding no major insights.

6 Discussion

This preliminary study aimed to evaluate the feasibility and effectiveness of a session-by-session monitoring system for both therapists and clients, in parallel to daily client measurements. The feedback gathered provides valuable insights into the strengths and areas for improvement of this methodology, which is intended to inform a larger-scale process-outcome study focusing on predicting therapeutic change.

Our findings echo prior pre-studies in three ways. First, feasibility with caveats: like earlier pilots, therapists and clients rated usability highly, yet clients sometimes experienced daily EMA as an obligation and usefulness dipped without structured feedback; prior work shows adherence and perceived value rise when regular feedback interviews are part of the protocol, something underused in our pilot (one interview only). Second, content focus: therapists' request to add alliance/emotion-of-the-session items mirrors dyadic monitoring protocols that track alliance every session; incorporating these in our post-session set should increase clinical relevance. Third, implementation details matter: notification glitches and timing issues we observed are the same levers highlighted in EMA literature as determinants of engagement. In short, our results are consistent with earlier pilots—daily monitoring is workable and accepted, but its utility depends on closing the loop (feedback), tuning item sets to the relational process, and getting the micro-UX right [12, 5, 16, 13, 24].

7 Limitations

This pilot has several limitations. The sample was very small (three therapists, four clients) and recruited by convenience/snowball methods, with role overlap (some authors as therapists), limiting generalizability and introducing possible expectancy and social–desirability biases. The observation window was short with few sessions per client, and feedback interviews were rarely used (one dyad), so acceptability and utility may be underestimated or mischaracterized. All primary measures were self-report; some post-session entries were delayed, possibly increasing recall bias but also possibly affording additional reflective processing and thus more considered responses. The session-related

Table 1: Participants and Data Collection Overview

Therapists			Clients					
	Gender	Age Range		Gender	Age Range	Feedback Interviews	No. of Sessions	Daily TPQ Duration
T1	M	35-45	C1	M	35-45	1	5	9 weeks
			C2	F	25-35	0	4	9 weeks
T2	F	45-55	C3	F	45-55	0	5	4 weeks
T3	F	35-45	C4	F	25-35	0	4	5 weeks
			4			1	18	

Table 2: Therapist Evaluation Questionnaire Results

Domain	M / Rating	Insights / Feedback	Illustrative Quote(s)
General Experience	Safety M = 4.6 (1–5)	Need for clearer guidance	"clearer instructions for presenting to clients' (T1)'; "support in explaining technical aspects" (T2); "rehearsing client presentations" (T3)
Pre-session Questionnaire	Comprehensiveness M = 4; Relevance M = 4; Influence rated 4 and 2	Difficult to predict topics; predefined aspects often intertwined; categories not natural but influenced focus; suggestion to rephrase items (wishes vs. intentions); frustration at not knowing client experience	"I was mostly guessing…clients came up with topics that changed the session course." (T1); "I rarely think about the aspects in such a structured way…that's why it influenced the session." (T2)
Post-session Questionnaire	Comprehensiveness & Relevance M = 4.6; Usefulness M = 4.0	Number of items appropriate; easier to complete than pre-session; items clear but limited new insight; missed items on alliance, emotions, session atmosphere; difficulty categorizing events; interested in client post-session reports	"relational aspect was missing" (T2); "I missed questions for [...] reflection, e.g. regarding alliance or feelings." (T1); "Sometimes it was difficult to determine exactly in which area something happened for the client." (T1)
User Experience (App)	Usability M = 4.6	All used mobile app; Likert scales suitable for focus; suggestion to add free-text fields; post-session timing added time pressure; preference for push notifications; minor technical issue	"It was an extra commitment between an already tight time-window between sessions." (T1); "... notifications [...] would remind me to fill in the questionnaire..." (T2)

Note. Ratings are on a 1–5 Likert scale (1 = low/poor, 5 = high/excellent). M denotes the mean across $N = 3$ therapists. Quotes translated from Slovene.

Table 3: Client Evaluation Questionnaire Results

Domain	M / Rating	Insights / Feedback	Illustrative Quote(s)
General Experience	Purpose clarity M = 3.5; Procedure clarity M = 3.75; Safety M = 5	Clients felt very safe; C4 unsure about right to withdraw; all knew whom to contact; mixed responses on support/presentation prior to study	—
TPQ	Comprehensiveness M = 4.25; Difficulty M = 3.75; Usefulness M = 2.75	Often experienced as obligation; sometimes forgotten; completed in 3–4 minutes; varied opinions on timing; some items too general/redundant; valued specificity of emotion items; mixed views on item count; one feedback interview, no major insights	"challenging because I often forgot and solved things in hindsight… [...] felt some pressure to complete it." (C1); "understandable, simple, but [...] a kind of obligation." (C3); "I answered all the items in a section the same"; "there weren't any groundbreaking insights." (C1)
Post-session Questionnaire	Comprehensiveness M = 4.5; Helpfulness M = 4.0; Relevance M = 3.75	Number of items appropriate (3) or excessive (1); items clear but limited usefulness for reflection	"I wouldn't say that the items were particularly useful in reflecting on the therapy itself. But they were clear." (C1)
User Experience	App Ease of use M = 4.75	Technical issues: missing or irregular prompts; initial login difficulty (C3); desire for more control over notifications	"notification… appeared exactly the other way around as it should… It would be better if I had some control over [it]." (C1); "The possibility to set the notification time." (C4)

Note. Ratings are on a 1–5 Likert scale (1 = low/poor, 5 = high/excellent). M denotes the mean across $N = 4$ clients. Quotes translated from Slovene.

instruments underwent content-focused development only and were not psychometrically validated; bilingual translation/back-translation may still leave subtle construct drift. Platform issues (notification irregularities, a display bug for long labels) may have affected adherence. Finally, the study did not include the planned multimodal synchrony streams (audio/video/physiology) or session-level alliance items, constraining insight into barriers additional data collection methods might introduce.

8 Conclusion and Future Work

This pre-study primarily assessed feasibility and barriers rather than effects. Daily EMA plus brief session questionnaires proved implementable and acceptable, but value depended on workflow fit and feedback loops. Key friction points were methodological (very small convenience sample with role overlap; self-report only; delayed post-session entries), procedural (rare use of feedback interviews; pre-session "planned influence" sometimes felt guess-like amid emergent themes; lack of explicit alliance/emotion-of-session coverage), and technical (notification irregularities; minor display issues). These constraints shaped engagement and data quality as much as the instruments themselves, underscoring that successful monitoring is a service-design problem—stable micro-UX, clear rationale, and structured feedback, not merely a measurement problem.

Future work will be a larger trial focused on de-risking these barriers. It will prioritize pragmatic endpoints (adherence, timeliness, missingness, prompt reliability, time-to-completion, usability, protocol fidelity) and data-quality safeguards (harmonized scales, timestamp checks to quantify recall lag, basic psychometrics for EMPIS-Q). Finally, it will pilot the planned multimodal streams (session A/V and physiology) strictly for feasibility (consent rates, capture success, clinician burden) before testing prognostic utility in subsequent outcome-focused studies.

Funding

This work was partly funded by a Sigmund Freud University Vienna internal Initial Funding project grant (January–May 2025).

Acknowledgements

The authors would like to thank the participating clients for their time and effort.

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