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Ecological Momentary Assessment of Emotional Processing:

A Comparison of Daily Life Experience and Psychotherapy Sessions

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Ecological Momentary Assessment of Emotional Processing:

An Exploratory Analysis Comparing Daily Life and a Psychotherapy Analogue Session

Abstract

Background. Emotional processing has been studied in psychotherapy as state-dependent, sequential process of change. So far, no studies have applied this conceptualization of emotional processing to assessments of emotion in daily life. This is particularly important in light of the pertinence of day-by-day fluctuations of emotions for understanding mental health and for monitoring the impact of prevention and psychotherapy programs. This study examined the internal and ecological validity of a state-dependent conceptualization of emotional processing in daily life, in comparison with an experiential-psychodynamic psychotherapy analogue session.

Methods. In total, *N*=42 university students participated in an experiential-psychodynamic session, completed symptom measures and responded to a one-week period of ecological momentary assessment (EMA) using a smartphone. Emotional processing in the session was assessed using the valid observer-rated measure Classification of Affective Meaning States (CAMS) and emotional responses in daily life were assessed using newly developed theory-consistent items self-rated via an interactive smartphone program.

Results. Internal validity was generally satisfactory across the sub-scales used in EMA. Correspondence between EMA and in-session emotional processing was generally low, but specific relationships were found between self-rated fear, rejecting anger, hurt/grief or loneliness and the observer-rated productive emotions

in the psychotherapy analogue session. Relationships between maladaptive emotional processing and intensity in symptoms were found.

Conclusions. This is the first study to have examined the validity of a state-dependent conception of emotional processing in daily life, in direct comparison with a psychological session. We recommend using this assessment schedule to develop or complement integrative prevention or intervention programs.

Key-Words: Emotional Processing; Ecological Momentary Assessment; Psychotherapy Integration; Emotion Transformation; Assessment; Validation

Introduction

Emotions guide our decisions, behaviours, thoughts, motivations and intentions. They are goal-oriented experiences that play a central role in helping the individual know what is important, what to do next, and how to act in interpersonal situations. While theoretical conceptions on emotions differ between authors, the fundamentally adaptive potential of emotions has been widely acknowledged (Coppin & Sander, 2016; Frijda, 1986; Greenberg & Goldman, 2019). In addition, researchers in clinical settings tend to agree on a differentiation between adaptive versus less adaptive emotional experiences and states, the latter of which are likely to contribute to the development and maintenance of mental disorders that require psychotherapeutic treatment (Fosha, 2000; Greenberg & Paivio, 1997).

Emotional processing in psychotherapy classically denotes “a process whereby emotional disturbances are absorbed, and decline to the extent that other experiences and behaviour can proceed without disruption” (Rachman, 1980, p. 51). It is important to note that there is reference here to a process, or a mechanism, that absorbs emotional experience, but also a different experience or behaviour that emerges in place of the “absorbed” emotion. Although its definition remains ambiguous, it may fall under what Pascual-Leone and Greenberg (2006; 2007) referred to as emotion transformation. Emotion transformation in psychotherapy was first studied in experiential approaches for depression and interpersonal injuries, and it was shown that a specific sequence of emotional experiences was characteristic of good psychotherapy process (Pascual-Leone &

Greenberg, 2007), and that it followed a saw-toothed pattern of change: two steps forward and one step back (Pascual-Leone, 2009). Other studies have demonstrated that the self is related with good process and outcome across psychotherapy approaches (Kramer & Pascual-Leone, 2016; Kramer, Pascual-Leone, Rohde, & Sachse, 2015; Kramer et al., 2016). A common means to assess these different steps of emotion transformation within the therapy hour is the Classification of Affective Meaning States (CAMS, Pascual-Leone & Greenberg, 2005), a validated observer-rated measure. This line of results, together with others (Pascual-Leone, 2018), speak towards a state-dependent conception of emotional processing as a step-by-step, fluctuating and fluid, complex process moving the individual towards productive change. Such a conceptualization underlies the notion of emotion transformation and is at the very heart of understanding change in psychotherapy.

While a state-dependent conceptualization of emotional processing has been used to explain the core change of psychotherapy, it remains to be applied to daily life. An important target for research on mental health is to explain which state-dependent emotional experience is at the root of problems in everyday life, outside of psychotherapy. It addresses health research concerns upstream from where clients might later present for treatment. For example, knowing the state-dependent dynamics of emotions that may explain addictive behaviours and urges of self-harm (Scala et al., 2018), impulsive decisions (Reisch, Ebner-Priemer, Tschacher, Bohus, & Linehan, 2008; Tomko et al., 2014), and interpersonal problems, are of highest relevance not only for scientific research, but ultimately to

contribute to personalized interventions (Fisher & Boswell, 2016), self-care, and the prevention of serious mental health problems.

