


Measuring Emotion Regulation Skill Use During Treatment: A Promising Methodological Approach

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Abstract

Emotion regulation has become ubiquitous in the study of psychopathology and a growing number of treatment outcome studies are collecting data on emotion regulation skill use. However, traditional measures of emotion regulation fail to capture important nuances in emotion regulation processes, their relationship to psychopathology, and how individuals use emotion regulation skills over time and across contexts. Novel methodologies are particularly needed for measuring emotion regulation in the context of treatment studies. In this article, we discuss a proposed methodology, the combination of ecological momentary assessment (EMA), and single-case experimental design (SCED), for measuring emotion regulation strategy use in the context of treatment outcome studies. To inform this discussion, we provide a brief overview of common approaches to assessing emotion regulation skill use in the context of treatment outcome research. We then describe the utility of intensive data capture (EMA) in the context of idiographic treatment studies (SCED), present a case study to illustrate the different uses of data collected through EMA in the context of a SCED study, and discuss considerations for implementing this method in clinical practice.

Keywords

emotion regulation, ecological momentary assessment, single-case experimental design, treatment outcomes

The study of emotion regulation, defined as how one shapes “which emotions one has, when one has them, and how one experiences or expresses these emotions” (Gross, 1998), is one of the fastest growing areas of psychological research (Ford & Gross, 2018). Emotion dysregulation is conceptualized as an over-reliance on maladaptive emotion regulation strategies, or a limited use of adaptive strategies, in response to affective experiences (Kring & Sloan, 2009). Difficulty regulating emotions has been implicated in the onset and maintenance of a wide range of mental health conditions, including anxiety, depressive, substance use, and personality disorders (Sloan et al., 2017). Emotion regulation strategies (i.e., specific skills used to alter affective experiences) have been characterized as either adaptive or maladaptive based on their impact on individuals’ affect, behavior, and cognition (Aldao et al., 2010; Aldao & Nolen-Hoeksema, 2012a); adaptive strategies, which can be acceptance-based (e.g., mindfulness) or change-based (e.g., problem-solving, reappraisal), are often associated with lower levels of psychopathology (Aldao et al., 2010; Schäfer et al., 2017), improved interpersonal functioning (Aldao & Nolen-Hoeksema, 2012b), and greater well-being (Benita et al., 2020). Conversely, maladaptive emotion regulation strategies (e.g., rumination, avoidance, suppression)

have been associated with psychopathology in both clinical and non-clinical samples (Aldao et al., 2010; Dryman & Heimberg, 2018). Consequently, psychological treatments have become increasingly focused on targeting emotion regulation as a means of ameliorating symptoms (e.g., the Unified Protocol [UP; Barlow et al., 2018], dialectical behavior therapy [DBT; Linehan, 1993], emotion regulation therapy [ERT; Mennin, 2004]). These treatments focus on improving emotion regulation by teaching clients a range of specific emotion regulation strategies to influence their affective experiences (i.e., emotion regulation skills; Southward et al., 2021).

However, emotion regulation research has traditionally struggled to assess how emotion regulation strategies are applied in response to naturally occurring situational demands (Aldao, 2013). Two of the most common types of

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emotion regulation assessments are retrospective self-report questionnaires and laboratory-based paradigms. Retrospective questionnaires tend to capture data on trait-level skill use and broader dispositional tendencies toward emotion regulation. However, they often overlook the natural fluctuations of emotion regulation in response to daily environmental demands and emotional experiences (Aldao et al., 2010), are subject to recall bias, and show low levels of correspondence with concurrent reports of emotion regulation (Aldao et al., 2010; Ebner-Priemer & Trull, 2009; Solhan et al., 2009). Laboratory-based paradigms, in which participants are instructed to practice specific emotion regulation strategies following exposure to emotionally salient stimuli, are often highly structured and time limited, reducing their external validity and limiting our understanding of the long-term outcomes associated with different emotion regulation patterns (Aldao, 2013; Doré et al., 2016; Rosenthal et al., 2015). On their own, neither of these approaches may capture the nuanced and dynamic nature of emotion regulation, nor the variability in how individuals spontaneously select and implement strategies in response to everyday experiences (Aldao, 2013; Aldao & Nolen-Hoeksema, 2012a).

One alternative to these methods is ecological momentary assessment (EMA), a set of techniques that utilize repeated sampling of individuals' real-time behaviors and experiences (Shiffman et al., 2008). Over the last decade, EMA methods have proliferated in studies of emotion and emotion regulation, allowing for greater consideration of the contextuality and flexibility of emotion regulation strategy use (Aldao et al., 2015; Colombo et al., 2020; English & Eldesouky, 2020). For example, chronic use of distraction as an emotion regulation strategy can lead to emotional avoidance and worse long-term outcomes; however, distraction might be an effective strategy to use in specific situations, such as while trying to complete work (English et al., 2017). Because EMA can capture situational characteristics relevant to an emotion regulation strategy's adaptiveness (i.e., environmental features, emotionally-salient external stimuli, emotion type and intensity; Gross, 2014), some progress has been made in measuring the nuances of how individuals differentially select and implement emotion regulation skills, over time and across different contexts (Blanke et al., 2020; Bonanno & Burton, 2013).

However, one subarea of emotion regulation research that has yet to widely embrace EMA is treatment outcome research. To date, only a few studies (e.g., Cardona et al., 2021; Sauer-Zavala et al., 2020; Southward, Semcho, et al., 2020) have used EMA to study emotion regulation (including changes in emotion regulation strategy use) in the context of treatment outcome studies. This represents a significant gap in both emotion regulation research and treatment outcome research for emotional disorders. In this article, we first provide a brief overview of common

measures of emotion regulation in treatment outcome research for emotional disorders to highlight the limitations of this existing literature base. Then, we discuss a proposed methodology—the combination of EMA and single-case experimental design (SCED; Barlow et al., 2009)—for measuring emotion regulation strategy use in the context of a treatment outcome study. Together, these methodologies offer an opportunity to examine within-person fluctuations in the use of specific emotion regulation skills in response to specific interventions and provide insight into individual-level decision-making regarding what skills to implement in response to varying contextual demands. Finally, we will present a case study to illustrate how EMA data can be utilized in the context of a SCED study and discuss considerations for implementing this methodology in clinical settings for clinicians who wish to incorporate empirical data into treatment planning and delivery.

