

# Changing Attachment Orientation: Uncovering the Role of Shifting the Emotion Regulation Tendency

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Changes in the individual's attachment orientation toward greater security are considered an important clinical goal. One promising underlying process of change in attachment orientation is shifting the emotion regulation tendency, in which the individual progresses from overreliance on the self or on the other to regulate emotional arousal. The present study utilized a computational approach to study shifts in the emotion regulation tendency as these manifest in the patient's and therapist's vocally encoded emotional arousal. The study examined whether shifts in the regulation tendency are associated with decreases in the level of insecure attachment and in strengthening of the therapeutic alliance. Shifts in the regulation tendency were examined throughout the early stages of treatment (Sessions 1–4) using 11,710 talk turns within 52 patient–therapist dyads. Findings suggest that shifts in the emotion regulation tendency are associated with greater strengthening of the therapeutic alliance and a decrease in the level of attachment avoidance.

## Public Significance Statement

This is the first study that examined the therapeutic importance of shifting the individual's emotion regulation tendency. The study used a computational approach to calculate shifts in the regulation tendency, as it manifests in vocally encoded emotional arousal. Findings suggest that progressing from overreliance on the self or on the other to regulate emotional arousal is associated with strengthening of the therapeutic alliance and with further decreases in attachment avoidance.

**Keywords:** psychotherapy, acoustic markers, attachment orientation, therapeutic alliance

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A vast amount of empirical research accumulated through the past decades has suggested that the individual's attachment orientation is one of the most consistent factors contributing to mental health (for a meta-analysis see Zhang et al., 2022). The individual's attachment orientation develops from infancy to adulthood and is assumed to guide the individual's tendency to seek proximity and self-sooth

from attachment figures (Bowlby, 1988). Individual differences in attachment orientation are commonly conceptualized on two dimensions of attachment orientation: anxiety and avoidance. High levels of attachment anxiety manifest in exaggerated proximity-seeking tendencies and difficulties in self-regulating emotional arousal (Mikulincer & Shaver, 2007). High levels of attachment avoidance

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Avigail Bar-Sella and Dan Sayda contributed equally. The randomized controlled trial was preregistered (Zilcha-Mano et al., 2018, 2021). The study analyses code is available at [https://osf.io/q2rmx/?view\\_only=5f20a1da95ce41448cdaab4703ed0712](https://osf.io/q2rmx/?view_only=5f20a1da95ce41448cdaab4703ed0712). When this study was carried out, the informed-consent form for the participants stated that we would keep the data strictly confidential and would not be shared. Therefore, the data are not available. The authors reported how they determined their sample size, all data exclusions, all manipulations, and all measures in the study. The study design, procedure, and informed-consent form were approved by the institutional internal review board (Approval No. 118/15, October 10, 2015).

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manifest in inhibited proximity-seeking tendencies and difficulties in using the help of significant others to regulate emotional arousal (Mikulincer & Shaver, 2007). Theory and research suggest that high levels of attachment anxiety and avoidance underlie the etiology and maintenance of many psychopathologies (Bowlby, 1977; Stovall-McClough & Dozier, 2016). Among those receiving the greatest empirical attention is depression, showing that individuals with high levels of attachment anxiety and avoidance also have higher levels of depressive symptoms (for meta-analysis see Zhang et al., 2022).

In light of the centrality of attachment orientation to mental health, changes in attachment orientation are considered an important clinical target (Bowlby, 1988). Growing empirical research suggests that changes in attachment orientation occur during the course of treatment (e.g., Konvalin et al., 2023; Tmej et al., 2021) and are associated with beneficial therapeutic processes (for a meta-analysis see Bernecker et al., 2014) and outcome (e.g., An et al., 2022; Reiner et al., 2016; for a meta-analysis see Levy et al., 2018). Accordingly, changes in attachment orientation were found to be associated with better therapeutic alliance (for a meta-analysis see Bernecker et al., 2014), defined as stronger emotional bond to the therapist and greater agreement on the goals and tasks of treatment (Bordin, 1979). Specifically, a greater decrease in the level of attachment anxiety and avoidance was associated with a stronger bond to the therapist and greater agreement between the patient and the therapist on the treatment tasks and goals (for a meta-analysis see Bernecker et al., 2014). Changes in attachment orientation were also found to be associated with better treatment outcome (for a meta-analysis see Levy et al., 2018).

A potential therapeutic process that may stand as the basis of changes in attachment orientation is change in emotion regulation tendencies. Attachment theory has been conceptualized as an emotion regulation theory (Bowlby, 1988; for review see Mikulincer et al., 2003). That is, the building blocks of the formation of secure attachment are adaptive strategies of emotion regulation (Mikulincer et al., 2003; Shaver & Mikulincer, 2002). One common definition of emotion regulation refers to one's capacity to alter one's emotions, using instrumental support seeking from a significant other (Zaki & Williams, 2013). Theory and empirical research suggest that the responsiveness and availability of the attachment figure early in life affect the emotion regulation tendencies that will develop and the attachment orientation that will be formed (Mikulincer et al., 2003). It is theorized that when the attachment figure is inconsistently available and inconsistently responsive to the child's needs, in a way that leaves some hope for coregulation, the child will adopt regulation strategies that involve intensive demanding of proximity and support to regulate emotional distress (Mikulincer & Shaver, 2017). Later in life, such strategies will manifest in overreliance on the other for regulating emotions, at the expense of relying on the individual's capacity to self-soothe. Individuals who are characterized by such tendencies of emotion regulation tend to score high on self-report measures of attachment anxiety (Brennan et al., 1998). In contrast, when the attachment figure is perceived as a nonviable option for distress regulation, a child is theorized to adopt regulation strategies that involve inhibition of the quest for support and active attempts to handle distress alone (Mikulincer & Shaver, 2017). In adulthood, such strategies will manifest in overreliance on the individual's capacity of regulating emotion, at the expense of relying on a significant other. Individuals who are characterized by such tendencies of emotion regulation tend to score high on self-report measures of

attachment avoidance (Brennan et al., 1998). Accumulating empirical findings show that less adaptive tendencies of emotion regulation are associated with higher levels of attachment anxiety and avoidance and higher levels of psychopathologies such as depression (for review see Malik et al., 2015).

In the last decade, studies have started to examine changes occurring in patients' attachment-based tendencies and expectations throughout the course of treatment. These studies have found that patients may update and change their attachment-based tendencies and expectations during treatment (Egozi et al., 2021; Mallinckrodt et al., 2015). For example, Mallinckrodt et al. (2015) found that patients with higher levels of attachment avoidance could grow in emotional engagement during treatment, such that they started to report feeling more comfortable to share personal issues with the therapist and discuss upsetting topics. Moreover, changes in attachment-based tendencies and expectations were found to be beneficial to the therapeutic process. Patients who shifted from their initial level of attachment-based tendencies and expectations also reported stronger therapeutic alliance (Egozi et al., 2022; Mallinckrodt et al., 2015).