State-dependent emotional processing may be assessed in daily life using ecological momentary assessment (EMA). With regard to the development of emotional awareness in daily life, Lane (2020; Lane & Schwartz, 1992) developed an assessment tool that is able to grasp different levels of emotional awareness based on the assumption of its momentary fluctuating nature. For patients with borderline personality disorder, where fluctuating states represent a particular clinical and research challenge (Levy, Beeney, Wasserman, & Clarkin, 2010), several studies have shown that a state-dependent conception of emotion in daily life is promising. Scala and colleagues (2018) demonstrated that the clarity of an individual's self-concept and identity, and its changes in daily life, has a buffering effect against self-injurious urges when they emerge. Harpøth, Hepp et al. (2019) showed that positive affect and their fluctuations were related with decreases in symptoms in daily life, while the same authors (Harpøth, Kongerslev, et al., 2019) showed that positive affect was also related over time with ego-strength and quality of life for clients presenting with borderline personality disorder. These variables explained outcomes on the following day, even when the researchers controlled for negative emotions on the day of the first assessment. Links et al. (2007) were able to show that the daily fluctuations in negative affectivity in borderline personality disorder predicted self-reported suicide ideation and the number of suicidal behaviours. These studies have been feasible thanks to recent technological developments that allow ecological momentary assessment via smartphone

applications and devices. Ecological momentary assessment (EMA) allows the assessment of a phenomenon that one presumes to be fluid and fluctuating, even if such dynamic changes are unobservable when using fixed assessment points (e.g., weekly, or pre/post intervention). Furthermore, as compared to the more common retrospective self-reports, using momentary assessment reduces potential recall bias (Stone & Shiffman, 1994). Such repeated measurement schedules may contribute to personalize assessment and develop new idiographic models of explaining psychopathology and change in psychotherapy (Fisher, 2015; Fisher, Newman, & Molenaar, 2011). EMA thus allows particularly sensitive assessments, as well as a large and detailed measure of affect, mood, or behaviour (Moskowitz & Young, 2006). Looking forward, the use of mobile phones in research may also subsequently enable the increased availability and dissemination of assessment and treatment programs (Axelson et al., 2003) as well as represent a promising option for monitoring symptoms, affect, or behaviour (Clough & Casey, 2015).

The potential precision and validity of items used in EMA have been a point of criticism, in that quality criteria are underdeveloped for these items, and more research is needed to calculate reliability, validity and sensitivity to change for specific EMA sampling schedules (Santangelo, Bohus, & Ebner-Priemer, 2014; Solhan, Trull, Jahng, & Wood, 2009) so they can be used widely and confidently by researchers and clinicians. The present study aims to contribute to these questions in the domain of daily-life assessment of emotional processing as state-dependent phenomenon. **We also think that having internal consistency coefficients**

would help and will therefore calculate them for each of the scales used in EMA.

Studies have previously connected in-session experiences to outside session changes and experiences (Owen, Quirk, Hilsenroth, & Rodolfa, 2012; Quirk, Smith, Owen, & Practice, 2018). Establishing a link between in-session emotional experience and outside session emotional experiences is not simple. We still aim at extending the notion of emotion transformation that has already been validated in the context of in-session experiential-psychodynamic process and explore it in the context of daily life by using items that are consistent with the validated assessment approach used in psychotherapy process research (CAMS, Pascual-Leone & Greenberg, 2005). In order to do this, our study explores the validity of new items measuring each of the CAMS categories within a structured ecological momentary assessment. **Rather than focusing on different emotions, this study will be more exploratory and focus on exploring all different links between CAMS and EMA items.** Specifically, this study examines internal consistency and ecological validity, as well as convergent validity with an experiential-psychodynamic therapy session and with self-reported symptom measures.

Hypotheses

For the present validation study, we hypothesize that acceptable convergent validity will be achieved for coefficients of the sub-scales (i.e., representing distinct emotional states) measuring emotional processing in daily life. We further hypothesize that there is a correspondence between the preponderance of an

individual's set of emotional states observed in daily life with the preponderance of the emotions observed in sessions of experiential-psychodynamic psychotherapy analogue. Finally, we hypothesize that the observed intensity of (self-reported) symptoms will be associated with the frequency of maladaptive emotional states, also called the early expressions of distress, measured both in daily life and in the experiential-psychodynamic session. **We predict a correspondence between EMA and CAMS because we developed the EMA items based on the CAMS. Indeed, EMA items were elaborated based on previous observations of CAMS in session. We therefore have a perfect theoretical correspondence between the evaluations in session and in daily life, which we wish to explore empirically.**

Methods

Participants

A total of 42 participants took part in the study, including 35 (83%) women and with an age range from 20 to 33 years (M = 22.43, SD =2.86). Participants were all university students who were recruited via the participant pool for an undergraduate degree in psychology in French-speaking Switzerland. All participants agreed for their data to be used for research and scientific publication and the study was approved by the institutional ethics review board (number 2018-02064).

Assessments and measures

Self-report questionnaires. The Outcome Questionnaire (OQ-45) is a self-report questionnaire that includes 45 items to assess treatment levels of distress (Lambert, 2004), including an overall score and three subscale scores: symptomatic level, interpersonal relationships and social role. Problems are rated on a Likert-type scale ranging between 0 (never) and 4 (most of the times). The scale has been translated and validated in French (Emond et al., 2004) which was used in the present study. The Borderline Symptom List 23 (BSL 23) is a self-report questionnaire that assesses specific borderline symptomatology using 23 items (brief version), for which excellent psychometric properties have been reported (Bohus et al., 2009). The items are assessed using a Likert-type scale ranging from 0 (absent) to 4 (clearly present); an overall mean score is calculated (0-4); the French version has excellent psychometric properties (Nicastro et al., 2016). The Inventory of Interpersonal Problems (IIP; Horowitz, Rosenberg, Baer, Ureño, & Villaseñor, 1988) is a self-report questionnaire encompassing 64 items assessing a range of interpersonal problems; a general score is computed based on the mean of all items. Problems are rated on a Likert-type scale ranging between 0 (not at all) and 4 (very much). This widely used scale has been translated into French.