A Brief Overview of Assessments of Emotion Regulation Skill Use During Treatment

Although a growing number of treatment outcome studies are collecting data on emotion regulation skill use, there is considerable variability across studies in terms of *how* and *how often* emotion regulation skill use is assessed. Retrospective self-report questionnaires are often favored in treatment outcome studies because they are readily available, easy to administer, and relatively cost-efficient. Sloan et al. (2017)'s systematic review of studies of change in both emotion regulation *and* psychopathology following psychological intervention included a variety of self-report measures, such as the Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004), the Coping Orientation to Problems Experienced inventory (COPE; Carver et al., 1989), the Acceptance and Action Questionnaire (AAQ/AAQ-II; Bond et al., 2011), and the Emotion Regulation Skills Questionnaire (ERSQ; Grant et al., 2018). In addition to assessments of broad emotion regulation skills, other frequently used measures assess specific emotion regulation strategies, such as the White Bear Suppression Inventory (WBSI; Wegner & Zanakos, 1994) and the Ruminative Response Scale (RRS; Nolen-Hoeksema & Morrow, 1991).

Regarding how *often* emotion regulation skill use is assessed, many studies measure emotion regulation skill-use at baseline and post-intervention (e.g., Berking et al., 2008; Cavicchioli et al., 2019; Clyne & Blampied, 2004; Conklin et al., 2015), with some studies including additional follow-up timepoints (e.g., Gratz et al., 2015; Schuppert et al., 2012; Weiss et al., 2018). Although pre- and post-treatment comparisons of measures of emotion regulation skill use shed light on how individuals' use of skills might change following a course of treatment, this

approach fails to capture skill use *during* treatment. For instance, these study designs are unable to determine when and in response to what treatment component changes in emotion regulation occur. In addition to pre-post study designs, some treatment outcome studies (Aldao et al., 2014; Radkowsky et al., 2014; Slee et al., 2008) administer self-report measures at regular intervals over the course of treatment, thus allowing for more fine-grained assessments of how emotion regulation skill use changes during treatment. Nonetheless, several limitations to this methodology remain, including response biases; the trait-based (versus state-based) framing of questions, which limits a measure's ability to capture change over time; and a lack of attention to context.

As an alternative or supplement to self-report measures of emotion regulation, some treatment studies utilize behavioral tasks and experimental paradigms to capture data on how individuals can regulate emotions in response to emotion-evoking stimuli. Examples of these include administering emotion-focused vignettes to participants at baseline and post-treatment and recording what strategies they would use to cope with different emotions (Scarpa & Reyes, 2011), or providing participants with hypothetical neutral and emotion-evoking scenarios and recording how they would respond in each if they were experiencing the scenario (Clyne & Blampied, 2004). These behavioral tasks capture data about individuals' *knowledge* of emotion regulation strategies and their hypothetical skill use, but do not capture real-time use of these skills and lack ecological validity.

Taken together, the most common methodologies used to measure emotion regulation skill use in the context of treatment studies are limited in their ability to provide fine-grained and nuanced data on individuals' use of emotion regulation skills in real-time, and in response to varying contextual demands. Furthermore, the use of self-report questionnaires and behavioral tasks, often completed pre- and post-treatment, cannot determine *when* and *how* emotion regulation changes over the course of treatment. EMA provides a much-needed alternative to assessing emotion regulation skill use; however, this methodology has yet to become widespread in the context of treatment outcome research. As such, novel methodologies are particularly needed for measuring emotion regulation in the context of such treatment studies.

A Proposal for Measuring Emotion Regulation Skill Use in the Context of Treatment

EMA is an experience sampling method that allows for the real-time assessment of emotional experiences and regulation strategies (Nica & Links, 2009). EMA involves repeatedly collecting data remotely, often via smartphone, as

respondents go about their daily routines. For example, EMA questionnaires can prompt respondents to report antecedents (e.g., an argument) and consequences (e.g., affect ratings) of emotion regulation strategy use as they occur. By prompting individuals to report on real-time emotions, EMA methods provide a framework to incorporate both the contextual factors that influence emotion regulation (e.g., interpersonal context, location) as well as variation in implementation of regulation strategies into the assessment of emotion regulation, allowing researchers and clinicians to decipher the contexts in which certain strategies may be more or less effective (Southward et al., 2021). This methodology also reduces recall bias by collecting real-time data on the implementation of emotion regulation strategies in naturalistic settings (Bylsma & Rottenberg, 2011). Finally, the large number of repeated measures collected through EMA sampling allows researchers and clinicians to examine relationships between variables on a person-specific level, thus facilitating personalized feedback or treatment planning.

Single-case experimental design (SCED) represents an additional methodological framework that, when paired with EMA, can provide more in-depth examinations of the flexible selection of emotion regulation strategies during treatment (Barlow et al., 2009). SCED studies involve collecting process and outcome data at regular intervals (often weekly) as participants receive one or more interventions that are organized into multiple consecutive phases. The baseline (i.e., assessment-only) phase serves as a control condition to establish natural fluctuations in outcomes of interest across several assessment points. The next phase involves an experimental manipulation, usually the introduction of a behavioral intervention. Data analysis involves examining the extent to which the baseline patterns (e.g., mean score on outcome measure, slope of scores over the baseline period) change after the intervention is introduced. When multiple participants are involved, they may be randomly assigned to baseline phases of various lengths to allow for the causal inference that improvements occurring during the intervention phase can be attributed to the introduction of the study intervention and not simply the passage of a certain amount of time. This design provides strong internal validity, as each participant serves as their own control (Kazdin, 2019). The replicability of findings across participants can provide initial support for the generalizability of results (Barlow et al., 2009) that can be further targeted in larger samples. Examining the causal relations among constructs in SCED studies provides a more granular approach to measuring processes of change than is possible within traditional clinical trials.

