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Assessing changes associated in well-being after a psychological intervention for people with paranoid tendencies: An ESM application in clinical practice

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Abstract
During the last decades, Experience Sampling Methodology (ESM) has been widely used in the field of psychopathology research to increase our understanding of the processes involved. This self-report daily assessment technique might be a satisfactory tool in the context of clinical trials assessing the effect of psychological interventions, however the empirical literature on the application of ESM assessing changes associated with clinical interventions is still scarce. The aim of this study was to examine the usefulness of ESM in assessing changes in wellbeing after a multi-component Positive Psychology Intervention for people with paranoid tendencies. 73 individuals receiving individual psychotherapy at a University Clinic, and that had high scores in paranoid thinking, were offered group intervention to improve their well-being. The pre-post evaluation entailed an ESM protocol with a time-contingent design that included ten randomized time assessments per day during one week before and after the group intervention. A total of 54 participants completed the ESM procedure and the intervention and were thus, included in the analysis. Our findings provide evidence of the feasibility and viability of using ESM when conducting clinical trials. In particular, the ESM identified significant effects of the treatment in positive variables such as well-being, self-esteem, positive affect, and feeling close to others in daily life. ESM seems a promising methodology that is able to accurately monitor the momentary changes in clinical trial outcomes.

Keywords Experience sampling methodology · Effectiveness · 3rd generation psychotherapy · Well-being · Self-esteem · Paranoid thinking

Introduction

There is a growing consensus in the field of psychopathology that studying symptoms and related processes in the context of everyday life can add valuable and necessary information to more traditional approaches in psychological research (Myin-Germeys et al., 2003; Kimhy, & Vakhrusheva, 2019; Myin-Germeys et al., 2018). The study of psychological phenomena in everyday life and in their natural context has been made possible by the development of Experience Sampling Methodology (ESM; Hektner et al., 2007; Myin-Germeys et al., 2009) or Ecological Momentary Assessment (EMA; Stone & Shiffman, 1994; Shiffman et al., 2008).

The ESM is a structured self-report daily assessment technique which allows the appraisal of internal (not exclusively) mental phenomena such as mood, thoughts, or symptoms (Myin-Germeys et al., 2003; Mehl & Conner, 2012; Myin-Germeys et al., 2009). In order to perform the daily assessment, the individuals carry with them an electronic device (e.g., wristwatches or smartphones) throughout the day and are asked to report their momentary assessment when there are prompted by a signal (i.e. a notification or "beep") responding to a set of evaluations previously scheduled (i.e. several times per day, during a number of days) according to the objectives of the

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research (see Myin-Germeys et al., 2018 for a detailed description about ESM design). The time-series data collected via ESM provides pivotal clinical information that common questionnaires do not (Myin-Germeys et al., 2009; Palmier-Claus et al., 2011; Kimhy et al., 2010). For example, it allows the phenomena to be assessed as they naturally occur and captures the dynamic nature of psychological experiences (Palmier-Claus et al., 2019, Myin-Germeys et al., 2009). Consequently, this research tool offers several advantages in psychopathology; it is a powerful method to avoid problems with recall and retrospective report bias, it has an extremely high ecological validity, and it can be used in clinical studies given its sensitivity to small effects.