We used the OQ45 and IIP as main problem measures and the BSL 23 for exploratory purposes, because we consider that borderline symptoms represent particularly important emotional dimensions to be explored.

Single-session psychotherapy analogue. In order to be able to observe the participant's emotional processing they were invited to participate in a single analogue session of psychotherapy. The analogue treatment session was integrative in nature and represented intervention experiences borrowed from emotion focused therapy. **During the session analogue, we conducted an experiential two-chair dialogue focusing on self-criticism (Whelton & Greenberg, 2005).** The total time of the single-session analogue was 45 minutes. The single-session psychotherapy analogue experiential-psychodynamic session was conducted by a trained PhD student in clinical psychology, and was video-recorded.

Experiential two-chair dialogue focusing on self-criticism. The two chair-dialogue focusing on self-criticism is based on Gestalt-therapy, and more recently emotion-focused therapy principles (Greenberg, 2015; Kramer & Pascual-Leone, 2016; Watson & Greenberg, 2017; Whelton & Greenberg, 2005) and has been used as a single-session intervention in other studies (Shahar, 2014; Shahar et al., 2012). The current study did this using standard instructions in a guided-imagery and semi-structured interview-style task, which was given verbally by the researcher using the following steps: (1) The participant is invited to imagine a situation of failure from his/her own life; (2) The participant is encouraged to imagine the situation in detail for 5 minutes, giving special attention to his/her bodily reactions, action tendencies, thoughts, feelings, and intentions; (3) After this imagery step is completed (in silence), the participant is asked to change chairs (e.g., T: now, please come sit on this chair right across from where you are). Once

seated in the new chair, the participant receives the following instruction: “imagine you are the self-critical part in you, sitting in this chair. Be that part of yourself. What do you say from over here, in this chair?” At this point, the participant is given time and encouraged to enact his/her negative or self-critical voice, speaking the criticisms out loud as if telling someone; (4) The participant is then invited to change chairs, returning again to his/her first position, and receives the instruction: “What’s it like to be on the receiving end of this criticism? How do you react internally? Can you speak about what it’s like for you?” Once again, the participant is given time and supported in elaborating on his/her immediate experience of having been criticized; (5) Finally, about a third of participants had more to say from the critic position (e.g., yes, but…; well, actually the real problem is….). In these cases, and in order to avoid having a critical voice from the first chair, a second round of changing chairs was proposed to the participant. The second round used similar prompts as those in steps 3 and 4, while participants repeated and often further refined the meaning of both the criticism and their response to it.

Coding observed emotion. Both part of the analogue psychotherapy session served as the basis for rating using the Classification of Affective Meaning States (CAMS; Pascual-Leone & Greenberg, 2005), a method that is used to observe the presence of emotion states and to code emotion events when individuals are emotionally aroused and engaged. This observer-rated coding system is well-established in psychotherapy research, in particular in terms of its’ inter-rater reliability as well as content, substantive, and predictive validity (Pascual-Leone, 2018). This observer-rated coding system is designed to track the

changing “flow of emotion” and the data it yields allows one to describe emotion categories nominally but also in terms of an ordinal scale reflecting the degree to which a state suggests emotional processing has occurred (e.g., degree of transformation). Emotion codes were applied to the experiential-psychodynamic session using time-based coding with 1-minute bins. All 45 minutes of the interview were coded, if applicable. In total, 10 distinct affective-meaning states are coded: global distress, rejecting anger, fear/shame, negative self-evaluation, unmet existential need, relief, assertive anger, self-compassion, psychological hurt/grief, and acceptance and agency. In keeping with earlier work on the CAMS (Pascual-Leone, 2018) and in order to save power related to the reduction of multiple testing, we re-grouped the CAMS-codes from the psychotherapy analogue session in three levels. First, “Early Expressions of Distress” encompassed: global distress, rejecting anger and fear/shame. Second, the “Intermediate level” encompassed: negative self-evaluation, unmet existential need, and relief. And third, “Advanced Meaning Making states” encompassed: assertive anger, self-compassion, hurt/grief and acceptance and agency. Finally, in keeping with Pascual-Leone (Pascual-Leone, 2009), after coding the clinical material using the CAMS, we used the CAMS-transformation score calculated on an ordinal scale emotion transformation from global distress (0) to acceptance and agency (9).

