



“Vulnerability can breed strength”: The role of borderline personality disorder severity in movement synchrony among patients with major depressive disorder

Galit Peysachov, Manar Shehab, Yael Bouknik, Keren Deres-Cohen, Pavel Goldstein & Sigal Zilcha-Mano

To cite this article: Galit Peysachov, Manar Shehab, Yael Bouknik, Keren Deres-Cohen, Pavel Goldstein & Sigal Zilcha-Mano (05 Feb 2025): “Vulnerability can breed strength”: The role of borderline personality disorder severity in movement synchrony among patients with major depressive disorder, *Psychotherapy Research*, DOI: [10.1080/10503307.2025.2458174](https://doi.org/10.1080/10503307.2025.2458174)

To link to this article: <https://doi.org/10.1080/10503307.2025.2458174>



© 2025 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



[View supplementary material](#)



Published online: 05 Feb 2025.



[Submit your article to this journal](#)



Article views: 327



[View related articles](#)



[View Crossmark data](#)

RESEARCH ARTICLE

“Vulnerability can breed strength”: The role of borderline personality disorder severity in movement synchrony among patients with major depressive disorder

GALIT PEYSACHOV , MANAR SHEHAB, Yael BOUKNIK, KEREN DERES-COHEN, PAVEL GOLDSTEIN , & SIGAL ZILCHA-MANO 

Department of Psychology, University of Haifa, Haifa, Israel

(Received 31 December 2023; revised 21 January 2025; accepted 21 January 2025)

Abstract

Objective: Patients with Major depressive disorder (MDD) and a comorbid Borderline personality disorder (BPD) show a poorer prognosis for MDD compared to patients without BPD. Little is known about the therapeutic processes underlying this prognosis. The goal of the present study was to investigate whether patients with more severe BPD symptoms experience less strengthening in patient-therapist movement synchrony (MS) throughout treatment, and whether less strengthening in MS is associated with less effective sessions. **Method:** Ninety-five patients participating in a randomized control trial were assessed for BPD ($N = 9$) using the Structured Interview for DSM-IV Personality. 1367 video-taped sessions were analyzed for MS using Motion Energy Analysis. Session effectiveness was evaluated following each session using a one-item scale taken from the Helping Skills Measure. Multilevel models were used to assess whether BPD severity predicted MS throughout treatment, and whether MS predicted session effectiveness. **Results:** Patients with more severe BPD symptoms experienced greater strengthening in MS throughout treatment. Less MS strengthening was associated with less session effectiveness. **Conclusion:** These findings indicate unique therapeutic processes that characterize individuals with more severe BPD symptoms. Shedding light on these unique processes has the potential to contribute to the personalization of MDD treatment for patients with BPD.

Keywords: movement synchrony; borderline personality disorder; therapeutic processes; major depressive disorder; personality disorders

Clinical or methodological significance of this article: Individuals with BPD are characterized as experiencing major interpersonal dysfunction, including disturbances in their therapeutic relationships. Consistent with our hypothesis, patients with MDD and higher severity of BPD symptoms showed distinct patterns of MS development during treatment. However, in contrast to our hypothesis, patients with MDD and higher severity of BPD symptoms showed greater, as opposed to less, strengthening in their MS. This greater strengthening was found to be a potential strength rather than a vulnerability for these patients, as it was associated with greater session effectiveness.

Much theoretical and clinical research has been dedicated to the conceptualization of the core struggles of individuals with borderline personality disorder (BPD), as well as their unique needs in psychotherapy (Bateman & Fonagy, 2016; Lynch et al.,

2007). There are four core features which are characteristic of patients with BPD (Andrew & Skodol, 2005; Bohus et al., 2021; Gunderson et al., 2018; Lieb et al., 2004); The first is a difficulty in regulation of moods and emotions, resulting in the experience of

Correspondence concerning this article should be addressed to Sigal Zilcha-Mano, Department of Psychology, University of Haifa, Mount Carmel, Haifa 31905, Israel. Email: sigalzil@gmail.com

© 2025 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial-NoDerivatives License (<http://creativecommons.org/licenses/by-nc-nd/4.0/>), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited, and is not altered, transformed, or built upon in any way. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

intense shifts. The second is an instability in self-image or sense of self. The third is interpersonal dysfunction resulting in disrupted relationships, including disturbances in their therapeutic relationships (Baker & Beazley, 2022), and the fourth is dysregulation of impulses, resulting in impulsive and unpredictable behaviors. In addition to these core characterizing struggles, patients with BPD commonly experience high comorbidity with other mood disorders, with the most prevalent one being major depressive disorder (MDD), with comorbidity ranging up to 86.6% at baseline, as shown during a 2-year follow-up study (Zanarini et al., 2019).

Patients with BPD and a comorbid MDD tend to demonstrate a more severe clinical presentation and poorer prognosis than patients with MDD without BPD in response to psychotherapy treatment for MDD. Studies have shown that individuals with BPD and MDD experience an earlier onset of depression (Bellino et al., 2005; Joyce et al., 2003; Tong et al., 2020), more chronic depressive episodes (Gunderson et al., 2008; Joyce et al., 2003), a greater risk of relapse (Grilo et al., 2010, but also see Kline et al., 2024), and rate their depressive symptoms as more severe (Distel et al., 2016; Köhling et al., 2015; Stanley & Wilson, 2006). It has also been shown that BPD hinders treatment outcome (Ceresa et al., 2021). A comprehensive review by Ceresa et al. (2021), suggested that the presence of BPD hampers the treatment process, resulting in higher persistence of depressive symptoms and a reduced rate of remission. One example of a study included in the review is a five-year study conducted by Riihimäki et al. (2014), which found that patients with BPD and MDD spent more time with depressive symptoms, achieved full remission more slowly, and experienced more chronic depressive episodes compared to patients with MDD without BPD. These differences persisted up to a 5-year follow-up. Another study included in the review is a 3-year longitudinal study that found that the presence of BPD significantly elevated the risk of MDD persistence (Skodol et al., 2011). From these studies, it may be inferred that there is a need to tailor existing psychotherapy treatments for MDD to the unique needs and characteristics of patients who also experience symptoms of BPD (Riihimäki et al., 2014). To achieve this, it is necessary to acquire a better understanding of the ways in which therapeutic processes that lead to change in psychotherapy for MDD differ at the presence of BPD symptoms (Kazdin, 2009; Kramer et al., 2022).

To the best of our knowledge, most studies to date focusing on patients with BPD and MDD have focused on treatment outcome, as opposed to therapeutic processes (for example, see Harned et al., 2008), and almost no studies have investigated the

therapeutic processes that are associated with change in patients with BPD and MDD (for an exception, see Dinger et al., 2021). Although little is known about the therapeutic processes in patients with BPD and MDD, much research has been dedicated to the identification of therapeutic processes that lead to change in patients with BPD only (De Meulemeester et al., 2018; Euler et al., 2019; Kramer et al., 2017). A review by Levy et al. (2018), showed that many forms of psychotherapy treatment have been developed to address the unique struggles of patients with BPD, and have been proven more effective than waiting lists and psychotherapy treatment as usual. Many of these psychotherapy treatments developed for patients with BPD have common targeted therapeutic processes that correspond with core struggles of patients with BPD (Levy et al., 2018), such as acquisition of emotion regulation and adaptive coping skills, changes in interpersonal patterns (Mehlum, 2021; Rudge et al., 2020), and mentalization (Byrne & Egan, 2018). These accumulating findings suggest that patients with BPD may be more responsive to therapeutic processes that are tailored to their core struggles.

It may also be suggested that while some therapeutic processes work better for patients with BPD compared to other patients, some therapeutic processes that work well for other patients may not work as well for patients with BPD. For example, over the last few decades, studies conducted on the general population of patients with various disorders have consistently indicated that the therapeutic alliance is the most consistent predictor of treatment outcome (Flückiger et al., 2018). While existing literature indicates that this may be true for patients with BPD as well (Barnicot et al., 2012), several studies have emphasized the complexity in developing and establishing a positive therapeutic alliance between patients with BPD and their therapists (Baker & Beazley, 2022; Levy et al., 2010; McMain et al., 2015). Due to the importance and centrality of the therapeutic alliance in treatment, it is important to further delve into the complexity of the therapeutic alliance among patients with MDD who experience symptoms of BPD.

One way to dive deeper into the therapeutic alliance of this clinical population would be through self-report measures. However, patients with BPD have been reported to experience a potential bias when reporting on their interpersonal relationships, due to experiences of disturbances in their perception of others and their interpersonal interactions (Barnow et al., 2009; Cavicchioli & Maffei, 2020; Kanske et al., 2016; Lazarus et al., 2020). It can be suggested that self-report measures may serve as an obstacle when seeking to look deeper into the

therapeutic alliance and its' complexity in patients who experience symptoms of BPD. Therefore, it is important to investigate the therapeutic alliance in these patients by using an objective measure.

There are several promising candidates that have been suggested in the literature to serve as objective measures of the therapeutic alliance, such as patient-therapist facial expressions synchrony (Yokotani et al., 2020), hormonal synchrony (Levi et al., 2024; Zilcha-Mano et al., 2020), vocal synchrony (Nof et al., 2021) and physiological synchrony (Kleinbub et al., 2020). One of the biomarkers that has received the most empirical attention is patient-therapist movement synchrony (MS; Zilcha-Mano, 2024), which is defined as the coordination of movement between interacting partners, irrespective of the specific postures or gestures displayed (Condon & Ogston, 1966; Ramseyer & Tschacher, 2011). Accumulating research on the association between MS and the therapeutic alliance has shown mixed results. Whereas some studies have shown that more MS is associated with a better therapeutic alliance and better treatment outcome, others either did not find a significant association or found a negative association between MS and the therapeutic alliance and treatment outcome (for reviews, see Atzil-Slonim et al., 2023; Wiltshire et al., 2020; Zilcha-Mano, 2024).