During the last three decades, ESM has been widely used in the field of schizophrenia and paranoia continuum research to increase our understanding of psychotic experiences in several ways such as: studying the phenomenology of schizophrenia, offering new insight about fundamental causes and mechanisms implicated, focusing on person-environment interaction, or examining real-world social interactions (Myin-Germeys et al., 2018) or studying the related variables such as negative affect (Ben-Zeev et al., 2011; Kramer et al., 2014), self-esteem (Thewissen et al., 2011; Thewissen et al., 2008) or experiential avoidance (Udachina et al., 2009; 2014) linked to fluctuations in paranoia. Of particular promise, it has been claimed that ESM might be also a satisfactory tool in the context of clinical trials, assessing the effect of psychological interventions (Myin-Germeys et al., 2018). For instance, Pot-Kolder et al. (2018) used ESM to momentarily assess primary outcomes in a randomized controlled trial studying the effectiveness of a virtual-reality-based cognitive behavioral therapy for paranoid ideation. They found that ESM was able to capture changes between the baseline and the post-treatment assessment (e.g., a reduction of momentary paranoia in the experimental group when compared with the control group). Although research in psychosis has done great efforts in revealing the utility, feasibility, and validity of ESM (Granholm et al., 2007; Kimhy et al., 2006; So et al., 2013; Thonon et al., 2020), the empirical literature on the application of ESM assessing changes associated with a psychological intervention is still scarce (Oorschot et al., 2009). Recently, Pos et al. (2018) explored the effects of metacognitive group training on paranoid ideation in patients with recent-onset psychosis using experience sampling design. Also, Lüdtke et al. (2020) evaluated the feasibility and efficacy of a CBT-based psychological online intervention for people with psychosis, with ESM. These studies, which use ESM to evaluate changes of intervention are important because they assess levels and fluctuations of paranoid thinking, aspects which are highlighted as pivotal by the meta-analytic work of Murphy et al. (2018).

The importance of well-being has been widely acknowledged in the past 20 years. It has been suggested that specific measures that directly address well-being should be incorporated into mainstream mental health practices (Fava & Tomba, 2009). Positive Psychological Interventions (PPIs) offer one of the most promising ways to meet this objective and are effective in enhancing well-being and reducing distress in the general population (Bolier et al., 2013; Sin & Lyubomirsky, 2009) as well as in clinical samples (Chakhssi et al., 2018; Geerling et al., 2020; Hendriks et al., 2020). However, evidence for the effectiveness of PPIs is scarce for people with subclinical symptoms of psychosis. A recent intervention based on Positive Psychology to reduce positive schizotypy has shown promising effects in reducing the propensity for acute psychosis, with effects that were maintained at 12 months (Grant et al., 2018) but they did not assess well-being variables with self-report daily assessment techniques as ESM.

In sum, much more effort has been made to reduce distress than to improve aspects associated with well-being, and specific measures that directly address positive affect should be incorporated into mental health practices (Fava & Tomba, 2009; Vazquez, 2017).

Thus, the main aim of the present study is to examine the usefulness of the ESM in assessing changes in well-being following a psychological intervention for people with high levels of paranoid thinking. We consider important to highlight two aspects: 1. the need for studies such as this one, focused on developing effective treatments for people with high levels of paranoia, since this type of group represents a challenge for treatment. 2. The importance of implementing treatments that focus on well-being. In line with the need for a shift towards the positive in the psychological services (Jeste et al., 2017), the multi-component psychological group intervention had a particular emphasis on building positive affect, improving self-esteem, and forming genuine positive relationships with others. The intervention integrated positive psychology exercises of previous empirically validated interventions for psychosis (Slade et al., 2017) and ACT interventions for psychosis, emphasizing acceptance and goal setting consistent with values (Morris et al., 2013). The exercises (e.g., on fostering positive emotions, gratitude, personal strengths, or resilience) were adapted to the target population, resulting in 11 weekly group sessions of 90 min each (a detailed description of the intervention is described in Valiente et al., 2020). We hypothesized that ESM would accurately assess changes in variables associated with well-being (primary outcome). Furthermore, following previous empirical literature, we also hypothesized an improvement in variables associated with paranoia as positive and

negative affect (Ben-Zeev et al., 2011), experiential avoidance (Udachina et al., 2009; Valiente et al., 2015), and closeness to others (Contreras et al., 2020; Monsonet et al., 2020).