Given the considerable heterogeneity in how individuals select and implement emotion regulation skills, as well as how they respond to treatments, it is crucial to examine within-person functional relationships between relevant

constructs (e.g., emotions, emotion regulation strategy use, context). EMA and SCED both involve frequent repeated measures, generating detailed data that allow for person-specific analyses of the relationship between different constructs over time. Thus, in combination, these methodological approaches can closely examine within-person fluctuations in the use of specific emotion regulation skills in response to specific interventions, and provide insight into decision making with regard to what skills to implement in response to varying contextual demands.

Combining EMA and SCED leverages each approach's unique strengths: the collection of high-resolution observational data through EMA and the use of highly controlled experimental manipulation in SCED. Researchers and clinicians can control or manipulate which intervention components are delivered across SCED phases and assess subsequent changes in emotion regulation patterns captured via EMA, allowing for the identification of causal relationships between specific intervention components and changes in emotion regulation skill use. For example, in a case study of a participant who received a personalized delivery of the Unified Protocol for the Transdiagnostic Treatment of Emotional Disorders (UP; Barlow et al., 2018), Altman and Earleywine (2021) used EMA to identify changes in symptoms and emotion regulation skill use following specific modules of the UP. Using person-specific EMA data, they examined individual-level changes in symptoms and emotion regulation over the course of treatment, and were able to infer relationships between specific intervention components (e.g., exposures) and use of emotion regulation strategies (e.g., avoidance). The findings—for instance, that the exposure module was followed by reductions in avoidance and procrastination, or that the emotion-driven behaviors module was followed by reductions in worry—highlight what can be learned from study designs that link EMA to shifts in treatment strategies. One limitation to note from this study is that the participant received each UP module sequentially without pause in between modules, which limits the authors' ability to infer causality between each module and its associated skills. To address this issue, SCED studies often incorporate multiple baseline periods in between treatment phases (i.e., “ABAB” designs) to separate treatment phases and reduce “carry over” effects from one phase to the next (Kazdin, 2019).

Case Study

This case example is intended to illustrate how this methodology can be implemented by clinicians wishing to incorporate empirical data into treatment planning and delivery. We illustrate how collecting EMA data in the context of a SCED study may be a valuable tool in better understanding (1) individual variations in emotion regulation skill use over the course of a brief intervention and (2) associations

between skill use and psychopathology. These data come from a larger study by Sauer-Zavala and colleagues (2020) that identified the discrete effects of teaching individuals an emotion regulation skill common to treatments for borderline personality disorder (BPD): countering emotion-driven behavioral urges (also referred to as “opposite action”). Individuals with BPD report higher levels of negative affect in response to stressful daily events and greater fluctuations between positive and negative emotions compared to non-clinical controls and depressed samples (Ebner-Priemer et al., 2007; Nica & Links, 2009; Rosenthal et al., 2015). Thus, this population offers a valuable opportunity to study affective dynamics.

Participants ($N = 8$) with BPD received four weekly sessions of the Countering Emotion-Driven Behaviors module of the Unified Protocol for the Transdiagnostic Treatment of Emotional Disorders (UP; Barlow et al., 2018), which is designed to teach clients to practice behaviors that counter the action urge associated with ineffective or maladaptive emotions (e.g., approaching a feared but not dangerous situation; scheduling enjoyable activities when sad). Participants completed measures at least once-a-day via text message or email assessing the frequency of their emotional experiences and corresponding behaviors during baseline (2–4 weeks), treatment (4 weeks), and follow-up (4 weeks) phases. Participants reported on the type and intensity of each emotion experienced that day, the circumstances prompting each emotional experience, and their behavioral response to each emotion (Cardona et al., 2021; Sauer-Zavala et al., 2020; Southward, Semcho, et al., 2020). Behavioral responses were classified by the research team as either adaptive (e.g., allowed the emotion to be there, collected the facts about a situation before responding, used assertive behaviors, set a limit, asked for help) or maladaptive (e.g., used substances, engaged in self-injury, sought reassurance, lashed out) based on previous theory and research (Naragon-Gainey et al., 2017; Southward & Cheavens, 2020). Participants were reminded to complete these assessments once per day, but were informed that they could complete the assessments as many times per day as they liked. Participants also completed weekly symptom measures; here, we present data on BPD symptom severity using the self-report version of the Zanarini Rating Scale for BPD (ZAN-BPD; Zanarini et al., 2015) and anxiety symptom severity using the Overall Anxiety Severity and Impairment Scale (OASIS; Campbell-Sills et al., 2009). For a more detailed description of the study protocol and EMA procedures, see Sauer-Zavala et al. (2020).

The data from participant 007, a 27-year-old non-Hispanic Black male, are presented here. He scored a 12 on the ZAN-BPD at baseline, indicating moderately severe BPD symptoms (Zanarini et al., 2015). We describe three methods of analyzing these data to highlight a variety of techniques clinicians can use to draw inferences from individual-level data.