Ecological Momentary Assessment (EMA). After the end of the single psychotherapy analogue session, each participant was given a mobile phone and was asked to respond to a catalogue of newly created items (Pascual-Leone & Kramer, 2018) four times a day, during seven consecutive days (programmed

times were for each day 08h01am, 12h07pm, 04h10pm, 08h50pm). The following gate question was used “Since the last assessment have you had a difficult interpersonal experience or an interpersonal stress?” (yes/no). If the participant responded “yes”, the full assessment was administered by asking with whom the experience occurred (partner, family, friends, colleagues, acquaintance or neighbour, stranger or other). The participant was then invited to only consider his/her *emotional* reaction (i.e., *inner* emotional experience) to this event (not the behaviour, nor what was outwardly expressed) when responding to subsequent questions.

Two additional preliminary gate questions were given. One question (gate A: emotion predominance) asked for the predominant inner emotional experience among the following: sadness, anger, shame/guilt, fear/anxiety, hope or satisfaction. Another question (gate B: emotion intensities) offered a series of visual analogue scales to probe for the intensity of each of the following emotional experiences as a result of the event: sadness, anger, shame, anxiety. Sets of questions then followed based on an interactive decision tree algorithm intended to assess the participant’s presenting emotional states according to the same conceptualization that had been used by observers using the CAMS.

Based on the results of these two preliminary gate questions (predominance, and intensities), the application delivered specific follow-up questions: if “sadness” was predominant (gate A), or if “sadness” was rated over 40% in intensity (gate B), 15 specific items pertaining to the categories of global distress, hurt/grief and anxiety were administered to the participant. If “anxiety/fear”

was predominant (gate A) or if “anxiety” was rated over 40% in intensity (gate B), then 8 specific items from to the categories of fear, anxiety, and loneliness were administered. If “shame/guilt” was predominant (gate A) or if “shame” was rated over 40% in intensity (gate B), 11 specific items pertaining to the categories shame, anxiety and loneliness were administered. If “anger” was predominant (gate A), or if “anger” was rated over 40% in intensity (gate B), then 14 specific items related to categories of rejecting anger and assertive anger were administered. Finally, all participants received 6 specific items pertaining to the category of self-compassion which ended the ecological momentary assessment. Consistent with CAMS, the following emotion categories were assessed through the EMA schedule: global distress (7 items, e.g., “I feel vague intense pain”), hurt/grief (6 items, e.g., “I feel wounded by this person or this situation”), anxiety (4 items, e.g., “I cannot stop worrying”), loneliness (6 items, e.g., “I feel lonely”), fear/shame (6 items, e.g., “I wish I could hide”), rejecting anger (8 items, e.g., “I hate this person”), assertive anger (6 items, e.g., “I want to fight for something and I know I deserve it”) and self-compassion and (6 items, e.g., “I deserve to treat myself gently”). These new categories (referred to as “CAMS-EMA”) designate the coding of emotion that results from this interactive self-report within a moment of assessment (as opposed to CAMS which denotes the *observer*-rated scale based on the analogue psychotherapy session by a trained researcher).

Before ending, two closing items in each assessment schedule asked participants if any of the prior questions about how they felt may have influenced or changed their emotional experience itself, and if so how (i.e. with three options: a)

intensity of emotional experience went up, compared with before the assessment, b) intensity stayed the same, and c) intensity went down).

Procedure

Recruitment took place in French-speaking Switzerland; in undergraduate classes in psychology where the objective of the study and the inclusion criteria (good health, French-speaking, between 18 and 35 years old) were presented by the researchers. Upon contacting the researchers by email or by phone to fix an appointment for the meeting, the participant gave his/her written consent to participate in the study. The analogue psychotherapy session occurred before the collection of EMA data. The CAMS was coded from both parts of the psychotherapy analogue session.

At the end of the single psychotherapy analogue session, the participants received a smartphone Samsung Galaxy J3 on which the assessment schedule was programmed as well as the self-reported questionnaires in paper and pencil format to fill in at home (OQ-45, BSL-23, IIP-64). The researcher gave instructions on how to use the phone, explained the content of the assessment and described the assessment timing. Participants were asked to keep the mobile phone turned on during the entire week and immediately call a research team member of the study if any problem occurred with the device. Two participants experienced problems requiring such technical assistance.

A second appointment was scheduled for the participant one week later to bring the mobile phone and the completed questionnaires back to the investigators.

The participant received the equivalent of $50 USD compensation for his/her participation in the study.

Statistical analyses

Internal consistencies of each sub-scales measured by EMA were computed using Cronbach's alpha statistics. Inter-rater reliability for the Classification of Affective Meaning States applied to the analogue psychotherapy sessions was computed using kappa coefficients. In order to test the first hypothesis on correspondence of emotion categories between the analogue psychotherapy session and the ecological momentary assessment, we used Pearson's and Spearman's correlations to link the frequency with which each of the three CAMS-code levels (early expressions of distress; intermediate; advanced meaning making) were observed, or a given CAMS-transformation score (ranging from 1-9), -- each observed during the psychotherapy analogue session --, with the frequency of each of the eight CAMS-EMA codes. In order to test the second hypothesis, we used Pearson's and Spearman's correlations to link the intensity of self-reported symptoms (general distress, borderline, and interpersonal problems) with the intensity of early expressions of distress as represented, first in the CAMS-EMA, and second in the observation-based CAMS rating (based on the analogue session). Linear regression analyses were computed where appropriate.