Theory and studies conceptualizing how changes in attachment orientation occur as the result of treatment suggest challenging the patient's attachment tendencies by flexibly adopting a stance that contrasts with the patient's rigid expectations (e.g., Bowlby, 1988; Daly & Mallinckrodt, 2009; Dozier & Tyrrell, 1998). Accordingly, individuals with higher levels of attachment anxiety are expected to benefit the most from shifting their interpersonal tendencies and expectations through moving toward greater dependency on themselves than on others. On the basis of this process, a shift in their emotion regulation tendencies occurs by moving from high reliance on interpersonal regulation, in which the individual relies mostly on another to regulate emotions, to intrapersonal regulation in which individuals rely more on their own strength. Similarly, individuals with higher levels of attachment avoidance are expected to benefit the most from shifting their interpersonal tendencies and expectations by moving toward greater dependency on another than on themselves. Accordingly, as the basis of this process, a shift in their emotion regulation tendencies occurs by moving from high reliance on intrapersonal regulation in which the individual relies mostly on themselves to regulate emotions to interpersonal regulation in which individuals rely more on a significant other. Whereas the empirical literature regarding the role of shifting regulation tendency to changes in attachment orientation is still limited, existing research examining the association between emotion regulation and changes in attachment orientation shows promising findings. For example, a recent study found that improvement in strategies of emotion regulation during treatment is associated with a decrease in the level of attachment avoidance (Zalaznik et al., 2019).

A variety of approaches have sought to identify processes that may underlie the shift in attachment-based tendencies and expectations. Some have suggested pairing therapists and patients with dissimilar attachment tendencies on the anxiety-avoidance dimension (Tyrrell et al., 1999), that is, to pair therapists who are relatively higher in attachment anxiety orientation with patients who are higher in attachment avoidance orientation and vice versa. In this way the natural style of the therapists makes them more likely to resist the first instinct to complement rather than contradict the patient's attachment tendencies and adopt an interpersonal stance that is contrary to what the patient pulls for. Seeking to identify processes that may be underlying the shift in attachment-based tendencies and

expectations, others have suggested that therapists should directly adopt techniques that contrast with the patients' attachment-based expectations and tendencies (Daly & Mallinckrodt, 2009). They suggested that therapists should first meet the patient's attachment needs and gradually, when the therapeutic alliance develops, respond to the patient in a way that contrasts with, or contradicts, the patient's expectations. Accordingly, when working with patients who are high in attachment anxiety and are overwhelmed by emotional distress, it is suggested that therapists should respond to the patient's strong need for connection and gradually encourage more autonomous self-regulation. Similarly, when working with patients who are high in attachment avoidance, it is suggested that therapists should first empower the patient to set the emotional pace and later gradually promote exploration of emotional issues and regulating emotions with the support of the therapist. Such a gradual process, which meets the patients' expectations and then contradicts their attachment-based tendencies, is thought to support the development of a stronger therapeutic alliance. Taken together, the different approaches suggested in the literature highlight the importance of shifting emotion regulation tendencies to facilitate changes in attachment orientation.

Despite the variety of clinical approaches suggesting supporting shifts in attachment-based tendencies and expectations (e.g., Bowlby, 1988; Daly & Mallinckrodt, 2009; Dozier & Tyrrell, 1998), little is known about the specific process of this shift, which in turn may facilitate further changes in attachment orientation. One approach that may help to shed light on shifts in emotion regulation tendencies is by capturing the tendency (intra- vs. interpersonal) of regulation and then calculating the shift between these tendencies. The tendency of regulation can be captured using learning computational models (e.g., Brown et al., 2021; Huys et al., 2022). Among the computational models that are in use within the field of psychological research, learning computational models are commonly used to calculate sequential updating of information in response to environmental factors (e.g., Behrens et al., 2007; Lockwood & Klein-Flügge, 2020). In terms of regulation, learning computational models can be utilized to examine the extent to which the patient's emotional arousal during the session relies on—and is adapted in response to—the emotional arousal of the therapist. Accordingly, the more the patient's emotional arousal changes in response to changes in the therapist's emotional arousal, the more the patient tends toward interpersonal regulation. Conversely, the more the patient's emotional arousal changes independently of changes in the therapist's emotional arousal, the more the patient tends toward intrapersonal regulation. Once the tendency of regulation is evaluated, it is possible to calculate the level of shift from one tendency to the other.

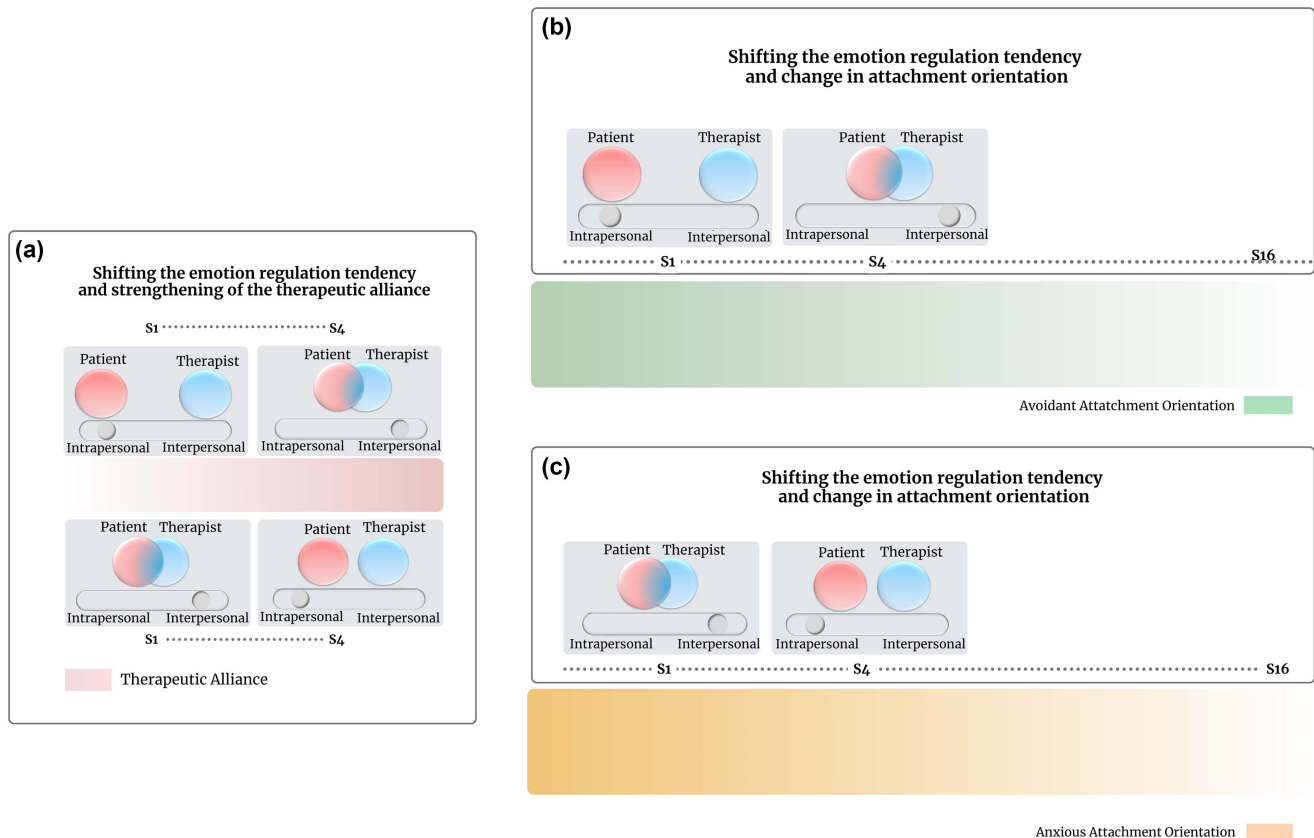
To determine whether an individual shows a tendency for intrapersonal or interpersonal regulation, a measurement of emotion is needed that can zoom into the emotional processes that occur moment by moment within a session. One such measurement, implemented within the field of psychotherapy research, is the fundamental frequency (F0) of the voice. F0 refers to the lowest frequency harmonic that is created by the vibration of the vocal cords during speech. F0 is widely interpreted as a measure of vocally encoded emotional arousal because it captures the degree of emotional activation conveyed by the voice (Juslin & Scherer, 2005). F0, representing vocally encoded emotional arousal, was found to be highly correlated with higher levels of physiological measures of emotional arousal (e.g., Scherer, 1989; Weusthoff et al., 2013)