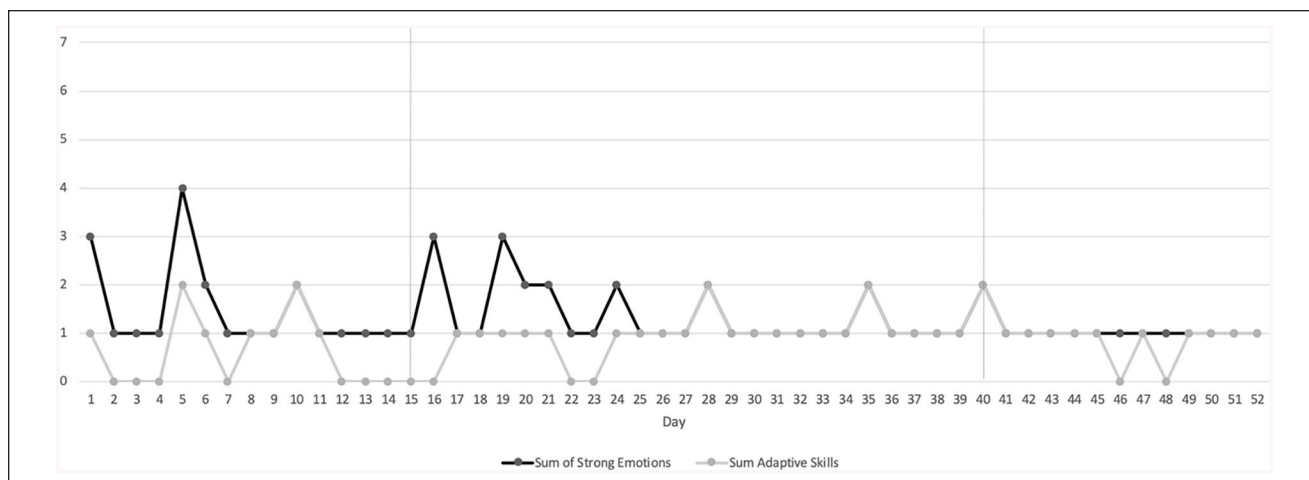


Figure 1. Proportion of Daily Emotional Experiences Responded to With Adaptive Emotion Regulation Skills.

Daily Level Data

Figure 1 displays daily counts of emotional experiences (black line) and adaptive responses to those emotions (dark gray line) for each day. The data displayed are aggregates of participant responses collected over a single day (i.e., the total number of emotional experiences reported and total times participants responded to emotional experiences with adaptive skills). Overlap between these lines suggests that participant 007 responded to every emotion with an adaptive skill. A dark gray point below a black one indicates that the participant did not respond to each emotion with an adaptive emotion regulation strategy. Using visual inspection (Kazdin, 2019), a lack of overlap between data points during the baseline phase indicated that the participant infrequently used adaptive emotion regulation skills in response to the strong emotions he reported experiencing. By contrast, the treatment phase was associated with an increase in the overlap between data points, which was maintained during the follow-up phase. This pattern indicates that the treatment period was associated with an increased use of adaptive emotion regulation skills in response to strong emotions, which in turn suggests that the Countering Emotion-Driven Behaviors module of the UP promoted a change in adaptive emotion regulation skill use.

Figure 2 further breaks down the specific adaptive skills into two separate emotion regulation strategies: problem-solving (dark gray) and mindfulness (light gray) and indicates the number of times each strategy was used in response to a strong emotion (black). Although participant 007 appeared to predominantly use problem-solving skills for a period of time during the treatment phase (days 19–31); overall, he reported using both mindfulness and problem-solving skills in response to strong emotions throughout the treatment and follow-up periods. This variability in the selection and implementation of adaptive skills is consistent

with the growing literature on the importance of flexibility and variability in the implementation of emotion regulation strategies (Aldao et al., 2010, 2015; Aldao & Nolen-Hoeksema, 2012b; Bonanno & Burton, 2013).

Weekly Level Data

To translate the daily level EMA data into weekly level data, we calculated the percentage of strong emotions to which participants responded with an adaptive emotion regulation skill (Figure 3). This was done by dividing the total number of instances participants used an adaptive emotion regulation skill by the total number of emotional experiences the participant reported in a given week. Converting daily level EMA data into evenly spaced weekly data points that coincide with weekly sessions allows clinicians to apply established guidelines for analyzing SCED data using both visual inspection and statistical methods (Tate et al., 2016). Visual inspection was used to assess the mean and slope of the graph to identify changes across study phases. This technique was supplemented with percentage of non-overlapping data (PND) calculations to determine (1) the statistical significance of within-person changes in skill use and symptom improvement during each treatment phase and (2) whether skill use coincided with symptom reduction across treatment phases. PND statistics compare the number of non-overlapping data points between treatment phases (i.e., between baseline and treatment, and baseline and follow-up). Data points that do not coincide with the range of scores from the previous phase are considered non-overlapping. PND greater than or equal to 70% are considered clinically significant (Scruggs & Mastropieri, 1998), and phases with higher PND indicate a more robust effect of that phase.

We observed a significant increase in adaptive skill use in response to strong emotions during the treatment, as

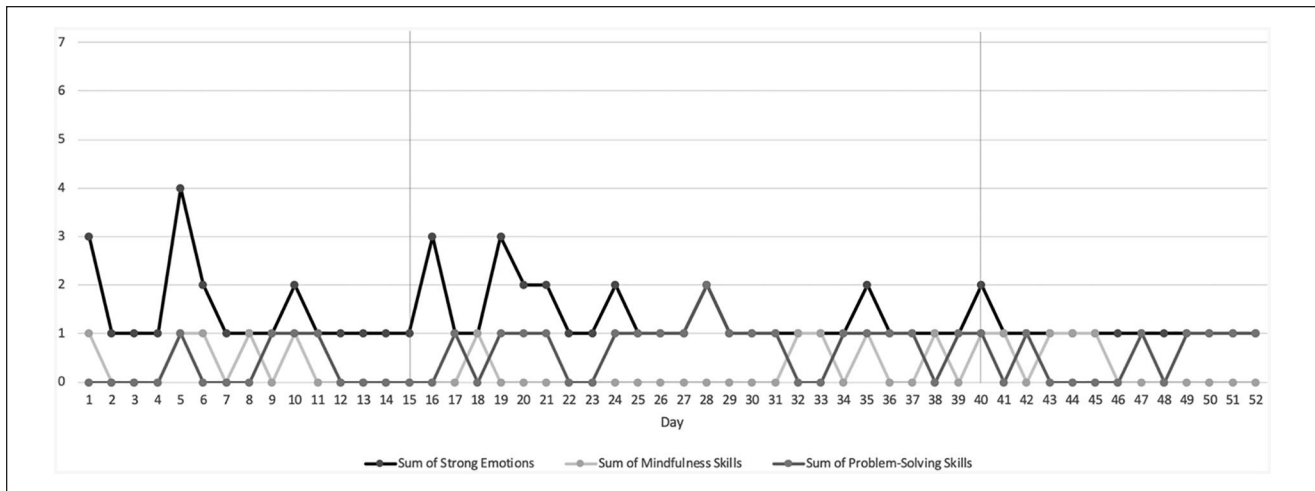


Figure 2. Proportion of Daily Emotional Experiences Responded to With Adaptive Emotion Regulation Skills, Broken Down by Skill Type (i.e., Mindfulness and Problem-Solving).