Method

Participants

Participants were recruited from a University Psychology Clinic where the group intervention took place. Eligibility criteria included a) being currently in psychotherapy at the Clinic for any type of psychological distress; b) being aged 18–36 years and c) scoring one standard deviation above the population mean on the paranoid ideation and/or interpersonal susceptibility subdimensions of the Symptom CheckList-90-Revised (SCL-90-R; Derogatis, 1994). Participants were excluded if a) they had a current diagnosis of substance dependence or a severe personality disorder; b) their clinician perceived that their clinical characteristics could interfere with benefiting from a group intervention and, c) participants were not willing to participate in the study.

The Clinic's psychotherapists screened potential participants and referred them to the intervention group. From 2017 to 2019, 8 therapy groups with 5 to 10 participants each were conducted. A total of 86 participants were referred and consented to take part in the study. Out of the 86, 13 were excluded, 12 were assigned but did not participate in the group intervention and 7 participants did not complete the ESM post-treatment evaluation (see Fig. 1). Thus, the total number of participants included in the current analysis was 54 (see Fig. 1).

The sample was composed of young people with diagnoses of common mental problems and also, others who seek help for psychological difficulties that do not fit into DSM or ICD categories.

Demographic and clinical characteristics of participants are depicted in Table 1.

Procedure

A pre-post design was used to test the utility of ESM in assessing momentary changes in selected variables and to identity the potential benefit of the group intervention in a convenience sample of people in psychotherapy with paranoid tendencies. Ethical approval for the study was obtained from the Deontological Commission of the University Faculty of Psychology. The research was conducted in compliance with the Declaration of Helsinki (World Medical

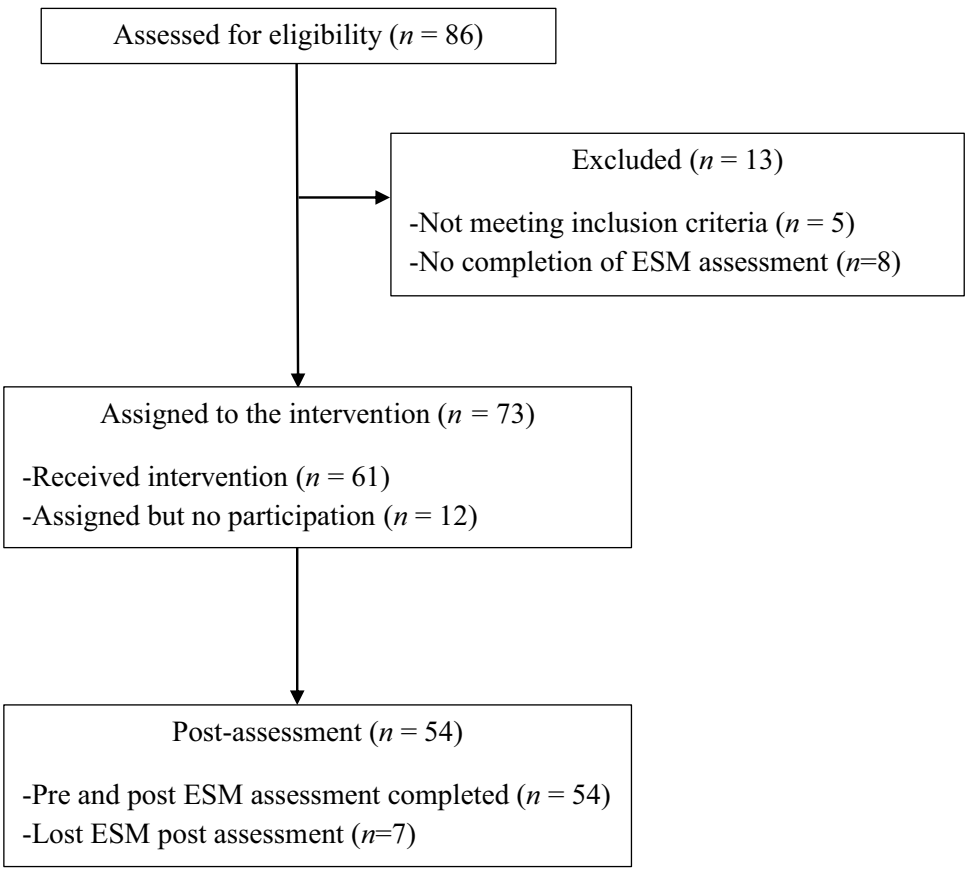

Fig. 1 Flow chart of participants included in the ESM assessment and intervention