and with self-reported emotional arousal (e.g., Baucom et al., 2012). The implementation of F0 to measure within-session processes of emotion regulation has gained increasing empirical attention over the last decade due to technological developments. Studies that have used F0 to measure within-session emotion regulation showed that by assessing and analyzing the F0s of both the patient and the therapist, talk turn by talk turn throughout the session, it is possible to capture intra- and interpersonal emotion regulation dynamics, that is, to capture the level at which the patient's emotional arousal is affected by their own level of arousal a moment earlier (i.e., the patient's intrapersonal emotion regulation) and the level at which the patient's emotional arousal is affected by the therapist's level of arousal a moment earlier (i.e., the patient's interpersonal emotion regulation, e.g., Bar-Sella, Nof, et al., 2023; Bryan et al., 2018; Soma et al., 2020; Wieder & Wiltshire, 2020). These studies were instrumental in shedding light on intra- and interpersonal processes of emotion regulation and their association with the treatment process (Bryan et al., 2018; Wieder & Wiltshire, 2020) and treatment outcome, as was found in a previous study using this data set (Bar-Sella, Nof, et al., 2023). Yet, these studies focused on emotion regulation within a snapshot of a single session; this leaves open the question of possible shifts in the emotion regulation tendencies throughout the course of treatment and the association between shifts in the tendency of regulation and important treatment targets such as changes in attachment orientation.

The present study used rigorous state-of-the-art measurement of emotion regulation tendency, in which (a) within-session changes of emotional arousal were assessed by F0 of the patient's and the therapist's voices (Juslin & Scherer, 2005) and (b) the tendency of regulation (intra- vs. interpersonal) was calculated using a learning computational model (Brown et al., 2021; Huys et al., 2022). The conceptual model standing as the basis of this study states that a shift in the emotion regulation tendency, from intrapersonal to interpersonal or vice versa, is beneficial to the therapeutic process (Daly & Mallinckrodt, 2009). As such, it is expected to be associated with strengthening of the therapeutic alliance during the same time frame (Egozi et al., 2022). This shift is conceptualized as being in the underlying therapeutic process, underpinning changes in attachment orientation throughout the course of treatment. This is presented in Figure 1. To examine this conceptual model, the present study focused on two main aims: The first aim was to evaluate whether a shift in the regulation tendency is a beneficial process. Therefore, the study examined whether (Hypothesis 1) a greater shift in emotion regulation tendency, either from intrapersonal to interpersonal tendency or vice versa, is associated with greater strengthening of the therapeutic alliance (this hypothesis is presented in Panel a of Figure 1). To estimate the initial level of the patient's emotion regulation tendency, that is, to identify in which regulation tendency the patient started treatment, we focused on Session 1. To examine whether a shift occurs in the emotion regulation tendency, we focused on Session 4, as it incorporates an important interpersonal therapeutic process according to the treatment manual (Book, 1998; Leibovich et al., 2020; Luborsky et al., 1995) and represents a stage of treatment that can serve as an important indicator of treatment success (Lutz et al., 2021).

As the second aim of the present study, we examined whether shifts in emotion regulation tendencies at the early stages of treatment are associated with changes in attachment orientation throughout the course of treatment. Specifically, the study examined

**Figure 1**  
Graphical Demonstration of the Study's Conceptualization



*Note.* Panel a: Demonstrates the expected association between shifts in the patient's emotion regulation tendency (from intrapersonal to interpersonal and vice versa) and strengthening of the therapeutic alliance at the early stages of the treatment (Hypothesis 1). Darkening of the pink color indicates strengthening of the therapeutic alliance. Panel b: Demonstrates the expected association between a shift in the emotion regulation tendency—from intrapersonal to interpersonal—and decrease in the level of avoidant attachment orientation throughout treatment (Hypothesis 2a). Lightening of the green color indicates a decrease in the level of avoidant attachment orientation. Panel c: Demonstrates the expected association between shift in the emotion regulation tendency—from interpersonal to intrapersonal—and decrease in the level of anxious attachment orientation throughout treatment (Hypothesis 2b). Lightening of the orange color indicates a decrease in the level of anxious attachment orientation. S = study. See the online article for the color version of this figure.

whether (Hypothesis 2a) a greater shift from intrapersonal to interpersonal emotion regulation tendency will be associated with a greater decrease in the level of attachment avoidance throughout the course of treatment (this hypothesis is presented in Panel b of Figure 1). Accordingly, the study examined whether (Hypothesis 2b) a greater shift from interpersonal to intrapersonal emotion regulation tendency will be associated with a greater decrease in the level of attachment anxiety throughout the course of treatment (this hypothesis is presented in Panel c of Figure 1).

## Method

### Transparency and Openness

The randomized controlled trial (RCT) was preregistered (Zilcha-Mano et al., 2021). The secondary analyses were not. The study analyses code is available at [https://osf.io/q2rmx/?view\\_only=5f20a1da95ce41448cdaab4703ed0712](https://osf.io/q2rmx/?view_only=5f20a1da95ce41448cdaab4703ed0712) (Bar-Sella, Sayda, et al., 2023).

When this study was carried out, the informed-consent form for the participants stated that we would keep the data strictly confidential and would not be shared. Therefore, the data are not available. We reported how we determined our sample size, all data exclusions, all manipulations, and all measures in the study. The study design, procedure, and informed-consent form were approved by the institutional internal review board.

### Participants

Fifty-two patients with major depressive disorder (MDD), from the training and active phases of a RCT (Zilcha-Mano et al., 2021), were included in the present study. This subsample includes all active patients of the RCT ( $N = 100$ ), excluding (a) patients whose data do not meet the recommended standards for high-quality acoustic data, either because (i) less sophisticated recording equipment was used ( $N = 27$ ; Rochman & Amir, 2013) or (ii) recordings took place during COVID-19 ( $N = 13$ ), and (b) a further 14 patients whose data

became available later. An additional sample of pilot patients was also included ( $N = 6$ ). Out of the subsample included in the data analysis of the present study ( $N = 52$ ), 26 patients were randomly assigned to each of the two treatments (see details below). Three patients dropped out of treatment (completed less than 16 sessions), but no selective attrition due to potential differences in the tendency of regulation between completers and dropouts was found: Session 1,  $t(2, 88) = -2.12, p = .126$ ; Session 4,  $t(2, 627) = -2.48, p = .100$ . All patients signed an informed-consent form before joining the study. Demographic and diagnostic information for this subsample appears in [Supplemental Table S1](#).