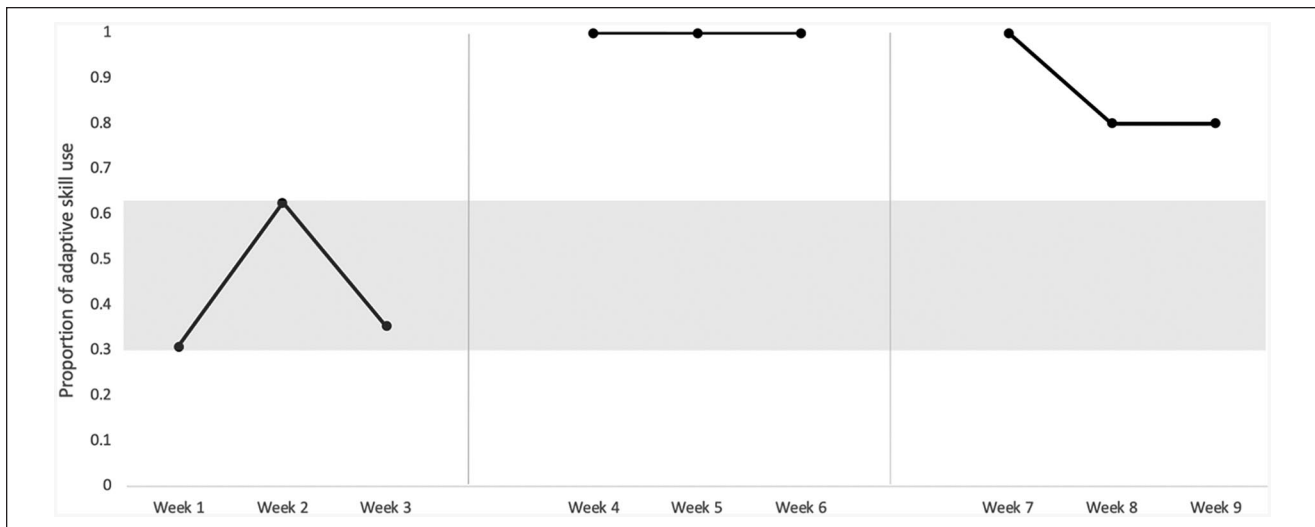


Figure 3. Weekly Proportions of Adaptive Skill Use in Response to Strong Emotions.

determined by both visual inspection (Figure 3) and PND statistics (Table 1). Furthermore, this increase was maintained during the follow-up phase according to both visual inspection (Figure 3) and PND statistics (Table 1). Given that many symptom and outcome measures used in treatment outcome research are administered weekly, converting daily level EMA data into weekly level data allows for the comparison of patterns of emotion regulation skill use with changes in symptoms and outcomes over the course of treatment. For example, we observed significant decreases in symptoms of BPD and anxiety over the course of treatment, as determined by both visual inspection (Figure 4) and PND statistics (Table 1). The decrease in symptoms of anxiety, but not BPD, was maintained during the follow-up

phase according to both visual inspection (Figure 4) and PND statistics (Table 1). We also observed that reductions in symptoms of BPD and anxiety coincided with increases in adaptive skill-use during the treatment phase using both visual inspection and PND statistics. Thus, we were able to collect ecologically valid data through EMA that is easily converted to weekly aggregate scores; the daily level data aggregated at the weekly level can be directly compared to once-weekly self-report data, which allows for the analysis of relationships between variables captured on different time scales.

In this example, visualizing emotion regulation skill use and changes in symptoms of anxiety and BPD allows clinicians to observe potential relationships between these

Table 1. Percent of Non-Overlapping Data (PND) for Emotion Regulation Skill Use.

Participant	Adaptive skill use	ZAN-BPD	OASIS
007			
BL-TX (Weeks 1–6)	100*	100*	100*
BL-FU (Weeks 1–9)	100*	66.67	100*

Note: ZAN-BPD = Zanarini Rating Scale for BPD; BPD = borderline personality disorder; OASIS = Overall Anxiety Severity and Impairment Scale; BL-TX = percent of non-overlapping data points between the baseline and treatment phases; BL-FU = percent of non-overlapping data points between the baseline and follow-up phases.

*Significant improvement at $p < .05$.