One potential explanation for these mixed-results is that the tendency to synchronize with others may be disorder-specific (Paulick et al., 2018), and therefore manifest differently in MS, depending on the present disorders. For example, while studies have shown that MS is higher in individuals with depression and individuals with social anxiety when compared to healthy controls (Altmann et al., 2021; Asher et al., 2020; Shatz et al., 2024), MS was found to be lower in individuals with depression when compared to individuals with social anxiety (Paulick et al., 2018). Meaning, not only do patients with depression and patients with social anxiety were found to differ from healthy controls, but they also seem to differ from each other in their tendency to synchronize with others. In the case of patients with BPD, a study has shown that when inducing Oxytocin hormone intra-nasally, which is expected to affect interpersonal interactions, patients with BPD experienced a decrease in levels of MS, while healthy controls experienced an increase. It has been suggested that this difference between patients with BPD and healthy controls may be explained through the mediating effect of their interpersonal struggle (Ramseyer et al., 2020).

Based on the presented literature, we propose the following conceptual model: due to patients with BPD having interpersonal struggles, patients with MDD and higher severity of BPD symptoms will exhibit less strengthening in their alliance with their

therapists through treatment, manifested as a maladaptive tendency to synchronize and less strengthening in MS with their therapists throughout treatment (Mayo & Gordon, 2020; Zilcha-Mano, 2024). In addition, much of the existing literature shows that more MS is associated with better treatment outcome across various clinical populations (Atzil-Slonim et al., 2023; Wiltshire et al., 2020; Zilcha-Mano, 2024), therefore, we hypothesized that less strengthening in MS will predict less improvement in session effectiveness, in our overall sample and irrespective of BPD symptoms severity.

We chose to focus on session effectiveness as the dependent variable, as opposed to other variables of treatment outcome, for the following reasons: Patients with BPD and MDD exhibit difficulties in a wide variety of areas going beyond depressive symptoms (Brodsky et al., 2006; Dixon-Gordon et al., 2015), and they have a large heterogeneity in their presenting problems and disabilities (Asnaani et al., 2007; Rebok et al., 2015). Focusing on session effectiveness enables capturing a broad spectrum of difficulties that these patients may face. In addition, it captures the immediate subjective experience of the patients, which is crucial in patients with BPD, who tend to experience fluctuations in their internal states (Kanske et al., 2016). In addition, similarly to studies conducted in recent years (for examples, see Buronfosse et al., 2024; Szücs et al., 2020; Yuan et al., 2023), we focused on BPD as a continuous measure, as this has been shown to be more reliable in the measurement of BPD in particular (Carcone et al., 2015) and more informative of patients who do not meet the dichotomous criteria (Morgan et al., 2013). Given the importance of disentangling between- from within-patient variance (Cohen et al., 2021; Prinz et al., 2021; Zilcha-Mano, 2021), in the current study we disentangled the trait-like component (the between-variance) from the state-like component (the within-variance) of MS, and focused on the state-like component of MS to represent the individual-specific within process changes in MS (Zilcha-Mano, 2021).

The overarching goal of the present study was to test our proposed conceptual model. To achieve this, we defined two aims: First, we investigated the development of MS throughout treatment as a function of BPD severity. Second, we investigated whether the development of MS throughout treatment was associated with session effectiveness. These hypotheses were tested in a randomized-controlled trial (RCT; Zilcha-Mano, Goldstein et al., 2021) providing short-term psychotherapy treatment to patients with MDD, including patients with varying severity levels of BPD symptoms. This allowed us to explore the therapeutic process and

its association with session effectiveness in a population with varying degrees of this comorbidity.

Method

Study Design

One hundred and eighteen patients were included in the pilot and active phases of the RCT providing psychotherapy treatment for MDD (Zilcha-Mano et al., 2018; Zilcha-Mano, Goldstein et al., 2021; Zilcha-Mano, Shahar et al., 2021). Ten patients were excluded from the current study due to the session effectiveness one-item scale being introduced into the study after their treatment had ended. An additional thirteen patients were excluded due to their treatment being held remotely during the COVID-19 pandemic from the beginning of treatment to the end, preventing MS scores from being calculated. This resulted in ninety-five patients for inclusion in the current study. The patients were recruited through advertisements offering 16 50-minute sessions of free treatment for depression. The RCT compared supportive and supportive-expressive psychotherapy treatment (SET; Luborsky, 1984; Luborsky et al., 1995). All participants signed informed consent forms to participate in the RCT. The RCT was approved by the ethical committee of the University of Haifa. The participants (therapists and patients) were not notified of the research questions addressed in the current study.

Inclusion criteria were as follows: (a) meeting MDD diagnostic criteria based on structured clinical interviews for Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (American Psychiatric Association, 2013), with scores above 14 on the 17-item Hamilton Rating Scale for Depression (HRSD; Hamilton, 1967) at two evaluations, one week apart, and current MDD based on the Mini-International Neuropsychiatric Interview (Sheehan et al., 1998); (b) if the patients were on medication, their dosage had to be stable for at least 3 months before entering the study, and they were asked to maintain a stable dosage for the duration of the treatment; (c) age between 18 and 60 years; (d) fluency in Hebrew; and (e) provision of written informed consent.

Exclusion criteria were as follows: (a) current risk of suicide or self-harm (HRSD suicide item score > 2); (b) current substance abuse disorder; (c) current or past schizophrenia, psychosis, bipolar disorder, or severe eating disorder requiring medical monitoring; (d) history of organic mental disease; or (e) currently in psychotherapy. In the enrollment to the RCT, patients with various comorbidities were included, such as personality disorders, to represent the population of individuals with MDD.

Psychotherapy was found to be effective for patients with MDD only, and with MDD and comorbid disorders (Barber et al., 2013).

Participants

Patients. Ninety-five patients were included in the analyses. The mean age of the patients was 31.24 years ($SD = 8.62$), and 61.1% were female; mean level of education was 14.55 years ($SD = 2.09$); 50.5% reported that their monthly family income was below the average monthly income per family (about \$4212), 22.1% reported it was average, 24.2% reported it was above average, and 3.2% did not report income; 65.3% were employed, 32.6% were unemployed, and 2.1% did not report employment. Of the participants, 78.9% were single, 14.7% married, 5.3% were divorced or separated and 1.1% were widowed. 80% were Jewish, 1.1% were Christian, 8.4% were Muslim, 7.4% were “other”, 1.1% were Druze, and 2.1% did not report their religion. In addition to MDD, 74.7% ($N = 71$) of the patients were diagnosed with one or more personality disorders, with comorbidity rates as follows: avoidant ($N = 39$, 41.1%), obsessive-compulsive ($N = 37$, 38.9%), dependent ($N = 13$, 13.7%), paranoid ($N = 11$, 11.6%), narcissistic ($N = 11$, 11.6%), borderline ($N = 9$, 9.5%), schizoid ($N = 7$, 7.4%), histrionic ($N = 5$, 5.3%), and schizotypal ($N = 1$, 1.1%). For a table of the patients’ demographics see Table S1 in online supplements.

Therapists. Out of nine therapists included in the pilot and active phases of the RCT, seven therapists were included in the analyses. All therapists had formal training in psychodynamic treatment and at least five years of expertise in its practice. The therapists attended a 20-hour training workshop in supportive and expressive techniques before seeing patients. Two therapists did not continue into the pilot phase after the training workshop. One therapist did not continue into the active phase of the RCT, and was included in the analyses. Six therapists completed treatment of two pilot patients, one of each treatment type, and demonstrated sufficient adherence before moving to the active phase of the RCT. Throughout the study, the therapists received weekly personal and group supervision provided by two experienced licensed clinical psychologists, who were further supervised by an international expert in SET. To account for a potential therapist effect, therapists provided treatment in both conditions to act as their own controls and avoid nesting of therapists within treatment conditions, which may result in unwanted confounding. Mean clinical experience

of the therapists included in the current study was 11.88 years ($SD = 5.73$); their mean age was 39.89 ($SD = 6.15$); and 6 of the therapists were females. The mean number of patients treated by each therapist included in the current study was 9.67 ($SD = 7.41$; range = 1–18). Five of the therapists were Jewish, one was Christian, and one was atheist.

Treatment

Patients received 16 weekly 50-minute sessions of SET, a time-limited psychodynamic treatment adapted for depression, either in an expressive-focused condition (SET) or in a supportive-focused condition (ST). Patients were randomized into one of the two treatment conditions and assigned to one therapist. Assignment to treatment condition was conducted by an outside institution, not involved in the study. Comprehensive treatment protocols were used for SET: the Luborsky manualized treatment (Luborsky, 1984; Luborsky et al., 1995). The ST condition included all supportive techniques detailed in the manual, excluding the expressive techniques (as detailed in Leibovich et al., 2018). Supportive techniques refer to techniques used to promote a healthy therapeutic relationship, and expressive techniques refer to techniques used to improve the patients' self-understanding through interpretations of interpersonal themes (Luborsky, 1984). The adherence of therapists to the treatment manuals was assessed using the Penn Adherence-Competence Scale (PACS; Barber & Crits-Christoph, 1996). The results of the PACS coding were as expected (Zilcha-Mano, Goldstein et al., 2021).