### **Inclusion Criteria**

They are as follows: (a) MDD diagnostic criteria using the structured clinical interviews for *Diagnostic and Statistical Manual of Mental Disorders*, 5th edition, with scores above 14 on the 17-item Hamilton Rating Scale for Depression (Hamilton, 1967) at two evaluations, 1 week apart, and current MDD based on the Mini International Neuropsychiatric Interview (Sheehan et al., 1998); (b) if on medication, patients' dosage had to be stable for at least 3 months before the start of the study, and they had to be willing to maintain stable dosage for the duration of treatment; (c) age between 18 and 60 years; (d) Hebrew language fluency; and (e) provision of written informed consent.

### **Exclusion Criteria**

They are as follows: (a) current risk of suicide or self-harm (Hamilton Rating Scale for Depression suicide item  $>2$ ); (b) current substance abuse disorder; (c) current or past schizophrenia or psychosis, bipolar disorder, or severe eating disorder, requiring medical monitoring; (d) history of organic mental disease; and (e) currently in psychotherapy.

### **Treatments and Therapists**

Patients received sixteen 50-min weekly sessions of a time-limited manualized psychodynamic treatment adapted for depression. Hebrew was used as the language in all therapy sessions. Patients received either an expressive-focused treatment ( $N = 26$ ; supportive expressive treatment; the original manual of Luborsky et al., 1995) or a supportive-focused treatment (Leibovich et al., 2020), using the same manual but excluding the expressive component. Treatments were provided in a research-based clinic. Seven therapists participated in the study. Six of the seven therapists were women, with an average age of 40.28 ( $SD = 6.75$ ). Therapists' mean caseload was 4.35 ( $SD = 2.69$ ). All therapists provided both treatments, acting as their own control. No difference in acoustic parameters was found between types of treatment: Session 1,  $t(50) = 0.46, p = .643$ ; Session 4,  $t(50) = 0.71, p = .478$ .

### **Measures**

#### **Vocally Encoded Emotional Arousal**

The mean fundamental frequency (F0) was used as the measure of vocally encoded emotional arousal. Mean F0 shows good psychometric properties. In the present study, retest reliability showed high reliability, ranging from  $r = 0.90$  to  $r = 0.93$  (for additional details see

the online [Supplemental Material](#)). In previous studies, reliability tests of the measure, using a variety of methods, suggested that F0 is a reliable indicator of emotional arousal (Vogel & Maruff, 2008). Previous studies further suggested good convergent validity of the measure. Accordingly, mean F0 was found to be correlated with both autonomic monitoring of emotional arousal (e.g., Scherer, 1989; Weusthoff et al., 2013) and self-report measures of emotional arousal (e.g., Baucom et al., 2012). Additionally, as can be expected for measures of emotion regulation, F0 was also found to be associated with treatment prognosis in a previous study using the current acoustical data (Bar-Sella, Nof, et al., 2023).

Patients' and therapists' mean F0 values during the session were extracted in a four-step analysis: (a) The volume of audio files was normalized using the Audacity software (Audacity Team, 2018); (b) each file was manually trimmed (segmented) into separate patients' and therapist's talk turns; (c) overlapping speech and irrelevant noises were excluded from the analysis, as recommended by Bryan et al. (2018); and (d) mean F0 values were estimated using the Praat software package Version 6.0.24 (Boersma & Weenink, 2009) with a time step of 0.25 s (Bryan et al., 2018) and a bandpass filter to restrict F0 values to the normal range of adult speech (between 75 Hz and 300 Hz; Juslin & Scherer, 2005). A mean F0 was calculated for every talk turn. A graphical demonstration of the patient's and therapist's F0 variability throughout the session is shown in Panel (i) of Figure 2a.

#### **Therapeutic Alliance**

Alliance was measured with the Working Alliance Inventory (WAI; Horvath & Greenberg, 1989; Tracey & Kokotovic, 1989), a self-report questionnaire assessing the therapeutic alliance. The WAI consists of 12 items rated on a 7-point Likert scale ranging from 1 (*never*) to 7 (*always*). The mean score was calculated for each timepoint of assessment. The internal reliability range for the WAI from Sessions 1 to 4 was .85–.89.

#### **Attachment Orientation**

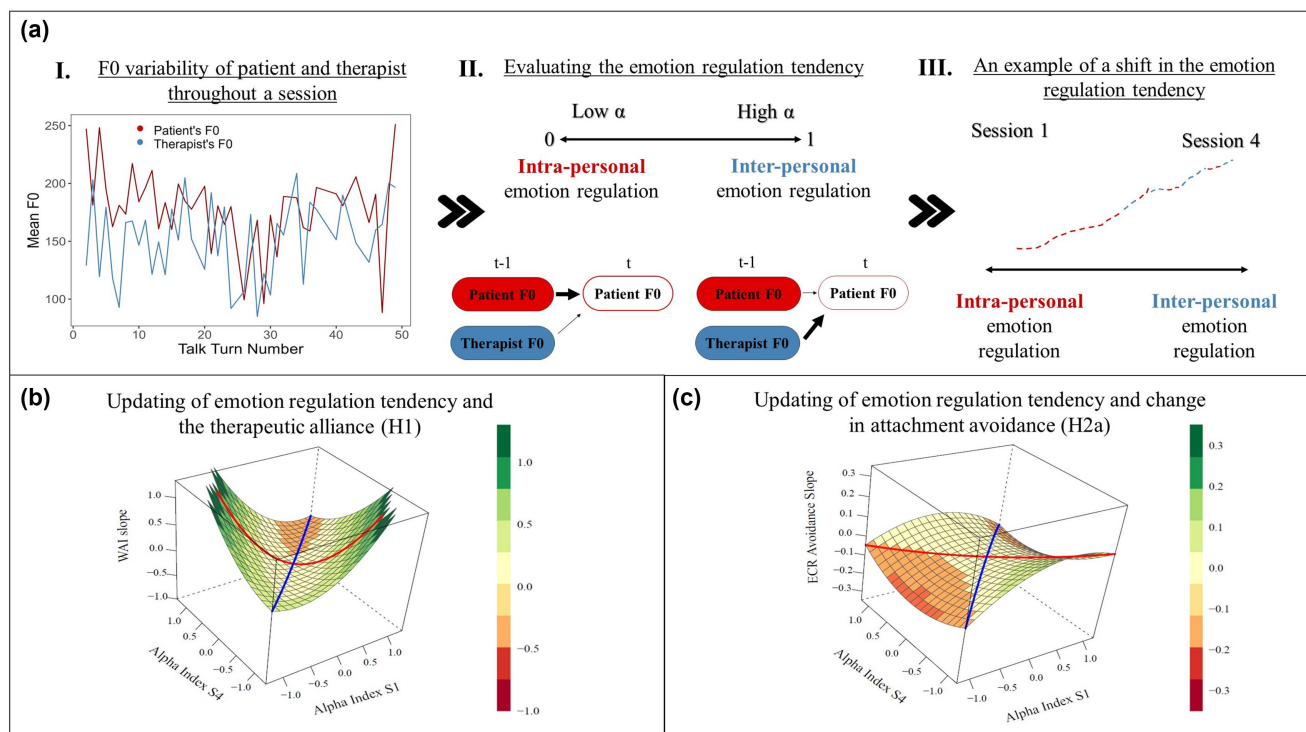
Attachment orientation was measured with the Experience in Close Relationship (ECR; Brennan et al., 1998), a 36-item self-report measure of assessing the construct of adult general attachment orientation on two primary dimensions: avoidance and anxiety. The mean score for each dimension (avoidance and anxiety) was calculated for each timepoint of assessment. The internal reliability ranges for avoidance and anxiety throughout treatment were .90–.92 and .88–.92, respectively.