Table 1 Demographic and clinical characteristics of participants

	Participants $N = 54$
Demographic characteristics	
Age in years, mean (SD)	23.19 (4.76)
Sex: Women, n (%)	35 (83.3)
Single status, n (%)	53 (98.1)
Education, n (%)	
Secondary School	11 (20.4)
College Education	43 (79.6)
Employed, n (%)	
Unemployed	36 (66.7)
Part-time employment	11 (20.3)
Full-time employment	7 (13)
Clinical characteristics, mean (SD)	
SCL-90-R depression	1.99 (.79)
SCL-90-R anxiety	1.19 (.65)
SCL-90-R paranoid ideation	1.24 (.90)
SCL-90-R interpersonal susceptibility	1.66 (.83)
Participants diagnosis, n (%)	
Psychological difficulties that do not fit into DSM or ICD categories	24 (44.4)
Mood disorders	14 (25.9)
Anxiety disorders	4 (7.4)
Personality disorders	3 (5.6)
Others	9 (16.7)

Note. *SD* = Standard Deviation; SCL-90-R = Symptom Checklist-90-Revised

Association Declaration of Helsinki, 2008). All participants were informed about the study and the group intervention and signed a written informed consent before entering the study. Then, participants received an individual briefing on the ESM procedure. They were, also, asked about possible concerns and, questions were answered. Finally, contact information was provided in the case of participants had technical problems or future doubts. After that, they performed the ESM assessment at baseline (pre-treatment evaluation). Eleven weeks later (i.e., the duration of the intervention), they underwent the ESM post-treatment evaluation after the completion of the last group session.

ESM Measures

Participants received a smartphone during the pre- and post-assessment period to do the ESM procedure. We used a quasi-random time-event design, whereby participants received 10 signals (beeps) a day on seven consecutive days, to complete entries at quasi-random intervals (at least 30 min between each signal) between 9:00 a.m. and 10:30 p.m. We programmed the smartphone with Qualtrics software management (https://www.qualtrics.com). All self-assessments were rated on 9-point Likert scales. The assessment was also programmed to be available 15 min after beeps, as there is evidence that reports completed after this interval are less reliable and less valid (Delespaul, 1995). These reports were dropped from the analysis to ensure reliability (Delespaul, 1995). The final number of observations analyzed was 1040 pre-treatment observations and 582 post-treatment observations.

The data presented here are part of a larger project (see Valiente et al., 2020), and therefore only the elements of the ESM assessment protocol used for this study are described here.

Eudaimonic Well-Being: Three items were adapted from the Scale of Psychological Well-Being (SPWB; Ryff & Keyes, 1995): 1. "At this moment, I am optimistic about the future"; 2. "At this moment, I feel that I am thinking clearly" and 3. "At this moment, I feel that I am able to make my own decisions". A total score was obtained by averaging these items. Cronbach's α for this scale was good ($\alpha = .83$).

Self-esteem was measured by 2 items, adapted from the Rosenberg Self-esteem Scale (RSES; Rosenberg, 1965): 1. "At this moment, I feel good about myself" and 2. "At this moment, I feel I can manage issues well". A total score was obtained by averaging these items. Cronbach's α for this scale was good ($\alpha = .80$).

Positive and Negative Affect: Positive affect (PA) was measured by 3 items: 1. "At this moment, I feel excited"; 2. "At this moment, I feel happy" and 3. "At this moment, I feel quiet". Negative affect (NA) was also measured by 3 items: 1. "At this moment, I feel sad"; 2. "At this moment, I feel stressed" and 3. "At this moment, I feel angry". These ESM items have been used in previous ESM literature (e.g., Palmier-Claus et al., 2011; Contreras et al., 2020). A total score for negative and positive affect was obtained by averaging these items, respectively. Cronbach's α was acceptable ($\alpha = .71$; $\alpha = .72$) for both measures, respectively.