Measures

Diagnosis of borderline personality disorder. BPD was assessed using the Structured Interview for the Diagnosis of Personality Disorders (SIDP-IV; Pfohl et al., 1997). This instrument is a comprehensive, semi-structured clinical interview for the assessment of DSM-IV Axis II diagnoses. The SIDP-IV includes neutral questions organized into topical sections to produce a natural flow in the interview. The number of criteria for each personality disorder in the DSM-IV varies from 7 to 9, while in BPD specifically, there are 9 criteria. Criteria were rated as follows: 0 = Absent, 1 = Sub-threshold, 2 = Present, 3 = Strongly present. A score of 2 or more on at least 3–5 criteria (depending on the personality disorder in question) is required for a diagnosis of the identified personality disorder using a dichotomous measure. The required criteria for the diagnosis of BPD using the dichotomous measure, is to meet at

least 5 criteria out of 9 total possible criteria. The instructions for the SIDP-IV specify a scoring rule according to which behavior typical of the past 5 years represents the basis for the ratings. SIDP-IV interviewers were masters or doctoral level clinical psychologists, who received extensive training and supervision in the administration of the SIDP-IV. Personality disorders were examined both as a dichotomous and a continuous variable (Jane et al., 2006). Consistent with compelling arguments made for the assessment and study of BPD as a continuous measure (Herpertz et al., 2017; Trull et al., 1990; Trull & Durrett, 2005; Verheul, 2005; Wiggins & Pincus, 2002), in the current study we operationalized BPD as continuous measure for the main analyses. It has been shown in previous studies that, for the measurement of BPD in particular, a continuous measure is most informative for patients who do not reach the dichotomous criteria (Morgan et al., 2013) and is more reliable than a dichotomous measurement (Carcone et al., 2015). For sensitivity analysis, we repeated the main analyses with BPD as a dichotomous measure. In the current study, baseline measurements of BPD were included in the analysis. The inter-rater reliability of the BPD scale for the patients included in the current study was assessed using Cronbach's α , yielding a value of 0.953.

Movement synchrony. Consent was obtained from patients for all treatment sessions to be videotaped and used for MS analysis. All sessions were analyzed using Motion Energy Analysis (MEA; Ramseyer, 2020a).

Data collection. Data collection required a digital video camera (with no specific codec required), placed in a completely stable position throughout the recording and a light source that was not subject to large fluctuations. In order to provide time-locked images, a single camera was used to record both the patient and the therapist. The videos were uploaded to a computer equipped with the MEA software (Ramseyer, 2020a).

Sample analysis. Videos of the therapy sessions were edited, using Corel VideoStudio Software, to include only the segment of treatment during which the patient and therapist remain seated. Digitized sequences (25 frames/seconds) of the sessions were analyzed using MEA (Ramseyer, 2020a). The software was used to calculate the differences in gray-scale pixels between consecutive video-frames in four different regions of interest: the patient's head, the patient's body, the therapist's head and the therapist's body. This provided objective and quantitative measures of the dynamic motion characteristics of patient and therapist. Calculations of MS were

conducted using the rMEA R-package (Kleinbub & Ramseyer, 2021) for the statistical software R (R core Team, 2013). For further details on the sample analysis see online supplements.

Quantifying movement synchrony. The quantification of MS was based on a time-lagged cross-correlation algorithm. Cross-correlations between the two partners' time series, in window segments of 1-minute duration, for positive and negative time lags up to 5s in steps of 0.1s were computed by shifting one time series in relation to the other stepwise (50 steps in each direction of positive and negative lags). Cross-correlations were then standardized (Fisher's Z), and the absolute values of the cross-correlations were averaged, to create one global value of MS. The use of absolute values means that both positive and negative cross-correlations contributed positively to the 50-minute MS measure. This strategy created a single value, representative of the global MS between patient and therapist per session (Ramseyer, 2020a; Ramseyer & Tschacher, 2011).

Pseudo-synchrony. Following the work of Ramseyer and Tschacher (2010), in order to control for spurious correlations, we examined MS compared to pseudo-synchrony, which refers to MS that was caused by random coincidence. The present pseudo-interactions were generated on short time scales by using an automated surrogate testing algorithm (Ramseyer & Tschacher, 2010). Surrogate data sets ($n = 100$ out of each genuine data set) were produced by shuffling the 1-minute segments of the original data, thus aligning patient's and therapist's movement segments that never actually occurred at the same time. The original timing of each individual's movement within the session was preserved, so that the shuffled segments still reflected the actual timing of the occurrence of the movement within that individual's data. Pseudo-synchrony for the shuffled data sets was calculated identically to the way in which MS was calculated for the original data set, as described above. For the statistical comparison of MS versus pseudo-synchrony, the mean value of the shuffled data sets was calculated (i.e., the base level of pseudo-synchrony) and compared with the value of genuine MS from the original data set. Each session was characterized by one value of genuine MS and one value of pseudo-synchrony. MS was assessed with a z-transformed MS variable: providing an effect-size estimate of MS compared with pseudo-synchrony (Ramseyer & Tschacher, 2011). The resulting effect-size estimates were used as the MS scores included in the analyses.

$$(\text{synchrony} - \text{pseudosynchrony}) / SD_{\text{pseudosynchrony}}$$

Session effectiveness. Session effectiveness was measured repeatedly by the patients after each of the 16 weekly sessions, using a one-item scale for assessment of overall session effectiveness, taken from the Session Evaluation Scale (SES) of the Helping Skills Measure (Hill & Kellems, 2002). Originally, the SES included four items, each rated on a 5-point Likert scale, with higher scores reflecting perceptions of higher session quality. Later, a fifth item was added requiring the patients to "rate the overall effectiveness of this session" ranging from 1 (not effective) to 5 (highly effective) (Lent et al., 2006). In the current study we focused on the ratings of the fifth item, which is a direct assessment of session effectiveness, as we specifically aimed to assess session effectiveness. A comprehensive summary of the study design is provided in Figure 1.

Data Analysis

The data of the present study was hierarchically nested on three levels: sessions nested within patients, nested within therapists. To account for the resulting non-independence of effects, and to prevent their inflation, we added the patient and therapist as random effects, using the SAS PROC MIXED procedure for multilevel modeling (Littell et al., 2006) when testing both of our hypotheses: (a) In patients with MDD, patients with higher severity of BPD symptoms will exhibit less strengthening in their MS with their therapists; (b) patients with less strengthening in their MS with their therapists will evaluate sessions as less effective.

To examine both study hypotheses, we evaluated the following trend models for each hypothesis: without time; with time not including slope as random; with time including slope as random; with linear in log transformation of time, not including slope as random; and with linear in log transformation of time, including slope as random. The Likelihood Ratio test and the Bayesian Information Criterion (BIC) were used to determine whether the inclusion of each term improved the model fit (For Log Likelihood and BIC values see Table S2 in the online supplements). The model that was found to have the best fit for both hypotheses was the model with linear in log transformation of time, including slope as random. This is consistent with accumulating findings suggesting that most of the change in therapeutic processes occurs during the first few sessions of treatment (Lutz et al., 2021). Due to the usage of models with linear in log transformation of time, we did not use an autoregressive model, as an autoregressive model assumes a

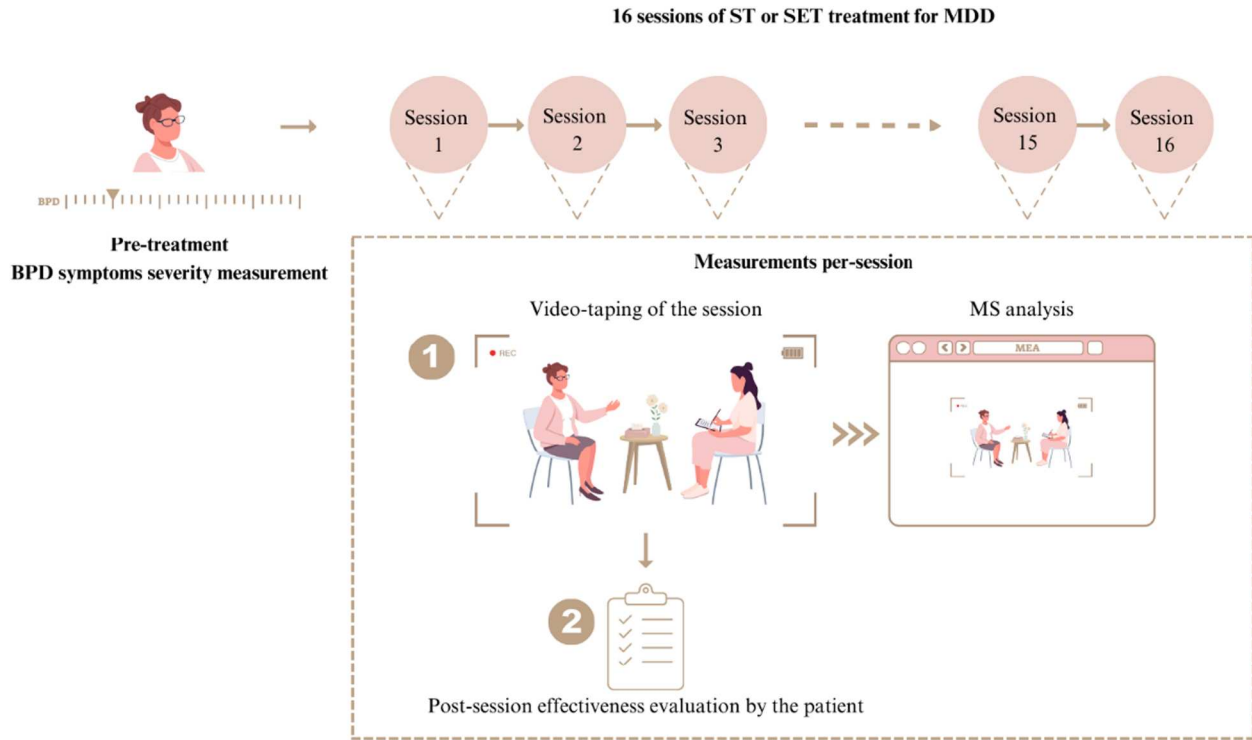


Figure 1. Study design.

constant correlation between adjacent sessions over time (Bringmann et al., 2017).