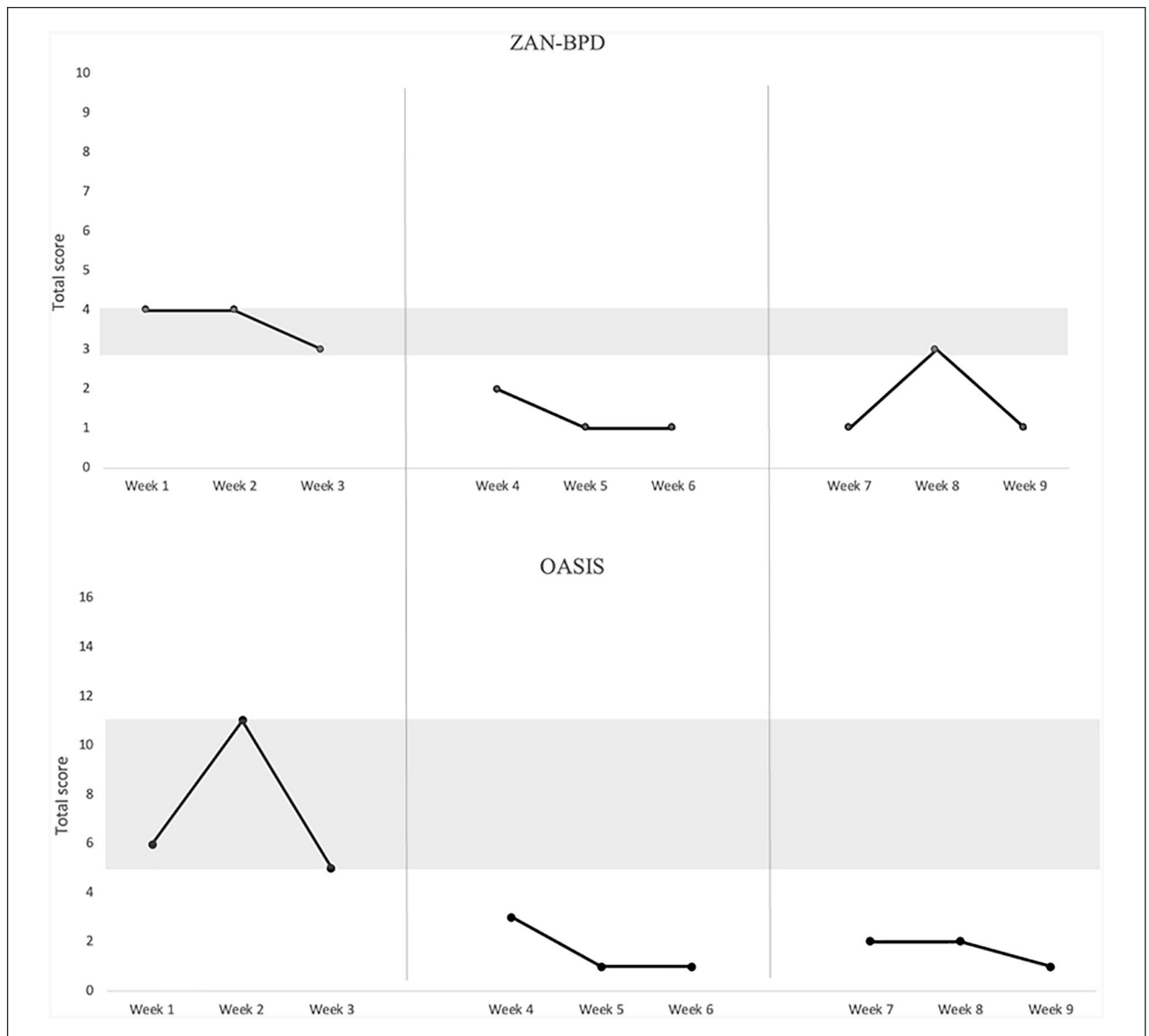


Figure 4. Weekly Scores on the Overall Anxiety Severity and Interference Scale (OASIS) and the Zanarini Rating Scale for BPD (ZAN-BPD).

variables using SCED techniques. As participant 007 learned and applied more adaptive emotion regulation skill use (Figure 3), he experienced decreases in BPD and anxiety symptoms (Figure 4). Although further criteria are necessary to establish mechanisms of change in treatment (Kazdin & Nock, 2003), these analyses allow clinicians to generate hypotheses about potential mechanisms. Clinically, these hypotheses can then be tested by teaching clients a new emotion regulation skill and observing whether increased use of that specific skill coincides with symptom reduction.

Although visual inspection is the primary technique for analyzing single-variable data in SCED studies (e.g., change in one variable across phases; Kazdin, 2019), it becomes more challenging to analyze relationships between multiple variables that are changing over time. Clinicians interested in a more rigorous test of the relationship between two changing variables, such as weekly skill use and weekly symptom outcomes, can use the statistical program Simulation Modeling Analysis (SMA; Borckardt & Nash, 2014). SMA calculates correlations between two variables with five or more data points, which can lend statistical support to hypotheses about interrelated processes being measured in therapy. Furthermore, users can run cross-lagged correlations, which are useful in establishing temporal precedence (which variable changes first)—a necessary, and often overlooked, criterion in establishing mechanisms of change (Kazdin & Nock, 2003). For example, a client with depression may share with their clinician that they tend to feel better during periods when they are regularly seeing supportive friends, although it may be unclear whether social support alleviates their depression or whether being less depressed makes them more likely to seek support. Cross-lagged correlations between depression scores and measures of social connection or support can reveal which of these measures tends to change first, hinting at what may be the causal mechanism. Although establishing mechanisms of change using SCED is beyond the scope of the current case example (i.e., the parent study did not include enough observations of symptom severity during the treatment phase to conduct these analyses), user-friendly tools such as SMA can benefit clinicians who seek to understand whether multiple therapeutic processes are related to each other and whether changes in a given variable precede changes in another. SMA is available freely online (<https://www.clinicalresearcher.org/software.htm>).

Contextual Data

Using EMA in the context of SCED studies allows clinicians to collect data on specific emotional and environmental contexts in which individuals use emotion regulation skills. These data can help clinicians identify whether a participants'

patterns of skill use are consistent across contexts or vary in response to particular emotions or environments.

Emotion-Specific Context. Idiographic multilevel logistic regressions can be used to examine whether specific emotions (e.g., sadness, anger, fear, shame, guilt) are related to the use of specific emotion regulation strategies and whether these relations vary by treatment phase (Cardona et al., 2021). Interestingly, and despite the visual patterns above, there were no significant relations between emotions and emotion regulation skills across study phases ($ps > 0.05$) for participant 007.

These analyses provided nuanced examination of the relationship between emotions and emotion regulation skill use, with data that could have informed the course of treatment. For instance, other participants in the study appeared to use the same skills for anxiety and for sadness regardless of the study phase, which could indicate an overall inflexible pattern of skill use. Clients displaying such patterns may benefit from focusing on how to flexibly implement emotion regulation skills by learning how to use internal (e.g., emotion type and intensity) and external (e.g., environmental) cues to identify what skill might be most effective in a given moment. This level of granularity can also help clinicians identify specific emotions that their clients might have a harder time responding to effectively. If a client shows patterns of rigid or maladaptive responding to specific emotions, additional time in sessions could be spent troubleshooting ways to improve effective skill use for that particular emotion. Overall, this method may offer valuable insight to clinicians attempting to personalize strategies for regulating clients' specific emotions.