Results

Sample for the analyses

Out of the 42 participants, three had a technical problem with the video recording of session assessments and therefore no CAMS data were available for these participants. Out of the 42 participants for EMA, 30 (71% of the entire sample) responded at least once “yes” to at least one of the initial gate questions related with a difficult interpersonal situation (12 responded “no” at all time points). **This means that 12 participants never reported experiencing a difficult interpersonal situation over the week and 30 participants reported at least one difficult situation. Concretely, this means that 30 participants responded “yes” when opening the phone and seeing the question “did you experience a difficult interpersonal situation” at any time point.** The entire data set represents a total of *N* = 86 effective answers over the course of 28 possible assessment points, distributed over the seven days (i.e., four possible assessment points per day). This represents a response rate of 7.8% from the total possible number of solicitations for data, **which is rather low**. Out of all 30 participants who provided at least one point of data, 27 of them (90% of n = 30) provided data at two or more time points; of these 15 (56%) provided data at three or more time points; and of those, 6 (20%) provided data at least four times over the seven days period. **In other words, this means that out of 42 participants, 30 reported an interpersonal difficult situation at least once during the week: this could be at any time point of any day. Out of the same 30 participants, 27 reported experiencing at least a second difficult situation (at any other time point, any**

other day of the week than the one previously reported) and out of those 27, 15 reported experiencing at least a third difficult situation; and so on. Importantly, when we state that a participant answered four times, it could be that this participant answered four times on the same day, one time every day during four days, two times on two different (consecutive or not) days, three times on the first day and one on the seventh; etc. Here, we are talking about general response rate at *any* given time point.

Preliminary analyses

For data extracted from the psychotherapy analogue session: inter-rater reliability for CAMS ratings was computed for *n* = 15 participants (50% reliability sample) and yielded a mean kappa of .78, which is considered very good to excellent agreement above chance and comparable to prior research (Pascual-Leone, 2018).

For data regarding the EMA procedure: In order to reduce experimental fatigue, we counted the number of occurrences per day (i.e., first day of assessment, second day, and so forth, until the seventh day) and were able to show that for the 30 participants who responded at least once to the EMA protocol, the number of responses were randomly distributed across the seven days. The total of 86 observations were distributed as follows: 12 observations on the first day, then 15, 11, 9, 13, 14, and 12 on the last day. We conclude that there has been no experimental fatigue effects over the course of data collection events.

Out of the 86 interpersonal stress events (coded from 30 participants), 22 (26%) took place with an intimate partner, 15 (17%) with a family member, 11 (13%) with a colleague, 11 (13%) with a stranger, 6 (7%) with a friend, 6 (7%) with an acquaintance or neighbour, and 15 (17%) events fell under the category "other."

Inter-rater reliability for CAMS ratings (for the clinical assessment) was computed for 15 participants (a 50% reliability sample) and yielded a mean kappa of .78. **Across the 30 participants CAMS frequencies were as follow: Early expressions of distress (EED) had a mean of 10.13 in the session, whereas intermediate mean score was 0.17 and advanced meaning making (AMM) 0.09.**

Finally, the closing items in each assessment had asked participants if rating their experience may have changed the feeling itself. Overall, 28% (24/86) of data collection events showed that participants felt the schedule may have influenced the nature of their emotional experience. For 11 (12.8%) of these events, participants reported that the intensity of their emotion was more intense than in the beginning of the assessment, for 12 (14%) events, participants reported that the intensity of their emotion was less intense than in the beginning of the assessment (1 event was reported as "the same").

Means, standard deviations, and internal consistencies for each sub-scale in ecological momentary assessment

Internal consistencies were computed using Cronbach alphas on the first occurrence in time of each of the emotion categories. Several sub-scales, as measured with ecological momentary assessment, had adequate internal consistencies, for Global distress (7 items): α = .81 (m = 3.69; sd = .1.45), Hurt/Grief (6 items): α = .78 (m = 4.38; sd = 1.46), Loneliness (3 items): α = .84 (m = 2.67, sd = 1.54), Fear (3 items): α = .81 (m = 1.98; sd = 1.14), Rejecting Anger (8): α = .61 (m = 3.00; sd = 0.99), Self-compassion: α = .63 (m = 3.88; sd= 1.22), Anxiety (3 items): α = .66 (m = 4.51; sd = 1.64) and Assertive anger (6 items): α = .67 (m = 3.89; sd = 1.17). For Shame, there were not enough occurrences to compute internal consistencies for this sub-scale (therefore, we excluded this subscale from further analyses).

Comparison between emotional processing in daily life and in an experiential-psychodynamic psychotherapy analogue session

We hypothesized that the predominant emotion categories assessed in daily life would correspond to the emotion categories observed in a psychotherapy analogue session. In order to test this, we defined emotion predominance as the CAMS code that is (a) observed most frequently (most frequent 1-minute bins of codes) in a psychotherapy analogue session, or (b) rated most frequently in the EMA protocol across assessment points over the week of monitoring. Correlations on the mean of all responses in EMA were computed (Table 1). We found moderate relationships between the self-reported intensity of EMA sub-scale “fear” and the observer-rated CAMS transformation score in the psychotherapy analogue session (*r* = .40), as well as with the frequency of advanced meaning making

components in the psychotherapy analogue session (r = .45). This means the more intensely participants typically identified feeling maladaptive fear in their daily lives, the more transformative the emotional experience was in a session. Conversely stated, when people did not report having much maladaptive fear during the difficult encounter in their daily life, they seemed to also have characteristically less productive therapy sessions, from the perspective of emotion transformation.