Given the importance of disentangling between- and within-patient variance when analyzing longitudinal data (Wang & Maxwell, 2015), we calculated a variable of MS values centered around the mean of each patient-therapist dyad, which was used as a measure reflecting the within-patient variance throughout treatment for each patient, while accounting for the between-patient variance. The resulting variable was used in all analyses conducted in this study as the measure reflecting MS in each session.

$$\begin{aligned} \text{Model 1. } MS_{stateijt} = & b_0 + b_1 * BPD_{ij} \\ & + b_2 * sessionlog(t) \\ & + b_3 * BPD_{ij} * sessionlog(t) \\ & + v_j + u_{ij} \\ & + w_{ij} * sessionlog(t) + e_{ijt} \end{aligned}$$

$$\begin{aligned} \text{Model 2. } SessionEffectiveness_{ijt} = & b_0 + b_1 * MS_{stateijt} + b_2 * sessionlog(t) \\ & + b_3 * BPD_{ij} + v_j + u_{ij} + w_{ij} * sessionlog(t) \\ & + e_{ijt} \end{aligned}$$

Note. $MS_{stateijt}$ and $SessionEffectiveness_{ijt}$ are the MS within-subject variance per dyad and session

effectiveness report (the dependent variable) of patient i , treated by therapist j at session t , respectively. BPD_{ij} is the baseline severity of BPD of patient i treated by therapist j . $Sessionlog(t)$ is session t after linear in log transformation of time. v_j and u_{ij} are the random effects (intercepts) of therapist j and patient i treated by therapist j . w_{ij} is the random effect of time. e_{ijt} is the random error. All random effects have a normal distribution, with a mean of zero, and are independent of each other, except for u_{ij} and w_{ij} , which are correlated (within a patient).

Given the relatively low percentages of missing data for BPD (0.0%), MS (6.8%) and session effectiveness (5.1%) and due to the ability of multilevel models to handle missing data under the missing at random assumption (Gallop & Tasca, 2009), we did not conduct any data imputation. This resulted in a total of 1,367 sessions included in the analyses, with an average of 14.39 sessions per patient and an average of 195.29 sessions per therapist.

As sensitivity analyses, we repeated our models with treatment condition controlled, MDD severity at baseline controlled and the trait-like component of MS controlled. We repeated our models with the state-like component of MS replaced by raw MS scores (preceding the disentanglement of the state- and trait-like components) and by MS calculated without using absolute values (Tschacher & Meier, 2020). We also repeated our models with session

effectiveness replaced by the state-like component of session effectiveness, and by MDD severity measured using HRSD, which served as the RCT's main outcome. In addition, we repeated our models with BPD as a dichotomous measure, as opposed to a continuous measure. Lastly, we assessed the association between BPD severity at baseline and the state-like component of MS at the first session, to determine whether patients with a higher severity of BPD symptoms started treatment with significantly lower levels of MS and experienced more strengthening in MS as a result of compensation (Cheavens et al., 2012; Zilcha-Mano, 2021).

Results

MS and session effectiveness were found to strengthen over time ($F(1,1360) = 4.19, p < 0.05$, $F(1,1381) = 51.87, p < 0.001$, respectively). Examining our first hypothesis, we found that BPD severity was a significant predictor of MS strengthening over time. This indicates that patients with higher

severity of BPD symptoms at baseline experienced greater strengthening in their MS with their therapists throughout treatment (Table I). As for our second hypothesis, MS was a significant predictor of session effectiveness scores over time. This indicates that patients who experienced less strengthening in their MS with their therapists throughout treatment also reported lower session effectiveness scores throughout treatment (Table II).

Sensitivity Analyses

Several sensitivity analyses were conducted. Findings were replicated when controlling for treatment condition, MDD severity at baseline and the trait-like component of MS (Tables S5, S6 and S7). In addition, findings were replicated when the state-like component of MS was replaced by raw scores of MS and by MS calculated without using absolute values (Tables S8 and S9). Findings were also replicated when session effectiveness was replaced with the state-like component of session effectiveness (Table S10). However, findings were not replicated when session effectiveness was replaced by MDD measured using HRSD, the RCT's main outcome (Table S11). Findings were replicated when BPD was used as a dichotomous measure (for results see Table S12; for descriptives see Table S13). For all sensitivity analyses model equations see online supplements. Finally, there was no significant association between BPD severity at baseline and the state-like component of MS at the first session.

Table I. Model 1 results.

Model	Predictor	Estimate	SE	<i>t</i>	<i>p</i>
MS_state (predicted by BPD)	BPD	-0.04*	0.02	-2.22	0.03
	Sessionlog	-0.05	0.07	-0.81	0.42
	BPD × Sessionlog	0.02*	0.01	2.32	0.02
	Sessionlog				

Note. Model 1 = the state-like component of patient-therapist movement synchrony, predicted by the interaction between the patient BPD severity at baseline and linear in log transformation of time; MS_state = the state-like component of patient-therapist movement; BPD = patient's BPD severity at baseline; Sessionlog = linear in log transformation of time; × = Interaction term; SE = standard error.

* $p < 0.05$.

Discussion

The overarching goal of the present study was to test our conceptual model, suggesting that in patients with MDD, patients with higher severity of BPD symptoms would exhibit less strengthening in MS

Table II. Model 2 results.

Model	Predictor	Estimate	SE	<i>t</i>	<i>p</i>
SessionEffectiveness (predicted by MS_state)	MS_state	0.07**	0.02	3.22	0.001
	BPD	0.01	0.02	0.45	0.66
	BPD × Sessionlog	0.27***	0.04	7.26	<.001

Note. Model 2 = session effectiveness evaluated by patients post-session predicted by the state-like component of patient-therapist movement synchrony while controlling for the effect of linear in log transformation of time and the patient BPD severity at baseline; SessionEffectiveness = session effectiveness as evaluated by the patients post-session; MS_state = the state-like component of patient-therapist movement synchrony; BPD = patient BPD severity at baseline; Sessionlog = linear in log transformation of time; SE = standard error.

** $p < 0.01$.

*** $p < 0.001$.

throughout treatment. In addition, in the overall sample, less strengthening in MS would predict lower session effectiveness as evaluated by the patients. Our conceptual model was partially confirmed. The first path proposed by our conceptual model suggested that in patients with MDD, patients with higher severity of BPD symptoms would show less strengthening in their MS with their therapists, as an expression of their interpersonal struggles. The first path was partially confirmed; patients with higher severity of BPD symptoms did show a different development of MS throughout treatment, which may indicate a unique pattern of MS development characteristic to patients who also experience symptoms of BPD (Paulick et al., 2018). However, this development was in the opposite direction of our hypothesis. Patients with higher severity of BPD symptoms showed greater strengthening in their MS with their therapists, as opposed to less strengthening. One possible explanation for the unexpected direction of this effect is the high dependency that patients with BPD tend to experience on others, in interpersonal relationships (Bornstein et al., 2010; Van Der Kolk et al., 1994). It can be speculated, based on the current findings, that the high dependency that patients with BPD experience with others may manifest in a strengthening of MS.

The second path proposed by our conceptual model suggested that patients with less strengthening in MS with their therapists would also evaluate sessions as less effective. The second path of our conceptual model was confirmed. The findings showed that patients whose MS with their therapists showed less strengthening throughout treatment also evaluated sessions as less effective. This finding is consistent with previous findings supporting a positive association between MS and treatment outcome (Atzil-Slonim et al., 2023; Wiltshire et al., 2020; Zilcha-Mano, 2024). The finding that higher levels of MS are associated with better treatment outcome, has been found across various studies, conducted on a variety of clinical populations, such as patients with chronic depression (Arnoult et al., 2013), post-traumatic stress disorder (Howard et al., 2022) and eating disorders (Graves et al., 2017). In the current study we have replicated this positive association between MS and session effectiveness in patients with MDD, including patients with BPD symptoms. However, this finding contrasts with a handful of studies that were not able to show a significant association, or showed a negative association, between MS and treatment outcome (Atzil-Slonim et al., 2023; Zilcha-Mano, 2024). Future studies should systematically explore for whom and when a negative association emerges between MS and session effectiveness (Galbusera et al., 2019;

Paladino et al., 2010), as has been demonstrated in MS and session effectiveness as evaluated by the therapists (Ramseyer, 2020b), and other forms of synchrony (Gernert et al., 2023; Reich et al., 2014; Schoenherr et al., 2021).