#### **Procedure**

Patients were recruited by self-referral, based on advertisements in central regions of Israel, offering free treatment at the psychotherapy research lab clinic. After describing the study to patients, written informed consent was obtained. Patients completed three intake sessions conducted by the case manager, before starting the treatment. During the intake, clinical information was collected, and details regarding the treatment were provided (Zilcha-Mano et al., 2021).

The first and fourth sessions were recorded using a Zoom Hypothesis 5 digital recorder to meet the high standard of audio

**Figure 2**  
 Procedure Pipeline and Results of Hypothesis 1 and Hypothesis 2a



**Note.** (a) Demonstrates the pipeline used to estimate the level of shift in the patient's tendency of emotion regulation. Mean F0 was calculated for each talk turn of patient and therapist during Sessions 1 and 4. Panel (i) shows an example of F0 records throughout the session. Patient's emotion regulation tendency was calculated using temporal difference model fit for an  $\alpha$  parameter, indicating the level to which the patient uses intra- (lower  $\alpha$ ) or interpersonal (higher  $\alpha$ ) regulation throughout the session. Panel (ii) shows the result of this step. A response surface analysis (RSA) model was used to estimate the level of shift in the tendency of regulation from Session 1 to 4. Panel (iii) depicts an example of a shift from intra- to interpersonal regulation. (b) Demonstrates RSA parameters for the association between a shift in the regulation tendency and strengthening of the therapeutic alliance. The  $x$ - and  $y$ -axes represent patients'  $\alpha$  index in Sessions 1 and 4 (respectively), centered around the sample mean. A higher value of  $\alpha$  indicates a higher tendency for intrapersonal regulation. A lower value of  $\alpha$  indicates a higher tendency for interpersonal regulation. The  $z$ -axis represents the patient's trajectory of the therapeutic alliance from Session 1 to 4. The  $a_4$  parameter was positively significant, suggesting that a greater shift in the patient's tendency of regulation, either from intrapersonal to interpersonal or vice versa, is associated with greater strengthening of the therapeutic alliance. This effect is displayed by the curvature of the incongruence line (red line), starting from the upper left corner (representing a greater shift from intrapersonal to interpersonal regulation), descending in the center of the cube (representing a smaller shift in the patient's tendency of regulation), and rising to the upper right corner (representing a greater shift from interpersonal to intrapersonal regulation). (c) Demonstrates RSA parameters for the association between a shift in the regulation tendency and the trajectory of change in attachment avoidance throughout treatment. The  $x$ - and  $y$ -axes represent the patient's  $\alpha$  index in Sessions 1 and 4 (respectively), centered around the sample mean. A higher value of  $\alpha$  indicates a higher tendency for intrapersonal regulation. A lower value of  $\alpha$  indicates a higher tendency for interpersonal regulation. The  $z$ -axis represents the patient's ECR avoidance slope throughout treatment. The  $a_3$  parameter was positively significant, suggesting that a greater shift in the patient's tendency of regulation, from intrapersonal to interpersonal regulation, is associated with a greater decrease in the level of attachment avoidance throughout treatment. This effect is displayed by the linear slope of the incongruence line (red line), starting from the left corner (representing a shift from intrapersonal to interpersonal regulation) and rising to the right corner (representing a shift from interpersonal to intrapersonal regulation). H = hypothesis; WAI = Working Alliance Inventory; S = study; ECR = Experience in Close Relationship. See the online article for the color version of this figure.

recording recommended in psychotherapy (Rochman & Amir, 2013). The recordings were performed with a 44.1 kHz sampling rate, 16-bit, and output as wav files. The microphones of the Hypothesis 5 recorder were of unidirectional condenser type and were set at a 90° angle toward the speaker. The midphase of the sessions was selected for acoustical analysis, due to its potential to represent the SE therapeutic dialogues in a more comprehensive manner. Each dyad's segment of analysis started at the 20<sup>th</sup> min, with a complete sentence of the therapist, and ended 15 min later. Patients completed the WAI postsession from Session 1 to Session 4. Patients completed

the ECR throughout treatment, commencing from the intake session, to Sessions 1, 2, 4, 8, and 12 and concluding at Session 16.

## Statistical Analysis

### Data Preparation

**Calculating Emotion Regulation Tendency.** To calculate the patient's tendency of regulation, an initial preprocessing procedure was conducted and included the following steps.

First, to ensure that the strength of association in patient and therapist F0 was not biased by growth in F0 values over time (Curran & Bauer, 2011), F0 data were detrended prior to analysis. To identify possible trends in the data, the following trend models were evaluated: linear, linear in log of time, and stability over time as a fixed effect. We started with a model with only a fixed intercept and added sequentially a fixed effect of session and a fixed linear effect of log of session. We used the log-likelihood test and the Bayesian information criterion (BIC) to determine whether the inclusion of each term improved the model fit. A model of fixed effect of log of time was found to demonstrate the best model fit in predicting the trajectory of the patient and therapist mean F0 in Session 1. A model of fixed effect of log of time and a model of fixed effect of time were found to demonstrate the best model fit in predicting the trajectory of the patient and therapist mean F0, respectively, in Session 4. Preprocessing, aimed at reducing the trend, was conducted in the fit to trends identified in the data.

Second, to examine whether there are between-individual differences that should be removed prior to analysis, intraclass correlations (ICC) were conducted. The ICCs were used to measure the amount of unexplained variance in patients' and therapists' mean F0, due to random effects of the patient and therapist. ICCs were calculated based on a model with only a random intercept of the therapist and patient, with no other covariates. The ICCs of Session 1 revealed the following: estimated variance of the patient random effects for *patient's* mean F0 of 58% ( $p < .001$ ) and null estimated variance for the therapist and estimated variance of the patient and therapist random effects for the *therapist's* mean F0 of 6% ( $p < .001$ ) and 24% ( $p = .035$ ), respectively. The ICCs of Session 4 revealed the following: estimated variance of the patient random effects for *patient's* mean F0 of 54% ( $p < .001$ ) and null estimated variance for the therapist and estimated variance of the patient random effects for *therapist's* mean F0 of 36% ( $p < .001$ ) and null estimated variance for the therapist.

Following these steps, as ICC showed therapist effect for the therapists' mean F0 in Session 1 and trend models showed that both patient and therapist mean F0 have a trend of time, the acoustical data were detrended prior to analysis. Detrending was conducted using recommended gold-standard methods (Curran & Bauer, 2011). Specifically, separate ordinary least squares (OLS) regressions were conducted for each individual (patient and therapist within each dyad). Detrending the data allowed us to control for both therapist effect (Falkenström et al., 2016) and time. Moreover, detrending the data using separate OLS regressions specifically allowed us to desegregate between-individual differences from within-individual changes in F0 (Curran & Bauer, 2011) such that pure within-individual moment-to-moment changes of F0 could be the focus of subsequent analysis.