Experiential avoidance was measured by 1 item, adapted from the Acceptance and Action Questionnaire-II (AAQ-II; Hayes, 2004): "Since the last beep, I have tried to avoid negative feelings and thoughts about myself."

Closeness to others was measured by 1 item, previously used in literature (e.g., Contreras et al., 2020): "At this moment, I feel close to others".

Paranoid thinking was measured by 3 items, adapted from the Persecutory Ideation Questionnaire (PIQ; McKay et al., 2006): 1. "Since the last beep, I've had the feeling that I can't trust people"; 2. "Since the last beep, I have had the feeling that people have tried to hurt me" and; 3. "Since the last beep, I have had the feeling that people have criticized me". A total score was obtained by averaging these items. Cronbach's α for this scale was acceptable ($\alpha = .68$).

Data Analysis

Results were analyzed in SPSS 26. All analyses were based on recommendations found in Heck et al. (2013). All treatment effects were analyzed using a linear mixed model, the recommended approach to longitudinal designs as estimates are based on all available data. To determine treatment effect on primary outcomes (well-being, self-esteem, affect, closeness to others), and secondaries outcomes (experiential avoidance and paranoid thinking) as measured with ESM, we conducted a multilevel regression analysis on them with treatment, time (beep), and their interaction term as predictors. As ESM data have a hierarchical structure with observations ('beeps') nested within subjects, beeps were assumed to be correlated within the same person as well as being correlated with adjacent beeps. Model building allowed for this correlation by nesting beeps within a subject with variance components (VC) and constraining errors in adjacent beeps by an autocorrelation structure (AR1). Additionally, for those models in which a two-way interaction was found between time and treatment, we formulated a multilevel piecewise growth model to test how the trends of the different variables changed as a function of the intervention participants went through. Piecewise growth models can be used to represent different phases of development or change. One way to do this is to examine whether there is a change in the time series at the point where the intervention is introduced (X) or at some specified point afterward (Heck et al., 2013). In our formulation, we focus on comparing the trend before the intervention versus the trend after the intervention. We assumed that the effects of the intervention would be seen immediately after the intervention took place.

Results

Results Founded after the Psychological Group Intervention

Mean scores of variables at pre- and post-treatment are presented in Fig. 2. Multilevel analysis with time (beep), treatment, and their interaction as the independent variables showed that the group intervention had a significant improvement on different psychological domains in the daily life context. To test the change in trends across time before and after the treatment, a multilevel piecewise growth model was run on significant variables that emerged as significant in the previous analyses as the dependent variable and time before the treatment and time after the treatment as the independent variables.

Eudaimonic Well-Being A multilevel analysis with time (beep), treatment, and their interaction as the independent variables and, well-being as the dependent variable showed a main effect of treatment, F (1, 420.97) = 59.08, $p < .001$, such that participants reported higher overall well-being after the treatment (M = 14.97, SE = .51) than before the treatment (M = 11.74, SE = 0.51). Additionally, the interaction between time (beep) × treatment on well-being was significant (time × treatment F (1, 305.11) = 10.15, p = .002), meaning that the impact of time on well-being significantly differed before vs. after the treatment.

To analyze the two-way interaction between time (beep) × treatment on well-being, we tested the change in trends across time before and after the treatment, a multilevel piecewise growth model was run with well-being as the dependent variable and time before the treatment and time after the treatment as the independent variables. A main effect of time before the treatment was found, F (1, 315.26) = 50.81, $p < .001$, such that scores in well-being