Taken together, the findings from the current study may be complementary to one another, suggesting a unique role that the therapeutic alliance may play in patients with MDD, with higher severity of BPD symptoms. One possible post hoc speculation may lie in the high dependency that patients with higher severity of BPD symptoms tend to experience with others. It is possible that, due to the therapeutic setting in which this high dependency is expressed, the therapist is able to leverage it for the benefit of the treatment. While, outside of the therapeutic setting, the high dependency of patients with BPD may present an obstacle and cause distress in their relationships (Bornstein, 2016; Daelman et al., 2017), in a therapeutic setting it may be perceived otherwise. The therapist may be able to tailor their patient-therapist interactions to the high dependency expressed, in a way that would lay the foundation for a more adaptive dependency to develop (Kivity et al., 2020; McMain et al., 2015). This more adaptive dependency may, in turn, be associated with higher session effectiveness as evaluated by the patients. This points to the high therapeutic potential that the relationship between the patient and therapist may hold for patients with MDD, and higher severity of BPD symptoms. If these findings are replicated in future studies and their interpretation receives support, they hold the potential to have important implications for the clinical practice of treating MDD in patients with BPD.

The present study carries several limitations that future studies should address. (a) A small sample size of ninety-five patients, which did not allow a direct assessment of the mediating effect between MS and session effectiveness: the mediating effect should be assessed in future studies with larger samples. (b) A minority of patients met the dichotomous criteria for BPD ($N = 9$): future studies relying on larger samples with a higher percentage of patients, or with all patients, meeting the dichotomous criteria for BPD should assess the development of MS throughout treatment and its' association to session effectiveness. This should be assessed while operationalizing BPD both as a continuous and a dichotomous measure. (c) A small sample size of seven therapists did not allow an evaluation of the therapist effect: future studies should investigate samples with a larger sample of therapists and a greater therapist to patient ratio (Crits-Christoph et al., 2011). (d) In the current study MS was operationalized as a global score per session without

addressing MS patterns such as in-phase and anti-phase (Tschacher & Meier, 2020): future studies should investigate in-session fluctuations of MS, MS patterns and other approaches to MS operationalization (Lutz et al., 2020; Prinz et al., 2021; Ramseyer, 2020b). (e) Future studies should assess session effectiveness using various other assessments, to eliminate further the potential bias of self-report in patients with BPD and to allow for the generalization of the results across other measures of outcome. (f) The post-hoc speculation that we have provided should be directly examined and other post-hoc speculations should be taken into consideration. For example, future studies relying on larger samples should assess the possibility that patients with MDD and BPD experience less MS with their therapists at baseline compared to patients with MDD without BPD and compensate throughout treatment resulting in greater MS strengthening over time (Cheavens et al., 2012; Zilcha-Mano, 2021).

Notwithstanding these limitations, the strength of the current study lies in its potential contribution to enhancing the understanding of the differences in therapeutic processes between patients with BPD and MDD. These findings point to the need to address patients with MDD who also experience BPD symptoms differently during treatment, and tailor MDD treatment to their needs. Deepening our understanding of such differences holds the potential to enhance the personalization of MDD treatment for patients with BPD. Despite the core interpersonal struggles of patients with BPD that can potentially hinder the therapeutic relationship (Baker & Beazley, 2022), the relationship of patients with BPD with their therapists may hold much therapeutic potential for them, meaning that one of their vulnerabilities may become one of their strengths in treatment.

Disclosure Statement

No potential conflict of interest was reported by the author(s).

Funding

This work is supported by the Israel Science Foundation [ISF, Grant no. 395/19 to S. Zilcha-Mano].

Supplemental Data

Supplemental data for this article can be accessed at <https://doi.org/10.1080/10503307.2025.2458174>.

ORCID

Galit Peysachov  <http://orcid.org/0009-0009-6227-2451>

Pavel Goldstein  <http://orcid.org/0000-0002-5224-1725>

Sigal Zilcha-Mano  <http://orcid.org/0000-0002-5645-4429>

References

- Altmann, U., Brummel, M., Meier, J., & Strauss, B. (2021). Movement synchrony and facial synchrony as diagnostic features of depression. *The Journal of Nervous and Mental Disease*, 209(2), 128–136. <https://doi.org/10.1097/nmd.0000000000001268>
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). American Psychiatric Publishing. <https://doi.org/10.1176/appi.books.9780890425596>
- Andrew, E., & Skodol, M. D. (2005). The borderline diagnosis: Concepts, criteria, and controversies. In J. G. Gunderson & P. D. Hoffman (Eds.), *Understanding and treating borderline personality disorder: A guide for professionals and families* (pp. 3–19). American Psychiatric Pub.
- Arnou, B. A., Steidtmann, D., Blasey, C., Manber, R., Constantino, M. J., Klein, D. N., Markowitz, J. C., Rothbaum, B. O., Thase, M. E., Fisher, A. J., & Kocsis, J. H. (2013). The relationship between the therapeutic alliance and treatment outcome in two distinct psychotherapies for chronic depression. *Journal of Consulting and Clinical Psychology*, 81(4), 627–638. <https://doi.org/10.1037/a0031530>
- Asher, M., Kauffmann, A., & Aderka, I. M. (2020). Out of Sync: Nonverbal synchrony in social anxiety disorder. *Clinical Psychological Science*, 8(2), 280–294. <https://doi.org/10.1177/2167702619894566>
- Asnaani, A., Chelminski, I., Young, D., & Zimmerman, M. (2007). Heterogeneity of borderline personality disorder: Do the number of criteria met make a difference? *Journal of Personality Disorders*, 21(6), 615–625. <https://doi.org/10.1521/pedi.2007.21.6.615>
- Atzil-Slonim, D., Soma, C. S., Zhang, X., Paz, A., & Imel, Z. E. (2023). Facilitating dyadic synchrony in psychotherapy sessions: Systematic review and meta-analysis. *Psychotherapy Research*, 33(7), 898–917. <https://doi.org/10.1080/10503307.2023.2191803>
- Baker, J., & Beazley, P. I. (2022). Judging personality disorder: A systematic review of clinician attitudes and responses to borderline personality disorder. *Journal of Psychiatric Practice*, 28(4), 275–293. <https://doi.org/10.1097/pra.0000000000000642>
- Barber, J., & Crits-Christoph, P. (1996). Development of a therapist adherence/competence rating scale for supportive-expressive dynamic psychotherapy: A preliminary report. *Psychotherapy Research*, 6(2), 81–94. <https://doi.org/10.1080/10503309612331331608>
- Barber, J. P., Muran, J. C., McCarthy, K. S., & Keefe, R. J. (2013). Research on psychodynamic therapies. In M. J. Lambert (Ed.), *Bergin and Garfield's handbook of psychotherapy and behavior change* (6th ed., pp. 443–494). John Wiley & Sons.
- Barnicot, K., Katsakou, C., Bhatti, N., Savill, M., Fearn, N., & Priebe, S. (2012). Factors predicting the outcome of psychotherapy for borderline personality disorder: A systematic review. *Clinical Psychology Review*, 32(5), 400–412. <https://doi.org/10.1016/j.cpr.2012.04.004>