To calculate the patient's tendency for intrapersonal or interpersonal emotion regulation at each timepoint of assessment (Session 1 and Session 4), we used a modification of the temporal difference reinforcement learning model (Sutton & Barto, 2018) that captures the extent to which the patient's emotional arousal during the session relies on—and is adapted in response to—the emotional arousal of the therapist. Specifically, using the temporal difference model, the patient's level of emotional arousal in each talk turn was predicted

by the patient's own level of arousal in the previous talk turn and by a prediction error: the difference between the patient's and the therapist's level of emotional arousal in the previous talk turn. This prediction error was multiplied by the parameter of the model,  $\alpha$ , as demonstrated in the following equation:

$$P_t = P_{t-1} + \alpha \times (T_{t-1} - P_{t-1}) = (1 - \alpha) \times P_{t-1} + \alpha \times (T_{t-1}), \quad (1)$$

where  $P_t$  is the patient's emotional arousal at talk turn  $t$ .  $P_{t-1}$  is the patient's emotional arousal at the previous talk turn.  $T_{t-1}$  is the therapist's emotional arousal at the previous talk turn. The difference between  $P_{t-1}$  and  $T_{t-1}$  ( $T_{t-1} - P_{t-1}$ ) is the prediction error.  $\alpha$  (ranges from 0 to 1) is the weight given to the prediction error and determines the extent to which the patient adapts their emotional arousal according to the therapist's level of emotional arousal (see Equation 1).

Using a model fitting procedure, the best-fitted  $\alpha$ , that is, the  $\alpha$  that minimizes the difference between the model's prediction and the data (using root-mean-squared deviation error term), was selected for each patient at each timepoint of assessment. The fitting procedure was conducted using the limited-memory Broyden-Fletcher-Goldfarb-Shanno with box constraints optimization algorithm (Byrd et al., 1995) by the "optim" function in R, with  $\alpha$  bounds ranging from 0 to 1. Following this fitting procedure,  $\alpha$  values were centered around the sample's mean for use in follow-up analyses. The  $\alpha$  index captures the level to which the patient's emotional arousal is adapted due to changes in the therapist's emotional arousal. A higher value of  $\alpha$  indicates high adaptation, such that the patient's current emotional state can be mostly explained by the therapist's emotional state. This is conceptualized as a higher tendency for interpersonal regulation. A lower value of  $\alpha$  indicates low adaptation, such that the patient's emotional arousal can be mostly explained by their own emotional state in the previous speaking turn. This is conceptualized as a higher tendency for intrapersonal regulation. A graphical demonstration of the calculation and interpretation of the  $\alpha$  index is presented in Panel (ii) of Figure 2a.

**Calculating the Development of the Therapeutic Alliance.** To examine how the therapeutic alliance develops from Session 1 to Session 4, the following trend models were evaluated: linear, linear in log of time, and stability over time as a fixed effect. The log-likelihood test and the BIC suggested that a model of fixed and random effect of time demonstrates the best model fit in predicting the trajectory of the patient-rated therapeutic alliance. The trajectory of the alliance development was calculated using separate OLS regressions for each patient, with time (Session 1–4) as a predictor and the rated alliance as an outcome.

**Calculating Trajectory of Change in Attachment Orientation.** To examine how attachment orientation changes throughout treatment, the following trend models were evaluated: linear, linear in log of time, and stability over time as a fixed effect. The log-likelihood test and the BIC suggested that a model of fixed and random effect of time demonstrates the best model fit in predicting the trajectory of change in attachment avoidance, and a model of fixed and random effect of log of time demonstrates the best model fit in predicting the trajectory of change in attachment anxiety. The trajectory of change in attachment orientation was calculated using separate OLS regressions for each patient, with time (intake to the end of

treatment) as a predictor and the attachment orientation as an outcome. This procedure was conducted twice, once for attachment anxiety and once for attachment avoidance.

Descriptive statistics of all variables are presented in [Supplemental Table S2](#).

### Models for Examining the Study's Hypotheses

Three models were conducted to examine the study's hypotheses:

**Model 1. Shifts in the Emotion Regulation Tendency and the Development of the Therapeutic Alliance (Hypothesis 1).** To examine the association between the patient's shifts in emotion regulation tendency and the development of the therapeutic alliance, we used polynomial regression, followed by a response surface analysis (RSA; Edwards, 2002; Edwards & Parry, 1993; Shanock et al., 2010, 2014). This procedure allows us to examine the extent to which congruence and/or incongruence of two predictors, that is, congruence and/or incongruence in the tendency of regulation between timepoints of assessment (Sessions 1 and 4), relate to an outcome variable, that is, the development of the therapeutic alliance from Session 1 to Session 4 (Edwards, 2002; Edwards & Parry, 1993). For the purpose of examining possible shifts in the tendency of regulation from Session 1 to Session 4, congruence between the predictors indicates no shift in the patient's regulation tendency, whereas incongruence between the predictors indicates a shift in the patient's tendency of regulation, either from intrapersonal regulation to interpersonal regulation or vice versa. A graphical demonstration of possible shifts in the tendency of regulation is presented in [Panel \(iii\) of Figure 2a](#).

RSA requires an initial preprocessing procedure that creates a composite representation of the mutual influence of two predictors on the dependent variable. The most common methodology reported in the literature is to fit a polynomial regression model, which includes linear, quadratic, and interaction terms of both predictors (Shanock et al., 2010; see [Supplemental Material](#), for further information). Next, the main interest of RSA is the surface parameters, which are estimated using the resulting coefficients from the polynomial regression. Therefore, as a first step, linear, quadratic, and interaction terms of the patient's  $\alpha$  index (representing the tendency of regulation at each timepoint) were estimated, resulting in five final predictors: ( $b_1$ ) patient's  $\alpha$  index in Session 1, ( $b_2$ ) patient's  $\alpha$  index in Session 4, ( $b_3$ ) a quadratic term formed by squaring the patient's  $\alpha$  index in Session 1, ( $b_4$ ) a cross-product term formed by multiplying the patient's  $\alpha$  index in Session 1 and in Session 4, and ( $b_5$ ) a quadratic term formed by squaring the patient's  $\alpha$  index in Session 4 (Edwards, 2002; Edwards & Parry, 1993; Shanock et al., 2010, 2014). The patient's  $\alpha$  index in each Session (1 and 4) was centered around the sample's mean prior to the analysis. The resulting model for Hypothesis 1 was as follows:

$$WAI_i = b_0 + b_1(\alpha 1_i) + b_2(\alpha 4_i) + b_3(\alpha 1_i^2) + b_4(\alpha 1_i \times \alpha 4_i) + b_5(\alpha 4_i^2) + e_i, \quad (2)$$

where  $WAI_i$  refers to the alliance development for patient  $i$  from Session 1 to Session 4,  $\alpha 1_i$  refers to patient  $i$ 's  $\alpha$  parameter for emotion regulation tendency in Session 1, and  $\alpha 4_i$  refers to patient  $i$ 's  $\alpha$  parameter for emotion regulation tendency in Session 4.  $e_i$  refers to the residual (see [Equation 2](#)).

Then, the resulting estimates from the polynomial regression were used to extract surface parameters: ( $a_1$ ) =  $b_1 + b_2$ , the slope along the line of congruence; ( $a_2$ ) =  $b_3 + b_4 + b_5$ , the curvature along the line of congruence; ( $a_3$ ) =  $b_1 - b_2$ , the slope along the line of incongruence; and ( $a_4$ ) =  $b_3 - b_4 + b_5$ , the curvature along the line of incongruence. To examine Hypothesis 1, we focused on the parameter  $a_4$ , which, when positive, indicates that a greater shift in the patient's tendency of regulation, either from intra- to interpersonal regulation or vice versa, is associated with greater strengthening of the therapeutic alliance.