Environmental Context. Descriptive data characterizing the proportion of strong emotions participant 007 responded to with adaptive emotion regulation strategies by environmental context are presented in Figure 5. The most common contexts in which strong emotion were experienced at baseline were interpersonal events and self-evaluation; interpersonal events, self-evaluation, and short-term routine disruptions were most common during the treatment phase; and interpersonal events and self-evaluation were most common during the follow-up phase. Over the course of the intervention, there was an increase in the proportion of adaptive skills used in response to strong emotions that were triggered by several contextual factors, including interpersonal events (particularly conflicts and fears of rejection/judgment) and short-term routine disruptions. The observed increase in adaptive skill use in response to interpersonal contexts is noteworthy given that interpersonal events are considered the prototypical emotional trigger for individuals with BPD (Sauer-Zavala & Barlow, 2014). This finding suggests that a four-session intervention aimed at countering emotion-driven behaviors can successfully alter

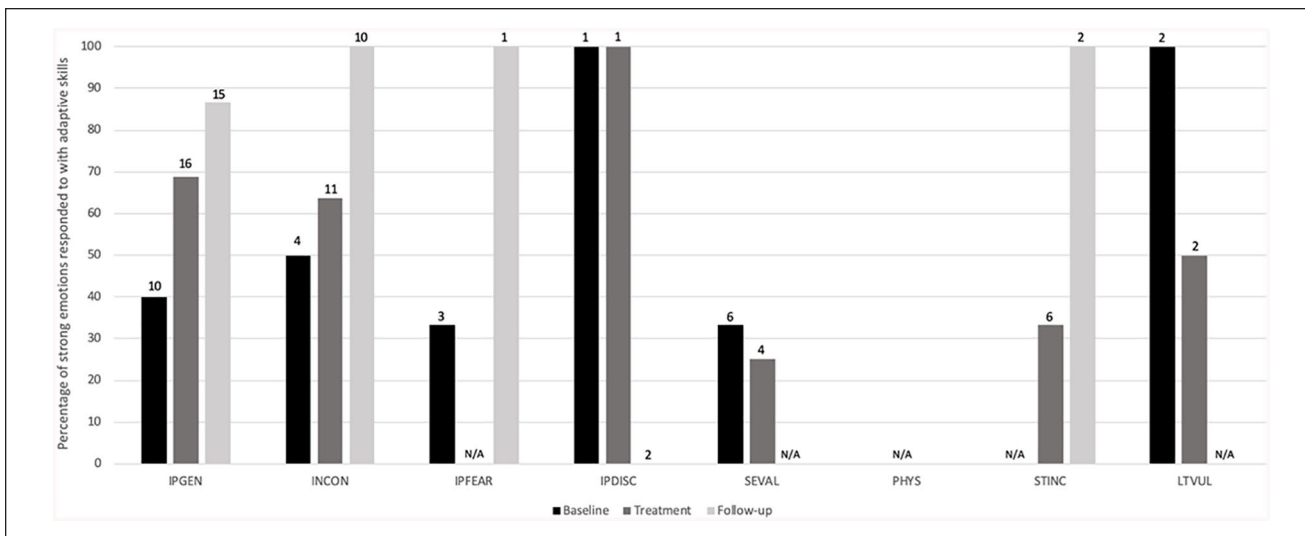


Figure 5. Percentage of Strong Emotions Responded to With Adaptive Emotion Regulation Skills, Broken Down by the Contextual Trigger of the Emotion.

Note. Numbers above each bar indicate the number of emotions triggered by the particular context. N/A = no emotions were triggered by these contexts; IPGEN = general interpersonal; INCON = interpersonal conflict; IPFEAR = fear of rejection/judgment; IPDISC = feelings of disconnection/loneliness; SEVAL = self-evaluation; PHYS = physical sensations; STINC = routine disruption/inconvenience; LTVUL = material/physical vulnerability factors.

patterns of emotion regulation skill use in response to emotional experiences in interpersonal contexts. However, participant 007 also reported a decrease in adaptive skill use in response to strong emotions experienced in the context of self-evaluation and material/physical vulnerability factors. Finally, although participant 007 responded to all experiences of disconnection/loneliness with adaptive skills during baseline and treatment, this did not continue during follow-up. These data provide insight into which contexts are more difficult for participant 007 to manage using adaptive skills, and suggest additional interventions may be helpful in generalizing this participant’s use of adaptive skills across contexts. These data can inform clinical work by identifying particular contexts that are relevant to the individual and that could become targets in treatment (e.g., by focusing on practicing skill use in more difficult contexts).

Practical Implications and Considerations for Use in Clinical Settings

Collecting EMA data in the context of a SCED study offers a rigorous and accessible approach to identifying idiographic changes in emotion regulation skill use, symptoms of psychopathology, and the relationship between emotions, skills, and symptoms over the course of treatment. Because this approach is idiographic, clinicians could integrate these principles into their practice to assist with treatment

planning and outcome monitoring. Given that the vast majority of clinics have waitlists, clinicians could develop EMA questionnaires for prospective clients to complete at regular intervals prior to beginning treatment. Questionnaires with items relevant to the client’s presenting concerns can help clinicians obtain a baseline understanding of how each potential client’s emotions and emotion regulation strategies are related to further specify treatment priorities (Piccirillo et al., 2019). This can be done using statistical techniques like person-level regressions (Cardona et al., 2021) or cross-lagged correlations that estimate the relationships between emotions and regulation strategies, as described above. These findings could then be used to generate a treatment plan consisting of sequential components to systematically build on the client’s baseline strengths and generalize their emotion regulation skills across relevant contexts. Clinicians could treat each treatment component as a different phase of a SCED design, making it possible to continuously assess outcomes in accordance with typical SCED analytic techniques by collecting weekly self-report data on symptoms, skills, and contexts.

For example, if rumination at time *t* most strongly predicts increased distress at time *t* + 1 compared to other measured emotion regulation strategies, a clinician may target reducing rumination earlier in treatment. The clinician could further explore if any adaptive emotion regulation strategies predicted decreases in rumination. Given that capitalizing on client strengths has been shown lead to more rapid improvements (Cheavens et al., 2012), the clinician

may begin treatment with modules dedicated to practicing that skill and sequentially test the delivery of other adaptive skills as treatment progresses. Treating each skill as a separate intervention phase in a SCED, while continuing to monitor relevant outcomes via self-report, would allow clinicians to determine whether a particular emotion regulation strategy is associated with reduction in the client's rumination and distress.