- Barnow, S., Stopsack, M., Grabe, H. J., Meinke, C., Spitzer, C., Kronmüller, K., & Sieswerda, S. (2009). Interpersonal evaluation bias in borderline personality disorder. *Behaviour Research and Therapy*, 47(5), 359–365. <https://doi.org/10.1016/j.brat.2009.02.003>
- Bateman, A., & Fonagy, P. (2016). Central ideas in the mentalizing approach to personality disorders. In *Mentalization-based treatment for personality disorders: A practical guide* (pp. 5–14). Oxford University Press.
- Bellino, S., Patria, L., Paradiso, E., Di Lorenzo, R., Zanon, C., Zizza, M., & Bogetto, F. (2005). Major depression in patients with borderline personality disorder: A clinical investigation. *The Canadian Journal of Psychiatry*, 50(4), 234–238. <https://doi.org/10.1177/070674370505000407>
- Bohus, M., Stoffers-Winterling, J., Sharp, C., Krause-Utz, A., Schmahl, C., & Lieb, K. (2021). Borderline personality disorder. *The Lancet*, 398(10310), 1528–1540. [https://doi.org/10.1016/s0140-6736\(21\)00476-1](https://doi.org/10.1016/s0140-6736(21)00476-1)
- Bornstein, R. F. (2016). Interpersonal dependency. In V. Zeigler-Hill & D. K. Marcus (Eds.), *The dark side of personality: Science and practice in social, personality, and clinical psychology* (pp. 341–359). American Psychological Association. <https://doi.org/10.1037/14854-018>
- Bornstein, R. F., Becker-Matero, N., Winarick, D. J., & Reichman, A. L. (2010). Interpersonal dependency in borderline personality disorder: Clinical context and empirical evidence. *Journal of Personality Disorders*, 24(1), 109–127. <https://doi.org/10.1521/pedi.2010.24.1.109>
- Bringmann, L. F., Hamaker, E. L., Vigo, D. E., Aubert, A., Borsboom, D., & Tuerlinckx, F. (2017). Changing dynamics: Time-varying autoregressive models using generalized additive modeling. *Psychological Methods*, 22(3), 409–425. <https://doi.org/10.1037/met0000085>
- Brodsky, B. S., Groves, S. A., Oquendo, M. A., Mann, J. J., & Stanley, B. (2006). Interpersonal precipitants and suicide attempts in borderline personality disorder. *Suicide and Life-Threatening Behavior*, 36(3), 313–322. <https://doi.org/10.1521/suli.2006.36.3.313>
- Buronfosse, A., Robin, M., Speranza, M., Duriez, P., Silva, J., Corcos, M., Perdereau, F., Younes, N., Cailhol, L., Gorwood, P., & Pham-Scottet, A. (2024). The impact of a telephone hotline on suicide attempts and self-injurious behaviors in patients with borderline personality disorder. *Frontiers in Psychiatry*, 14, 1288195. <https://doi.org/10.3389/fpsy.2023.1288195>
- Byrne, G., & Egan, J. (2018). A review of the effectiveness and mechanisms of change for three psychological interventions for borderline personality disorder. *Clinical Social Work Journal*, 46(3), 174–186. <https://doi.org/10.1007/s10615-018-0652-y>
- Carcone, D., Tokarz, V. L., & Ruocco, A. C. (2015). A systematic review on the reliability and validity of semistructured diagnostic interviews for borderline personality disorder. *Canadian Psychology/Psychologie Canadienne*, 56(2), 208–226. <https://doi.org/10.1037/cap0000026>
- Caviccholi, M., & Maffei, C. (2020). Rejection sensitivity in borderline personality disorder and the cognitive-affective personality system: A meta-analytic review. *Personality Disorders: Theory, Research, and Treatment*, 11(1), 1–12. <https://doi.org/10.1037/per0000359>
- Ceresa, A., Esposito, C. M., & Buoli, M. (2021). How does borderline personality disorder affect management and treatment response of patients with major depressive disorder? A comprehensive review. *Journal of Affective Disorders*, 281, 581–589. <https://doi.org/10.1016/j.jad.2020.11.111>
- Cheavens, J. S., Strunk, D. R., Lazarus, S. A., & Goldstein, L. A. (2012). The compensation and capitalization models: A test of two approaches to individualizing the treatment of depression. *Behaviour Research and Therapy*, 50(11), 699–706. <https://doi.org/10.1016/j.brat.2012.08.002>
- Cohen, K., Ramseyer, F. T., Tal, S., & Zilcha-Mano, S. (2021). Nonverbal synchrony and the alliance in psychotherapy for major depression: Disentangling state-like and trait-like effects. *Clinical Psychological Science*, 9(4), 634–648. <https://doi.org/10.1177/2167702620985294>
- Condon, W. S., & Ogston, W. D. (1966). Sound film analysis of normal and pathological behavior patterns. *The Journal of Nervous and Mental Disease*, 143(4), 338–347. <https://doi.org/10.1097/00005053-196610000-00005>
- Crits-Christoph, P., Gibbons, M. B. C., Hamilton, J., Ring-Kurtz, S., & Gallop, R. (2011). The dependability of alliance assessments: The alliance-outcome correlation is larger than you might think. *Journal of Consulting and Clinical Psychology*, 79(3), 267–278. <https://doi.org/10.1037/a0023668>
- Daelman, S., Bloch-Torrico, G., & Gagnon, J. (2017). Relations between dependency, negative affects, interpersonal difficulties and self-injury. *Suicidology Online*, 8(2), 1–17.
- De Meulemeester, C., Vansteelandt, K., Luyten, P., & Lowyck, B. (2018). Mentalizing as a mechanism of change in the treatment of patients with borderline personality disorder: A parallel process growth modeling approach. *Personality Disorders: Theory, Research, and Treatment*, 9(1), 22–29. <https://doi.org/10.1037/per0000256>
- Dinger, U., Fuchs, M., Köhling, J., Schauenburg, H., & Ehrental, J. C. (2021). Change of emotional experience in major depression and borderline personality disorder during psychotherapy: Associations with depression severity and personality functioning. *Journal of Personality Disorders*, 35, 1–20. <https://doi.org/10.1521/pedi.2019.33.420>
- Distel, M. A., Smit, J. H., Spinhoven, P., & Penninx, B. W. (2016). Borderline personality features in depressed or anxious patients. *Psychiatry Research*, 241, 224–231. <https://doi.org/10.1016/j.psychres.2016.05.007>
- Dixon-Gordon, K. L., Weiss, N. H., Tull, M. T., DiLillo, D., Messman-Moore, T., & Gratz, K. L. (2015). Characterizing emotional dysfunction in borderline personality, major depression, and their co-occurrence. *Comprehensive Psychiatry*, 62, 187–203. <https://doi.org/10.1016/j.comppsy.2015.07.014>
- Euler, S., Stalujanis, E., Allenbach, G., Kolly, S., De Roten, Y., Despland, J., & Kramer, U. (2019). Dialectical behavior therapy skills training affects defense mechanisms in borderline personality disorder: An integrative approach of mechanisms in psychotherapy. *Psychotherapy Research*, 29(8), 1074–1085. <https://doi.org/10.1080/10503307.2018.1497214>
- Flückiger, C., Del Re, A. C., Wampold, B. E., & Horvath, A. O. (2018). The alliance in adult psychotherapy: A meta-analytic synthesis. *Psychotherapy*, 55(4), 316–340. <https://doi.org/10.1037/pst0000172>
- Galbusera, L., Finn, M. T. M., Tschacher, W., & Kyselo, M. (2019). Interpersonal synchrony feels good but impedes self-regulation of affect. *Scientific Reports*, 9(1), 14691. <https://doi.org/10.1038/s41598-019-50960-0>
- Gallop, R., & Tasca, G. A. (2009). Multilevel modeling of longitudinal data for psychotherapy researchers: II. The complexities. *Psychotherapy Research*, 19(4–5), 438–452. <https://doi.org/10.1080/10503300902849475>
- Gernert, C. C., Nelson, A., Falkai, P., & Falter-Wagner, C. M. (2023). Synchrony in psychotherapy: High physiological positive concordance predicts symptom reduction and negative concordance predicts symptom aggravation. *International Journal of Methods in Psychiatric Research*, 33(1), e1978. <https://doi.org/10.1002/mpr.1978>
- 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., Karlsson, G. P., 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. *International Journal of Eating Disorders*, 50(4), 323–340. <https://doi.org/10.1002/eat.22672>
- Grilo, C. M., Stout, R. L., Markowitz, J. C., Sanislow, C. A., Ansell, E. B., Skodol, A. E., Bender, D. S., Pinto, A., Shea, M. T., Yen, S., Gunderson, J. G., Morey, L. C., Hopwood, C. J., & McGlashan, T. H. (2010). Personality disorders predict relapse after remission from an episode of major depressive disorder. *The Journal of Clinical Psychiatry*, 71(12), 1629–1635. <https://doi.org/10.4088/jcp.08m04200gre>
- Gunderson, J. G., Herpertz, S. C., Skodol, A. E., Torgersen, S., & Zanarini, M. C. (2018). Borderline personality disorder. *Nature Reviews Disease Primers*, 4(1), 18029. <https://doi.org/10.1038/nrdp.2018.29>
- Gunderson, J. G., Stout, R. L., Sanislow, C. A., Shea, M. T., McGlashan, T. H., Zanarini, M. C., Daversa, M. T., Grilo, C. M., Yen, S., & Skodol, A. E. (2008). New episodes and new onsets of major depression in borderline and other personality disorders. *Journal of Affective Disorders*, 111(1), 40–45. <https://doi.org/10.1016/j.jad.2008.01.026>
- Hamilton, M. (1967). Development of a rating scale for primary depressive illness. *British Journal of Social and Clinical Psychology*, 6(4), 278–296. <https://doi.org/10.1111/j.2044-8260.1967.tb00530.x>
- Harned, M. S., Chapman, A. L., Dexter-Mazza, E. T., Murray, A., Comtois, K. A., & Linehan, M. M. (2008). Treating co-occurring axis I disorders in recurrently suicidal women with borderline personality disorder: A 2-year randomized trial of dialectical behavior therapy versus community treatment by experts. *Journal of Consulting and Clinical Psychology*, 76(6), 1068–1075. <https://doi.org/10.1037/a0014044>
- Herpertz, S. C., Huprich, S. K., Bohus, M., Chanen, A., Goodman, M., Mehlum, L., Moran, P., Newton-Howes, G., Scott, L., & Sharp, C. (2017). The challenge of transforming the diagnostic system of personality disorders. *Journal of Personality Disorders*, 31(5), 577–589. https://doi.org/10.1521/pedi_2017_31_338
- Hill, C. E., & Kellems, I. S. (2002). Development and use of the helping skills measure to assess client perceptions of the effects of training and of helping skills in sessions. *Journal of Counseling Psychology*, 49(2), 264–272. <https://doi.org/10.1037/0022-0167.49.2.264>
- Howard, R., Berry, K., & Haddock, G. (2022). Therapeutic alliance in psychological therapy for posttraumatic stress disorder: A systematic review and meta-analysis. *Clinical Psychology & Psychotherapy*, 29(2), 373–399. <https://doi.org/10.1002/cpp.2642>
- Jane, J. S., Pagan, J. L., Turkheimer, E., Fiedler, E. R., & Oltmanns, T. F. (2006). The interrater reliability of the Structured Interview for DSM-IV Personality. *Comprehensive Psychiatry*, 47(5), 368–375. <https://doi.org/10.1016/j.comppsy.2006.01.009>
- Joyce, P. R., Mulder, R. T., Luty, S. E., McKenzie, J. M., Sullivan, P. F., & Cloninger, R. C. (2003). Borderline personality disorder in major depression: Symptomatology, temperament, character, differential drug response, and 6-month outcome. *Comprehensive Psychiatry*, 44(1), 35–43. <https://doi.org/10.1053/comp.2003.50001>
- Kanske, P., Schulze, L., Dziobek, I., Scheibner, H., Roepke, S., & Singer, T. (2016). The wandering mind in borderline personality disorder: Instability in self- and other-related thoughts. *Psychiatry Research*, 242, 302–310. <https://doi.org/10.1016/j.psychres.2016.05.060>
- Kazdin, A. E. (2009). Understanding how and why psychotherapy leads to change. *Psychotherapy Research*, 19(4–5), 418–428. <https://doi.org/10.1080/10503300802448899>
- Kivity, Y., Levy, K. N., Kolly, S., & Kramer, U. (2020). The therapeutic alliance over 10 sessions of therapy for borderline personality disorder: Agreement and congruence analysis and relation to outcome. *Journal of Personality Disorders*, 34(1), 1–21. https://doi.org/10.1521/pedi_2019_33_376
- Kleinbub, J. R., & Ramseyer, F. T. (2021). rMEA: An R package to assess nonverbal synchronization in motion energy analysis time-series. *Psychotherapy Research*, 31(6), 817–830. <https://doi.org/10.1080/10503307.2020.1844334>
- Kleinbub, J. R., Talia, A., & Palmieri, A. (2020). Physiological synchronization in the clinical process: A research primer. *Journal of Counseling Psychology*, 67(4), 420–437. <https://doi.org/10.1037/cou0000383>
- Kline, E. A., Lekkas, D., Bryan, A., Nemesure, M. D., Griffin, T. Z., Collins, A. C., Price, G. D., Heinz, M. V., Nepal, S., Pillai, A., Campbell, A. T., & Jacobson, N. C. (2024). The role of borderline personality disorder traits in predicting longitudinal variability of major depressive symptoms among a sample of depressed adults. *Journal of Affective Disorders*, 363, 492–500. <https://doi.org/10.1016/j.jad.2024.07.104>
- Köhling, J., Ehrental, J. C., Levy, K. N., Schauenburg, H., & Dinger, U. (2015). Quality and severity of depression in borderline personality disorder: A systematic review and meta-analysis. *Clinical Psychology Review*, 37, 13–25. <https://doi.org/10.1016/j.cpr.2015.02.002>
- Kramer, U., Eubanks, C. F., Bertsch, K., Herpertz, S. C., McMain, S., Mehlum, L., Renneberg, B., & Zimmermann, J. (2022). Future challenges in psychotherapy research for personality disorders. *Current Psychiatry Reports*, 24(11), 613–622. <https://doi.org/10.1007/s11920-022-01379-4>
- Kramer, U., Keller, S., Caspar, F., De Roten, Y., Despland, J., & Kolly, S. (2017). Early change in coping strategies in responsive treatments for borderline personality disorder: A mediation analysis. *Journal of Consulting and Clinical Psychology*, 85(5), 530–535. <https://doi.org/10.1037/ccp0000196>
- Lazarus, S. A., Beeney, J. E., Howard, K. P., Strunk, D. R., Pilkonis, P. A., & Cheavens, J. S. (2020). Characterization of relationship instability in women with borderline personality disorder: A social network analysis. *Personality Disorders: Theory, Research, and Treatment*, 11(5), 312–320. <https://doi.org/10.1037/per0000380>
- Leibovich, L., Nof, A., Auerbach-Barber, S., & Zilcha-Mano, S. (2018). A practical clinical suggestion for strengthening the alliance based on a supportive–expressive framework. *Psychotherapy*, 55(3), 231–240. <https://doi.org/10.1037/pst0000195>
- Lent, R. W., Hoffman, M. A., Hill, C. E., Treistman, D., Mount, M., & Singley, D. (2006). Client-specific counselor self-efficacy in novice counselors: Relation to perceptions of session quality. *Journal of Counseling Psychology*, 53(4), 453–463. <https://doi.org/10.1037/0022-0167.53.4.453>
- Levi, E., Peysachov, G., Admon, R., & Zilcha-Mano, S. (2024). Cortisol synchrony in psychotherapy for major depressive disorder. *Clinical Psychology & Psychotherapy*, 31(4), e3035. <https://doi.org/10.1002/cpp.3035>
- Levy, K. N., Beeney, J. E., Wasserman, R. H., & Clarkin, J. F. (2010). Conflict begets conflict: Executive control, mental state vacillations, and the therapeutic alliance in treatment of borderline personality disorder. *Psychotherapy Research*, 20(4), 413–422. <https://doi.org/10.1080/10503301003636696>
- Levy, K. N., McMain, S., Bateman, A., & Clouthier, T. (2018). Treatment of borderline personality disorder. *Psychiatric Clinics of North America*, 41(4), 711–728. <https://doi.org/10.1016/j.psc.2018.07.011>