We found a moderate relationship (ranging between r = .32 and .40) between the observer-rated CAMS transformation score in the psychotherapy analogue session and the self-reported intensity of EMA sub-scales of “loneliness” and “hurt/grief”, and also between observer-rated CAMS advanced meaning making states, the CAMS early expressions of distress on the one hand and the self-reported intensity of EMA sub-scale “rejecting anger” on the other hand. Similar to the findings reported on fear, this suggest that the more intensely participants explicitly identified feeling grief, loneliness, or rejecting anger in their daily interpersonal conflicts, the more transformative the emotional experience was in session.

Predicting emotional processing from the person’s symptom level

We hypothesized that the intensity of early expressions of distress (in daily life and in psychotherapy analogue sessions) were linked to the intensity of symptoms (e.g., general distress, borderline symptoms and interpersonal problems). Table 2 reports on these findings. In addition, two linear regression models predict the intensity of global distress ($F(2, 16) = 3.92$; p = .04; R^2 = .40) and rejecting anger ($F(2, 20) = 3.25$; p = .03; R^2 = .31) in daily life, from the

baseline intensity of their interpersonal problems and difficulty in social roles. Specifically, we found that when people reported feelings of global distress and rejecting anger in daily life within the context of an interpersonally stressful event, it was predicted by the severity of their general problems and symptoms (but not by specific interpersonal or borderline symptoms).

We also explored the link between observer-rated CAMS codes based on the psychotherapy analogue sessions and self-reported symptom levels (see Table 3). Here we found that expressions of rejecting anger within the single session was predicted by the baseline intensity of general and specific (borderline) symptomatology ($F(2, 29) = 3.34$; $p = .05$; $R^2 = .20$).

Discussion

The present study aimed to examine the internal validity of a state-dependent conceptualization of emotional processing, as self-assessed in daily life. Establishing validity of a dynamic conception of emotional processing in daily life may contribute to solidify the centrality of emotion in mental health and psychotherapy (Fosha, 2000; Frijda, 1986; Greenberg & Goldman, 2019). We hypothesized that the self-assessment of emotional processing in the context of a personally-relevant interpersonal stress in the daily life may correspond to an individual's core real-time emotional reactions during a single analogue session of psychotherapy. We hypothesized that the newly created assessment schedule would demonstrate sufficient internal validity and that the most frequent emotional state, self-assessed via an interactive personalized smartphone program, would correspond to the most frequently observed emotional state in an analogue

session experiential-psychodynamic psychotherapy. We also wanted to examine if maladaptive emotional states are linked with the intensity of symptoms and problems experienced in everyday life. These hypotheses were partially supported.

Overall, for the responding participants, 90% of the 30 participants responded at least twice during the week to gate questions over the subsequent assessment, yielding a total of 86 observations and with an absence of experimentation fatigue. We believe this indicates the EMA protocol was highly accessible and useable by participants. When examining each subscale, we observed that this specific EMA schedule was characterized by high internal validity. While this conclusion was true for almost all subscales (global distress, rejecting anger, fear, loneliness, hurt/grief and self-compassion, assertive anger, anxiety), one subscale did not have enough data points for calculation (shame). Across the CAMS-EMA categories represented from all three clusters (early expressions of distress; intermediate; advanced meaning making states), we found to have internal consistencies that were acceptable, on average. As for the absence of results related to the shame subscale, we believe that the explicit endorsement of feeling ashamed may be culturally mediated and inhibited (Greenberg & Iwakabe, 2011), which would explain its very low base rate. **While we observed a low response rate concerning shame in the daily life responses, maybe because of the self-reported design of EMA, we do want to explore if shame is observed in session and thus hetero-reported. Indeed, we believe that shame might be less accessible via EMA; or rather less prone to be expressed when participants are not directly experiencing it or reliving a**

situation involving it. Thus, no conclusion can be drawn so far in regard to the psychometric adequacy of items related to shame that we used in the present study **but we still consider it an interesting aspect to explore.**

Contrary to our hypotheses, the overall correspondence between emotional processing in a psychotherapy analogue session and in ecological momentary assessment was low. Interestingly however, our hypothesis tended to be partially confirmed specifically for the intermediate CAMS-EMA codes of fear and loneliness, as well as for rejecting anger and hurt/grief. This means that the more participants reported fear and loneliness in interpersonally stressful situations from their daily life, the more they were able to move through early expressions of distress toward deeper transformative emotional experiences when they participated in a two-chair dialogue and explored anecdotes about relational episodes. Fear and loneliness (and, in theory, shame) are evoked by interpersonal stressors in many individuals. Interpersonally conflictual situations can activate specific self-organizations, which prepares the individual for action (be it adaptive or less adaptive). Fear, loneliness and perhaps shame, as defined in the present study, are understood as potentially (primary) maladaptive emotion states (Greenberg & Goldman, 2019): they are understood as self-organizations that represent “familiar bad feelings” or capture the “same old story” (Angus & Greenberg, 2011). Being able to self-report on rather intense experiences of rejecting anger (as part of an early expression of distress) is also related with the depth of in-session emotion transformation: rejecting anger experience in interpersonal conflicts may serve as a stepping stone to these individuals for