This approach to treatment is consistent with the clinical scientist model of psychology training, which holds that direct clinical work can be bolstered by integrating skills of scientific inquiry (e.g., curiosity, data collection and monitoring, hypothesis generation and testing, ethical experimentation). Integrating EMA and SCED into routine clinical practice as outlined above allows clinicians and clients to collaboratively generate idiographic hypotheses about the client's difficulties based on granular, ecologically valid data (EMA), and then to test those hypotheses systematically via quasi-experimental manipulation (SCED). This methodology offers a data-driven approach to enhancing individualized case formulation and treatment (Persons, 2012).

The feasibility of this approach will likely differ based on settings and populations. Collecting EMA data in the context of SCED requires financial resources to implement EMA (i.e., mobile applications that deliver questionnaires and safely store data), training for designing questionnaires and analyzing data, and most importantly, the time to implement it in practice. This approach will likely be easiest to implement in settings that already conduct routine outcome monitoring (ROM) with clients. A recent push toward integrating ROM into clinical practice has been informed by mounting evidence of the usefulness of using routinely collected outcome data to document and examine the effectiveness of interventions, track treatment progress, identify barriers to treatment progress and warnings signs for client deterioration and dropout, and help clinicians tailor treatment to individual clients (Boswell, 2020; Boswell et al., 2015; Lambert et al., 2003, 2018). Technological advances have improved the speed and efficiency with which practitioners can administer reliable and valid questionnaires to their clients to track treatment progress over time (Boswell et al., 2015). Within these settings, clinicians could use SCED with the data they are already collecting through ROM, or optimize their ROM procedures to collect more frequent data (EMA) for use with SCED (e.g., by changing the measure schedule, administering measures more consistently, or automatizing/digitizing the measures). One notable example of a treatment that incorporates ROM components readymade for these methodologies is the daily diary card used in dialectical behavior therapy (DBT). Each day, DBT clients use their diary card to record specific emotions and intensities, behavioral urges, target behaviors, and skill use. Diary card completion is required in DBT and

may be completed via paper-and-pencil or electronic and application-based formats, which can facilitate the data entry and analysis needed for EMA/SCED.

However, the implementation and use of ROM in clinical settings in the United States has lagged behind evidence of its usefulness, and there is considerable variability in how data are being collected and used (Boswell et al., 2015). The individual- and systems-level barriers to implementing ROM in clinical practice mirror the barriers to combining EMA and SCED and are important to consider when discussing the potential feasibility of using this approach in clinical practice. Documented barriers include (1) financial burdens, as practitioners are often not compensated or reimbursed for routine assessments; (2) time burdens associated with selecting and administering questionnaires, scoring and interpreting results, providing feedback to clients, and establishing a reliable tracking system to routinely collect data; (3) lack of clarity around what measurement instruments to include and at what time intervals to deliver them; (4) concerns that ROM might disrupt the therapeutic alliance; and (5) concerns around how ROM will be used, both with regards to maintaining the confidentiality of data collected as well as potential use of data to evaluate clinicians (Boswell et al., 2015; Lambert et al., 2018). Similar limitations extend to clients, who might not have the time or resources needed to complete routine questionnaires (e.g., access to an internet-enabled smartphone).

In light of these limitations, several recommendations to facilitate the implementation of ROM in clinical settings have been proposed (Boswell et al., 2015; Lambert et al., 2018). While a comprehensive discussion of these barriers to implementation is beyond the scope of this article, we outline some examples here. To reduce the burden on providers, clinics could implement software applications with templated assessment packages, delivery schedules, and automated questionnaires dissemination. Ideally, data collection should be designed to be the easiest and least disruptive for clients and clinicians (e.g., administering short questionnaires, automating scoring procedures). Recommendations for what to include in assessment packages are available (Lambert et al., 2018). The use of ROM could also be incentivized, for example, through federal health insurance policies that base reimbursement on client outcomes (Southward, Cassiello-Robbins, et al., 2020). Formal training in the use of ROM, as well as the dissemination of research on the benefits of ROM, could help increase clinician motivation to use ROM and reduce skepticism around the utility and perceived risks associated with it. Finally, institutions should provide clear assurances about how the data will be used. These individual- and systems-level recommendations are relevant to improve the feasibility of combining EMA and SCED in clinical settings to provide clinicians a tool to examine and enhance the impact of emotion regulation skill use in treatment.

Conclusion

In recent years, the importance of emotions and emotion regulation in psychological treatment has been increasingly recognized, though the assessment of these constructs is hindered by several flaws. For example, emotion regulation is typically measured using retrospective self-report measures that aim to capture typical behavior during some prior time period (e.g., past week). The field has made great strides in understanding emotion regulation, but there is still much left to learn. To move forward, different research designs are needed that are equipped to capture new dimensions of emotion regulation, such as the effectiveness of particular strategies in real time, the differential impact of context on strategy use, and the effect of different treatment approaches on emotion dynamics.

Combining EMA, which involves capturing longitudinal data in real-time, with SCED, which involves experimental manipulation, allows for study designs that can reveal new information about how individuals experience and respond to their emotions. There is a great deal of flexibility in how researchers and clinicians alike can implement these procedures to answer idiographic questions about emotion regulation processes in individuals. For clinicians in particular, this methodology could represent an accessible opportunity to integrate empirical data into clinical practice. Simply incorporating routine outcome monitoring via weekly self-report questionnaires capturing emotion regulation processes and symptoms can assist in planning treatment and evaluating its effectiveness using the principles of SCED. For clinicians with access to sufficient resources, adding EMA procedures can improve the validity of the data used to plan treatment by capturing processes of interest in real time. Furthermore, based on the clinician's level of familiarity or expertise with statistics, several options exist for analyzing EMA data, such as person-level regressions, cross-lagged correlations, or other advanced options described elsewhere (Piccirillo et al., 2019). The above examples represent only a few of the many ways these methodologies can be applied in clinical settings, to advance evidence-based practices for treating emotional disorders.

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