- Lieb, K., Zanarini, M. C., Schmahl, C., Linehan, M. M., & Bohus, M. (2004). Borderline personality disorder. *The Lancet*, 364(9432), 453–461. [https://doi.org/10.1016/s0140-6736\(04\)16770-6](https://doi.org/10.1016/s0140-6736(04)16770-6)
- Littell, R. C., Milliken, G. A., Stroup, W. W., Wolfinger, R. D., & Schabenberger, O. (2006). *SAS for mixed models* (2nd ed.). SAS Institute Inc.
- Luborsky, L. (1984). *Principles of psychoanalytic psychotherapy: A manual for supportive-expressive treatment*. Basic Books.
- Luborsky, L., Mark, D., Hole, H. V., Popp, C., Goldsmith, B., & Cacciola, J. (1995). Supportive-expressive dynamic psychotherapy of depression: A time-limited version. In J. P. Barber & P. Crits-Christoph (Eds.), *Dynamic therapies for psychiatric disorders (Axis I)* (pp. 41–83). Basic Books. <https://psycnet.apa.org/record/1995-98051-001>
- Lutz, W., de Jong, K., Rubel, J. A., & Delgadillo, J. (2021). Measuring, predicting, and tracking change in psychotherapy. In M. Barkham, W. Lutz, & L. G. Castonguay (Eds.), *Bergin and Garfield's handbook of psychotherapy and behavior change: 50th anniversary edition* (7th ed., pp. 89–133). John Wiley & Sons.
- Lutz, W., Prinz, J. N., Schwartz, B., Paulick, J., Schoenherr, D., Deisenhofer, A., Terhürne, P., Boyle, K., Altmann, U., Strauß, B., Rafaeli, E., Atzil-Slonim, D., Bar-Kalifa, E., & Rubel, J. (2020). Patterns of early change in interpersonal problems and their relationship to nonverbal synchrony and multidimensional outcome. *Journal of Counseling Psychology*, 67(4), 449–461. <https://doi.org/10.1037/cou0000376>
- Lynch, T. R., Trost, W. T., Salsman, N., & Linehan, M. M. (2007). Dialectical behavior therapy for borderline personality disorder. *Annual Review of Clinical Psychology*, 3(1), 181–205. <https://doi.org/10.1146/annurev.clinpsy.2.022305.095229>
- Mayo, O., & Gordon, I. (2020). In and out of synchrony—behavioral and physiological dynamics of dyadic interpersonal coordination. *Psychophysiology*, 57(6), e13574. <https://doi.org/10.1111/psyp.13574>
- McMain, S. F., Boritz, T. Z., & Leybman, M. J. (2015). Common strategies for cultivating a positive therapy relationship in the treatment of borderline personality disorder. *Journal of Psychotherapy Integration*, 25(1), 20–29. <https://doi.org/10.1037/a0038768>
- Mehlum, L. (2021). Mechanisms of change in dialectical behaviour therapy for people with borderline personality disorder. *Current Opinion in Psychology*, 37, 89–93. <https://doi.org/10.1016/j.copsyc.2020.08.017>
- Morgan, T. A., Chelminski, I., Young, D., Dalrymple, K., & Zimmerman, M. (2013). Is dimensional scoring important only for subthreshold levels of severity in personality disorders other than borderline? *Comprehensive Psychiatry*, 54(6), 673–679. <https://doi.org/10.1016/j.comppsy.2013.01.008>
- Nof, A., Amir, O., Goldstein, P., & Zilcha-Mano, S. (2021). What do these sounds tell us about the therapeutic alliance: Acoustic markers as predictors of alliance. *Clinical Psychology & Psychotherapy*, 28(4), 807–817. <https://doi.org/10.1002/cpp.2534>
- Paladino, M., Mazzurega, M., Pavani, F., & Schubert, T. W. (2010). Synchronous multisensory stimulation blurs self-other boundaries. *Psychological Science*, 21(9), 1202–1207. <https://doi.org/10.1177/0956797610379234>
- Paulick, J., Rubel, J. A., Deisenhofer, A., Schwartz, B., Thielemann, D., Altmann, U., Boyle, K., Strauß, B., & Lutz, W. (2018). Diagnostic features of nonverbal synchrony in psychotherapy: Comparing depression and anxiety. *Cognitive Therapy and Research*, 42(5), 539–551. <https://doi.org/10.1007/s10608-018-9914-9>
- Pfohl, B., Blum, N., & Zimmerman, M. (1997). *Structured Interview for DSM-IV Personality: SIDP-IV*. American Psychiatric Pub.
- Prinz, J., Boyle, K., Ramseyer, F., Kabus, W., Bar-Kalifa, E., & Lutz, W. (2021). Within and between associations of nonverbal synchrony in relation to Grawe's general mechanisms of change. *Clinical Psychology & Psychotherapy*, 28(1), 159–168. <https://doi.org/10.1002/cpp.2498>
- Ramseyer, F. T. (2020a). Motion energy analysis (MEA): A primer on the assessment of motion from video. *Journal of Counseling Psychology*, 67(4), 536–549. <https://doi.org/10.1037/cou0000407>
- Ramseyer, F. T. (2020b). Exploring the evolution of nonverbal synchrony in psychotherapy: The idiographic perspective provides a different picture. *Psychotherapy Research*, 30(5), 622–634. <https://doi.org/10.1080/10503307.2019.1676932>
- Ramseyer, F., Ebert, A., Roser, P., Edel, M., Tschacher, W., & Brüne, M. (2020). Exploring nonverbal synchrony in borderline personality disorder: A double-blind placebo-controlled study using oxytocin. *British Journal of Clinical Psychology*, 59(2), 186–207. <https://doi.org/10.1111/bjc.12240>
- Ramseyer, F., & Tschacher, W. (2010). Nonverbal synchrony or random coincidence? How to tell the difference. In A. Esposito, N. Campbell, C. Vogel, A. Hussain, & A. Nijholt (Eds.), *Development of multimodal interfaces: Active listening and synchrony. Lecture notes in computer science* (pp. 182–196). Springer. https://doi.org/10.1007/978-3-642-12397-9_15
- 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), 284–295. <https://doi.org/10.1037/a0023419>
- R Core Team. (2013). *R: A language and environment for statistical computing*.
- Rebok, F., Teti, G. L., Fantini, A. P., Cárdenas-Delgado, C., Rojas, S. M., Derito, M. N. C., & Daray, F. M. (2015). Types of borderline personality disorder (BPD) in patients admitted for suicide-related behavior. *Psychiatric Quarterly*, 86(1), 49–60. <https://doi.org/10.1007/s11126-014-9317-3>
- 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>
- Riihimäki, K., Vuorilehto, M., & Isometsä, E. (2014). Borderline personality disorder among primary care depressive patients: A five-year study. *Journal of Affective Disorders*, 155, 303–306. <https://doi.org/10.1016/j.jad.2013.10.050>
- Rudge, S., Feigenbaum, J. D., & Fonagy, P. (2020). Mechanisms of change in dialectical behaviour therapy and cognitive behaviour therapy for borderline personality disorder: A critical review of the literature. *Journal of Mental Health*, 29(1), 92–102. <https://doi.org/10.1080/09638237.2017.1322185>
- Schoenherr, D., Strauss, B., Stangier, U., & Altmann, U. (2021). The influence of vocal synchrony on outcome and attachment anxiety/avoidance in treatments of social anxiety disorder. *Psychotherapy*, 58(4), 510–522. <https://doi.org/10.1037/pst0000393>
- Shatz, H., Oren-Yagoda, R., & Aderka, I. M. (2024). Nonverbal synchrony in diagnostic interviews of individuals with social anxiety disorder. *Journal of Anxiety Disorders*, 101, Article 102803. <https://doi.org/10.1016/j.janxdis.2023.102803>
- Sheehan, D. V., Lecrubier, Y., Sheehan, K. H., Amorim, P., Janavs, J., Weiller, E., Hergueta, T., Baker, R., & Dunbar, G. C. (1998). The Mini-International Neuropsychiatric Interview (M.I.N.I.): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. *Journal of Clinical Psychiatry*, 59(Suppl 20), 22–33.
- Skodol, A. E., Grilo, C. M., Keyes, K. M., Geier, T., Grant, B. F., & Hasin, D. S. (2011). Relationship of personality disorders to the course of major depressive disorder in a nationally representative sample. *American Journal of Psychiatry*, 168(3), 257–264. <https://doi.org/10.1176/appi.ajp.2010.10050695>
- Stanley, B., & Wilson, S. T. (2006). Heightened subjective experience of depression in borderline personality disorder. *Journal of*