**Model 2. Shift in the Emotion Regulation Tendency and Trajectory of Change in Attachment Avoidance (Hypothesis 2a).** To examine whether a greater shift from intrapersonal to interpersonal emotion regulation tendency, at the beginning of treatment, will be associated with greater reduction in the level of attachment avoidance throughout treatment, we replicated the statistical procedure described for Hypothesis 1, now with the trajectory of change in attachment avoidance as an outcome. The resulting model for Hypothesis 2a was as follows:

$$ECR\_Avo_i = b_0 + b_1(\alpha 1_i) + b_2(\alpha 4_i) + b_3(\alpha 1_i^2) + b_4(\alpha 1_i \times \alpha 4_i) + b_5(\alpha 4_i^2) + b_6(ECR\_Anx_i) + e_i, \quad (3)$$

where  $ECR\_Avo_i$  refers to the trajectory of change in attachment avoidance for patient  $i$ ,  $\alpha 1_i$  refers to patient  $i$ 's  $\alpha$  index in Session 1,  $\alpha 4_i$  refers to patient  $i$ 's  $\alpha$  index in Session 4,  $ECR\_Anx_i$  refers to the trajectory of change in attachment anxiety for patient  $i$ , and  $e_i$  refers to the residual (see [Equation 3](#)).

For the purpose of examining Hypothesis 2a, we focused on the parameter  $a_3$  which, when positive, indicates that a greater shift in the patient's regulation tendency from intrapersonal to interpersonal is associated with greater decrease in the level of attachment avoidance throughout treatment.

**Model 3. Shift in the Emotion Regulation Tendency and Trajectory of Change in Attachment Avoidance (Hypothesis 2b).** To examine whether a greater shift from interpersonal to intrapersonal emotion regulation tendency, at the beginning of treatment, will be associated with greater reduction in the level of attachment anxiety throughout treatment, we replicated the statistical procedure described for Hypothesis 2a, now with the trajectory of change in attachment anxiety as an outcome. The resulting model for Hypothesis 2b was the following:

$$ECR\_Anx_i = b_0 + b_1(\alpha 1_i) + b_2(\alpha 4_i) + b_3(\alpha 1_i^2) + b_4(\alpha 1_i \times \alpha 4_i) + b_5(\alpha 4_i^2) + b_6(ECR\_Avo_i) + e_i, \quad (4)$$

where  $ECR\_Anx_i$  refers to the trajectory of change in attachment anxiety for patient  $i$ ,  $\alpha 1_i$  refers to patient  $i$ 's  $\alpha$  index in Session 1,  $\alpha 4_i$  refers to patient  $i$ 's  $\alpha$  index in Session 4,  $ECR\_Avo_i$  refers to the trajectory of change in attachment avoidance for patient  $i$ , and refers  $e_i$  to the residual (see [Equation 4](#)).

To examine Hypothesis 2b we focused on the parameter  $a_3$ , which, when negative, indicates that a greater shift in the patient's regulation tendency from intrapersonal to interpersonal is associated with greater decrease in the level of attachment anxiety throughout treatment.



## Results

For an overview of the descriptive statistics for Hypotheses 1 and 2, see [Supplemental Table S2](#).

### Model 1. Shift in the Emotion Regulation Tendency and the Development of the Therapeutic Alliance (Hypothesis 1)

As hypothesized, a positive curvature trend for the line of incongruence was found ( $a_4 = 1.53, SE = .57, p = .006$ ), suggesting that a greater shift in the patient's regulation tendency, either from intrapersonal to interpersonal regulation or vice versa, is associated with greater strengthening of the therapeutic alliance (see [Figure 2b](#)). The validation steps suggested by [Humberg et al. \(2019\)](#), detailing the precise conditions under which an incongruence effect can be concluded, were conducted to ensure a valid interpretation of the findings. Sensitivity analysis suggests that results still hold when controlling for each patient's intercept of the alliance trajectory. No other surface parameters were found ( $ps > .05$ ; see [Table 1](#)).

### Model 2. Shift in the Emotion Regulation Tendency and Trajectory of Change in Attachment Avoidance (Hypothesis 2a)

As hypothesized, a positive slope around the line of incongruence was found ( $a_3 = .07, SE = .02, p < .001$ ), suggesting that a greater shift in the patient's regulation tendency, from intrapersonal to interpersonal regulation, is associated with a greater decrease in the level of attachment avoidance throughout treatment (see [Figure 2c](#)). Sensitivity analysis suggests the findings still hold when controlling for each patient's intercept of the trajectory of change in attachment avoidance. No other surface parameters were found ( $ps > .05$ ; see [Table 1](#)).

### Model 3. Shift in the Emotion Regulation Tendency and Trajectory of Change in Attachment Anxiety (Hypothesis 2b)

Contrary to the hypothesis, there was no negative slope along the line of incongruence ( $a_3 = .10, SE = .15, p = .515$ ). That is, the shift

in the patient's regulation tendency, from interpersonal to intrapersonal, was not associated with a decrease in the level of attachment anxiety throughout treatment. Other surface parameters ( $a_1, a_2, a_4$ ) were also not found ( $ps > .05$ ; see [Table 1](#)).

### Sensitivity Analysis

The same pattern of results was obtained when repeating the analyses (a) using nondetrended acoustical data in all Models (1, 2, and 3), (b) excluding alliance at Session 1 (Model 1), and (c) analyzing attachment orientation only between Session 1 and Session 4 (Models 2 and 3). A set of analyses assessing potential moderation of pretreatment attachment orientation on the association between shifts of the regulation tendency and changes in attachment orientation throughout treatment revealed that, for patients who were characterized by higher pretreatment attachment avoidance, a greater shift from intrapersonal to interpersonal emotion regulation tendency throughout the early stages of treatment was associated with a greater decrease in the level of attachment avoidance throughout treatment. Testing the association between shifts in the emotion regulation tendency and treatment outcome revealed nonsignificant results (see online [Supplemental Material](#) for all sensitivity analysis, [Supplemental Tables S3 and S6](#)).

## Discussion

Accumulating clinical and empirical literature suggests that high levels of attachment anxiety and avoidance underlie the etiology and maintenance of many psychopathologies ([Bowlby, 1977](#); [Stovall-McClough & Dozier, 2016](#)). Accordingly, changes in attachment orientation were marked as an important clinical target ([Bowlby, 1988](#)). Given the importance of changing the individual's attachment orientation toward greater security ([Bowlby, 1988](#); [Daly & Mallinckrodt, 2009](#)), the present study examined the role that shifting the individual's emotion regulation tendency plays in facilitating improvement in attachment orientation. For that purpose, vocally encoded emotional arousal and learning computational model were implemented to capture the emotion regulation tendency. We had two main aims. The first was to examine whether shifts in the emotion regulation tendency are beneficial to the therapeutic process. This aim's hypothesis was fully supported. The second was to examine

**Table 1**  
RSA Parameters for the Association Between Shifting the Emotion Regulation Tendency and Three Dependent Variables