further deepening and productive work. The association between (self-reported) rejecting anger and (in-session) early expressions of distress speaks to the relevance of our first hypothesis: it seems these undergraduate students reported consistently components of their secondary emotions with their experience in the psychotherapy analogue session. Similarly, the association between self-reported hurt/grief and the frequency of any advanced meaning making components in the experiential-psychodynamic session (of which the in-session experience of hurt and grief is part) is in line with our hypothesis and thus, represents a consistent, and to some extent probably accurate reporting on a primary adaptive experience both in- and outside of a psychotherapy analogue session in this student sample.

Our results suggest that participants who are aware of these specific emotional states in their experienced conflictual relationship also tend to be the ones who are more capable (with the help of a clinical interviewer) in accessing adaptive emotional states. These results may have two implications: (a) awareness of emotional schematic processing in daily life prepares the foundation for a productive in-session transformation process (Lane, 2020; Pascual-Leone, 2018), and (b) deepening and transforming a distressing experience may be better done in the context of a specific therapy context. This argument is supported by the general observation that there is a low general level of correspondence between the emotional predominance in daily life and that observed in a single session: these are related, but not identical, processes. As such, the state-dependent ecological momentary assessment may complement the in-session assessment and intervention focused on working with emotion.

Our data collection in the context of the EMA method involved sets of question that were presented to participants based on an interpersonal context. The notion of “identifying emotion” is relevant here because it also suggests the process of an emergent emotional awareness, and goes beyond endorsing an emotional state per se. Helping people to identify and label their emotion using content (i.e., EMA items here), can have an impact on the feeling itself (Torre & Lieberman, 2018). A study by Kassam and Mendes (2013) showed that self-reports of emotional processes impacted the latter: in particular, these authors observed a reduction in the autonomic responses related to emotions (i.e., heart rate and peripheral resistance). Even so, although rating one’s emotion has been shown to affect the physiological intensity of the emotion itself, the reduced physiological response associated with that feeling is not typically reflected in participants’ subjective self-reports (see Torre & Lieberman, 2018). So, although participants in our sample do not indicate the assessment schedule itself produced changes, we can only conclude it did not impact their conscious and subjective experience, but it may still have impacted them physiologically. In short, the possibility remains that the CAMS-EMA was not only an assessment, but may have served as a minimal intervention, changing to some degree the feelings in question.

In keeping with the empirical literature showing links between early expressions of distress and symptoms levels in psychotherapy, we also found specific links with symptom levels (Kramer & Pascual-Leone, 2016; Whelton & Greenberg, 2005). Interestingly, global distress and rejecting anger (but not fear)

measured in daily life is associated with a large effect for general symptom distress (i.e., *r*'s ranging between .45 and .57), although no links were found for the specific (borderline and interpersonal) problems. When looking at relationships between in-session CAMS codes and symptom levels, only rejecting anger related with several aspects of symptomatology (intensity of global symptoms and borderline symptoms). While the overall picture is consistent with our final hypothesis and supports ecological validity of the early expressions of distress assessed in the CAMS-EMA module, it sheds more light on how the core mechanism of emotion may explain symptoms. While there may be an issue of shared variance (both the CAMS-EMA and the symptom scales are self-reported scales), the strong correlations speak to a convincing effect of unproductive emotional processing – related to secondary emotional experiences (Greenberg & Goldman, 2019) – on distress and symptom levels (of note, given the correlational nature, the effect may be reversed meaning that symptoms may affect or produce the secondary emotional experiences). While this is important for the validity of the items tested, it may also be of future relevance for the use of EMA-based assessment and the related prevention of problematic behaviours in daily life, personality-related problems (Wright et al., 2019), such as addictive or self-harming behaviours (Scala et al., 2018), interpersonal problems, and impulsive behaviours (Tomko et al., 2014). The items used here may be adequate for the assessment of the effectiveness of interventions intended to prevent such problematic health behaviours.

We need to acknowledge a number of limitations of the present study.

The fact that we chose to focus on correlating CAMS in session and CAMS based items in EMA on a general level rather than focusing on specific emotions is understandable because this study is exploratory. Nonetheless, we think that this would be very important to do in a future study, we thus aim to do another study with more refined hypotheses regarding the relationship between in-session emotional processing state and post-treatment daily emotional state. The absence of pre- and post- outcome information, due to our study investigating only one session, is a methodological design decision that we think should be reconsidered for further studies. Indeed, having pre- and post- outcome information would strengthen our study and symptom measure should be examined before the session as well. Another limitation that this study has is the fact that, because we examined a single session with healthy control participants, we have no information on alliance. In a future study, we surely will include this information. Furthermore, the design involving a therapy session analogue *before* the ecological momentary assessment may run the risk of the former influencing the results on the latter. Because of the high intra-individual fluctuations (see the sd's per category) observed over the EMA assessment week, we can assume that this influence was kept negligible. The overall response rate may appear small, with a 7.8% response rate over 1090 observations that were theoretically possible, and 12 participants did not report any interpersonally stressful event during the entire week. However, this may simply speak to the base rate of noteworthy interpersonal difficulties that might be reported among a