- Personality Disorders*, 20(4), 307–318. <https://doi.org/10.1521/pedi.2006.20.4.307>
- Szücs, A., Szanto, K., Wright, A. G. C., & Dombrovski, A. Y. (2020). Personality of late- and early-onset elderly suicide attempters. *International Journal of Geriatric Psychiatry*, 35(4), 384–395. <https://doi.org/10.1002/gps.5254>
- Tong, P., Bo, P., Shi, Y., Dong, L., Sun, T., Gao, X., & Yang, Y. (2020). Clinical traits of patients with major depressive disorder with comorbid borderline personality disorder based on propensity score matching. *Depression and Anxiety*, 38(1), 100–106. <https://doi.org/10.1002/da.23122>
- Trull, T. J., & Durrett, C. A. (2005). Categorical and dimensional models of personality disorder. *Annual Review of Clinical Psychology*, 1(1), 355–380. <https://doi.org/10.1146/annurev.clinpsy.1.102803.144009>
- Trull, T. J., Widiger, T. A., & Guthrie, P. (1990). Categorical versus dimensional status of borderline personality disorder. *Journal of Abnormal Psychology*, 99(1), 40–48. <https://doi.org/10.1037/0021-843x.99.1.40>
- Tschacher, W., & Meier, D. (2020). Physiological synchrony in psychotherapy sessions. *Psychotherapy Research*, 30(5), 558–573. <https://doi.org/10.1080/10503307.2019.1612114>
- Van Der Kolk, B. A., Hostenler, A., Herron, N., & Fisler, R. E. (1994). Trauma and the development of borderline personality disorder. *Psychiatric Clinics of North America*, 17(4), 715–730. [https://doi.org/10.1016/s0193-953x\(18\)30082-0](https://doi.org/10.1016/s0193-953x(18)30082-0)
- Verheul, R. (2005). Taxonomic implications of three prospective studies on the course and outcome of personality disorders. *Journal of Personality Disorders*, 19(5), 581–585. <https://doi.org/10.1521/pedi.2005.19.5.581>
- Wang, L. P., & Maxwell, S. E. (2015). On disaggregating between-person and within-person effects with longitudinal data using multilevel models. *Psychological Methods*, 20(1), 63–83. <https://doi.org/10.1037/met0000030>
- Wiggins, J. S., & Pincus, A. L. (2002). Personality structure and the structure of personality disorders. In P. T. Costa & T. A. Widiger (Eds.), *Personality disorders and the five-factor model of personality* (pp. 103–124). American Psychological Association. <https://doi.org/10.1037/10423-007>
- 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), 752–773. <https://doi.org/10.1007/s10608-020-10106-3>
- Yokotani, K., Takagi, G., & Wakashima, K. (2020). Nonverbal synchrony of facial movements and expressions predict therapeutic alliance during a structured psychotherapeutic interview. *Journal of Nonverbal Behavior*, 44(1), 85–116. <https://doi.org/10.1007/s10919-019-00319-w>
- Yuan, Y., Lee, H., Newhill, C. E., Eack, S. M., Fusco, R., & Scott, L. N. (2023). Differential associations between childhood maltreatment types and borderline personality disorder from the perspective of emotion dysregulation. *Borderline Personality Disorder and Emotion Dysregulation*, 10(1), 1–14. <https://doi.org/10.1186/s40479-023-00210-7>
- Zanarini, M. C., Hörz-Sagstetter, S., Temes, C. M., Frankenburg, F. R., Hein, K. E., Reich, D. B., & Fitzmaurice, G. M. (2019). The 24-year course of major depression in patients with borderline personality disorder and personality-disordered comparison subjects. *Journal of Affective Disorders*, 258, 109–114. <https://doi.org/10.1016/j.jad.2019.08.005>
- Zilcha-Mano, S. (2021). Toward personalized psychotherapy: The importance of the trait-like/state-like distinction for understanding therapeutic change. *American Psychologist*, 76(3), 516–528. <https://doi.org/10.1037/amp0000629>
- Zilcha-Mano, S. (2024). How getting in sync is curative: Insights gained from research in psychotherapy. *Psychological Review*. <https://doi.org/10.1037/rev0000471>
- Zilcha-Mano, S., Dolev, T., Leibovich, L., & Barber, J. P. (2018). Identifying the most suitable treatment for depression based on patients' attachment: Study protocol for a randomized controlled trial of supportive-expressive vs. Supportive treatments. *BMC Psychiatry*, 18(1), 362. <https://doi.org/10.1186/s12888-018-1934-1>
- Zilcha-Mano, S., Goldstein, P., Dolev-Amit, T., David-Sela, T. B., & Barber, J. P. (2021). A randomized controlled trial for identifying the most suitable treatment for depression based on patients' attachment orientation. *Journal of Consulting and Clinical Psychology*, 89(12), 985–994. <https://doi.org/10.1037/ccp0000696>
- Zilcha-Mano, S., Shahar, B., Fisher, H., Dolev-Amit, T., Greenberg, L. S., & Barber, J. P. (2021). Investigating patient-specific mechanisms of change in SET vs. EFT for depression: study protocol for a mechanistic randomized controlled trial. *BMC Psychiatry*, (1). <https://doi.org/10.1186/s12888-021-03279-y>
- Zilcha-Mano, S., Shamay-Tsoory, S., Dolev-Amit, T., Zagoory-Sharon, O., & Feldman, R. (2020). Oxytocin as a biomarker of the formation of therapeutic alliance in psychotherapy and counseling psychology. *Journal of Counseling Psychology*, 67(4), 523–535. <https://doi.org/10.1037/cou0000386>