RSA parameter	Model 1 (H1) Development of the therapeutic alliance		Model 2 (H2a) Trajectory of change in attachment avoidance		Model 3 (H2b) Trajectory of change in attachment anxiety	
	Estimate (SE)	p value	Estimate (SE)	p value	Estimate (SE)	p value
$a_1$ : Slope along line of congruence	-0.18 (0.13)	.148	-0.01 (0.03)	.713	-0.15 (0.17)	.381
$a_2$ : Curvature along line of congruence	0.07 (0.54)	.894	-0.06 (0.16)	.692	-0.22 (0.73)	.767
$a_3$ : Slope along line of incongruence	-0.02 (0.09)	.825	0.07 (0.02)	<.001	0.10 (0.15)	.515
$a_4$ : Curvature along line of incongruence	1.53 (0.57)	.006	0.02 (0.09)	.772	0.13 (0.51)	.806

*Note.* RSA parameters for the association between shifting the emotion regulation tendency and three dependent variables: development of the therapeutic alliance (Model 1, H1), trajectory of change in attachment avoidance (Model 2, H2a), and trajectory of change in attachment anxiety (Model 3, H2b). RSA = response surface analysis; H = hypothesis; SE = standard error.

whether shifting the emotion regulation tendency is associated with changes in attachment orientation. The hypotheses of this aim were partially supported, with findings supporting our hypothesis regarding attachment avoidance, but not attachment anxiety. This pattern of results is consistent with the existing literature, in which changes in attachment-based tendencies and expectations emerge for attachment avoidance, but not for attachment anxiety (e.g., Egozi et al., 2021; Mallinckrodt et al., 2015).

Regarding the first aim, as hypothesized (Hypothesis 1), findings suggest that shifts in the emotion regulation tendency are associated with strengthening the therapeutic alliance. Specifically, findings suggest that patients who show a greater shift from *intrapersonal* to *interpersonal* regulation show greater strengthening of the alliance throughout the early stages of treatment. In addition, findings suggest that patients who show a greater shift from interpersonal to intrapersonal regulation also show greater strengthening of the alliance throughout the early stages of treatment. Together, these findings suggest that what is important to beneficial therapeutic processes such as the therapeutic alliance is the patient's ability to move from one tendency of regulation to the other, that is, to contradict the tendency of regulation with which the patient started the treatment (intra- vs. interpersonal), regardless of the tendency to which the patient moves. These findings are consistent with clinical literature highlighting the importance of shifting the emotion regulation tendency (e.g., Daly & Mallinckrodt, 2009). These findings are also consistent with theoretical conceptualization of the importance of contradicting the individual's attachment-based tendencies and expectations (e.g., Bowlby, 1988; Daly & Mallinckrodt, 2009; Dozier & Tyrrell, 1998). In line with the first hypothesis, the benefit of shifting the regulation tendency is shown in the strengthening of the therapeutic alliance, a consistent indicator of a good therapeutic process (Flückiger et al., 2018; Zilcha-Mano & Fisher, 2022). This finding is in line with empirical literature suggesting that changes in the individual's attachment-based tendencies and expectations are associated with stronger therapeutic alliance (Egozi et al., 2022; Mallinckrodt et al., 2015).

Regarding the second aim, examining whether shifts in the emotion regulation tendency throughout the beginning of treatment is associated with improvement in attachment orientation throughout the course of treatment, the study had two hypotheses. In the first (Hypothesis 2a), we hypothesized that a greater shift from intrapersonal to interpersonal emotion regulation would be associated with greater decrease in the level of attachment avoidance. This hypothesis was supported, that is, a greater shift from intrapersonal to interpersonal emotion regulation at the beginning of treatment was associated with a greater decrease in the level of attachment avoidance throughout the treatment. In the second hypothesis (Hypothesis 2b), we hypothesized that a greater shift from interpersonal to intrapersonal regulation would be associated with a greater decrease in the level of attachment anxiety. This hypothesis was not supported, that is, a greater shift from interpersonal to intrapersonal emotion regulation at the beginning of treatment was not associated with a greater decrease in the level of attachment anxiety throughout treatment. Regarding the significant finding of attachment avoidance, findings suggest that the more the patients move from relying on their own strengths to regulate emotional arousal, to better acquiring coping skills of relying on the therapist in regulating emotions, the more their

orientation to attachment avoidance is decreased throughout treatment. These findings are consistent with theoretical conceptualizations, clinical experiences, and empirical research, suggesting that when patients with higher levels of attachment avoidance start to show therapeutic progress, they are starting to share more emotional experiences with their therapist (Daly & Mallinckrodt, 2009; Egozi et al., 2021; Mallinckrodt et al., 2015).

Regarding the null results of attachment anxiety, one potential post hoc explanation is that shifting the emotion regulation tendency may serve as a mechanism for reducing the level of attachment anxiety, but the design of the present study could not capture this process. It is possible that a different measurement of emotional arousal or a different interval of assessment (e.g., a longer timeframe to measure attachment) could better capture such a process. Alternatively, it is possible that changes in attachment anxiety are based on a different mechanism than the one measured in the present study. Based on recent findings suggesting that patients with higher levels of attachment anxiety benefit more from treatments that target the patient's insight on interpersonal difficulties (Zilcha-Mano et al., 2021), it is possible that changes in the patient's insight on attachment-based tendencies and expectations would better serve as a mechanism in the process of reducing the level of attachment anxiety. Future studies should further examine these post hoc explanations.

If replicated in future studies, the findings may have important clinical implications. If replicated, the present findings may support the potential of shifts in the emotion regulation tendency to serve as a mechanism in the process of improving the attachment orientation toward greater security. Based on the present findings, therapists may benefit from identifying at the beginning of treatment the patient's tendency of regulation. If patients tend to rely mainly on their own capacities to regulate emotional arousal, therapists may support the patient's shift in the emotion regulation tendency to be better able to rely on the therapist's capacity to regulate emotion. Such a shift in the regulation tendency may be archived using suggested clinical approaches for counteracting the patient's attachment-based tendencies and expectations (e.g., Daly & Mallinckrodt, 2009; Dozier & Tyrrell, 1998).

The main limitation of the present study lies in its small sample size. Future studies should replicate the present findings using larger samples. Additionally, the present study uses a sample of a specific socioeconomic context. Future studies should examine whether the present findings can be generalized to samples from different ethnic, racial, and religious backgrounds, thus contributing to the identification of sociocultural-specific aspects of this phenomenon. Another limitation of the present study lies in the use of data from an RCT in which a few, trained and experienced, therapists treated a relatively large number of patients. As such, the present study was not ideal for testing research questions that require variability in both the patients' and the therapists' attachment orientation. Future studies with a larger number of therapists should also examine interdependent processes between patients' and therapists' changes in attachment-based tendencies and expectations.

Another limitation of the present study lies in the limited number of observations. Although, relative to the state of the art, the number of observations used in the present study is large, more frequent assessment of the emotion regulation tendency is needed to infer

whether changes in the tendency of regulation lead to changes in attachment orientation or whether it is the other way around. A more frequent assessment may also enable one to examine how the temporal interplay between shifts in the emotion regulation tendency and changes in the therapeutic alliance and in attachment orientation develops through time. Future studies with larger samples, examining within-individual processes of change, may further validate this mechanism. If further validated, the mechanism of shifting the emotion regulation tendency may serve as a therapeutic target in treatments that aim to improve attachment orientation and interpersonal interactions.

Notwithstanding these limitations, using a rigorous design, the present study contributes innovative findings regarding the role of shifting the emotion regulation tendency in facilitating further changes in attachment orientation. In this way, the present study provides invaluable insights into the large-scale temporal dynamics of moving from intra- to interpersonal emotion regulation as well as the other way around, in a quasineaturalistic setting (Petrova & Gross, 2023).

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