population of undergraduate students. While the results were sufficient for the purpose of the present validation study, it may prove problematic for further inquiries due to self-selection bias. The current design may have optimized selection of data from a **general healthy control** population, selecting participants who are more distressed or more easily unsettled than healthier or emotionally-resilient individuals. Alternatively, it is possible that the wording used for the gate question may have been too narrow and that other descriptions for identifying events may have produced other results, such as “no matter how minor the interpersonal stress may seem to you” or similar formulations. **We think that our gate question might have been too restrictive, which could explain the response rate.** Should one wish to collect data from a broader spectrum of the population, following this suggestion may increase the number of responses necessary for non-biased ecological momentary assessment. So far, we have not taken into account the longitudinal nature of the data, because our aim focused on an initial validation of the subscales used; future research should establish sensitivity to change of this assessment schedule, and its potential impact on day-by-day changes in emotion awareness. Relatedly, it may be important to consider an assessment module that may be activated by the participant in the actual situation of interpersonal stress. Such a state-dependent emotion-focused assessment may be particularly helpful for prevention or intervention programs. Nevertheless, for this particular validation study of these items, we chose to have a more controlled and regular assessment schedule to maximize the number of theoretically possible assessment points. **Because sample sizes were small, we**

decided to interpret also correlations higher than .30 even if they were not significant. This is because we think that our correlations, even when non-significant, are interesting and could benefit from a bigger sample size in a future study.

We can tentatively conclude that the validity of a state-dependent conception of emotional processing can be extended from the psychotherapy analogue context to daily life. The focus on relational stress may be recommended for further inquiry. In addition, we recommend that the assessment schedule be considered for examining the effectiveness of prevention programs that aim to reduce problematic health behaviours (e.g., impulsive and addictive behaviours, self-harming behaviours). We found that the participant's awareness of his/her intermediate – primary maladaptive (Greenberg & Goldman, 2019)– emotional states (i.e., fear, loneliness, but also rejecting anger and hurt/grief) assessed in the context of an interpersonal stressor in daily life are positively linked with productive in-session emotional processing. Therefore, it may be helpful to use the EMA schedule as a "day to day" complement to an emotion-focused intervention, preparing the individual for in-session access of the relevant underlying primary emotions which will then lead to lasting change in psychotherapy.

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Table 1:

Inter-correlations (Spearman's) between CAMS-EMA categories and in-session CAMS (*N* = 30)

CAMS-EMA subscales	CAMS Transform	CAMS EED	CAMS Intermediate	CAMS AMM
"Global Distress"	.26 (ns)	.19(ns)	.08(ns)	.19(ns)
"Rejecting Anger"	.40*	.32(ns)	.25(ns)	.00(ns)
"Fear"	.40*	-	.17(ns)	.45*
"Loneliness"	.09(ns)	.21(ns)	-.23(ns)	.33(ns)
"Anxiety"	.25(ns)	-	-.03(ns)	-
"Assertive Anger"	.23(ns)	.03(ns)	-.17(ns)	.02(ns)
"Self-Compassion"	.11(ns)	.20(ns)	.29(ns)	.16(ns)
"Hurt/Grief"	.27(ns)	.24(ns)	.03(ns)	.10(ns)
		-		.37(ns)
		.05(ns)		
		.20(ns)		

Note. EMA: ecological momentary assessment. CAMS: Classification of Affective Meaning States; EED: Early Expressions of Distress; AMM: Advanced Meaning Making.

*$p < .05$

Table 2

Inter-correlations (Pearson's) between early expressions of distress in daily life (self-assessed within EMA) and symptom intensity (n = 30)

	EMA-Global distress	EMA-Rejecting Anger	EMA-Fear
OQ-Symptom Distress	.45 (ns)	.51*	.17 (ns)
OQ-Interpersonal Relations	.50*	.51*	.48 (ns)
OQ-Social Role	.57*	.08 (ns)	.21 (ns)
OQ-total	.51*	.51*	.32 (ns)
Borderline Symptom List	.37 (ns)	.41 (ns)	-.04 (ns)
Inventory Interpersonal Problems	.29 (ns)	.36 (ns)	.27 (ns)

Note. EMA : Ecological momentary assessment ; *p < .05

Table 3

Inter-correlations (Spearman's) between early expressions of distress in sessions (assessed with CAMS) and symptom intensity (*n* = 39)

	Global Distress	Rejecting Anger	Fear/ Shame
OQ-Symptom Distress	-.09 (ns)	.42*	.17 (ns)
OQ-Interpersonal Relations	-.26 (ns)	.32 (ns)	.29 (ns)
OQ-Social Role	-.27 (ns)	-.04 (ns)	-.11 (ns)
OQ-total	-.17 (ns)	.32 (ns)	.09 (ns)
Borderline Symptom List	-.06 (ns)	.29 (ns)	.26 (ns)
Inventory Interpersonal Problems	-.21 (ns)	.34 (ns)	.03 (ns)

Note. CAMS : Classification of Affective Meaning States*; *p* < .05