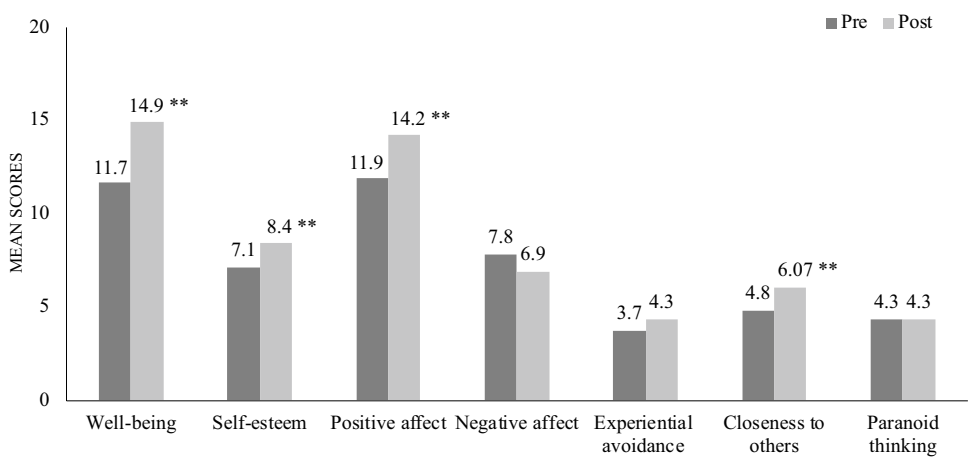

Fig. 2 Differences between Pre-treatment vs Post-treatment means in psychological variables (N = 54). Note. ** $p < .01$

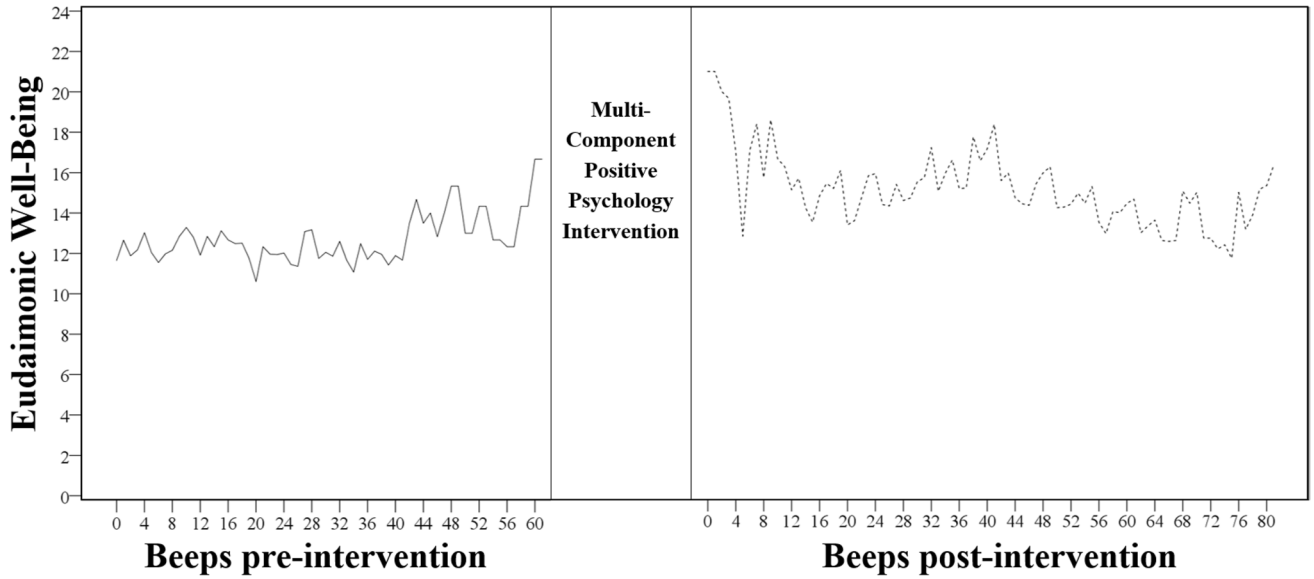

Fig. 3 Eudaimonic Well-Being as a function time before the treatment and time after the treatment

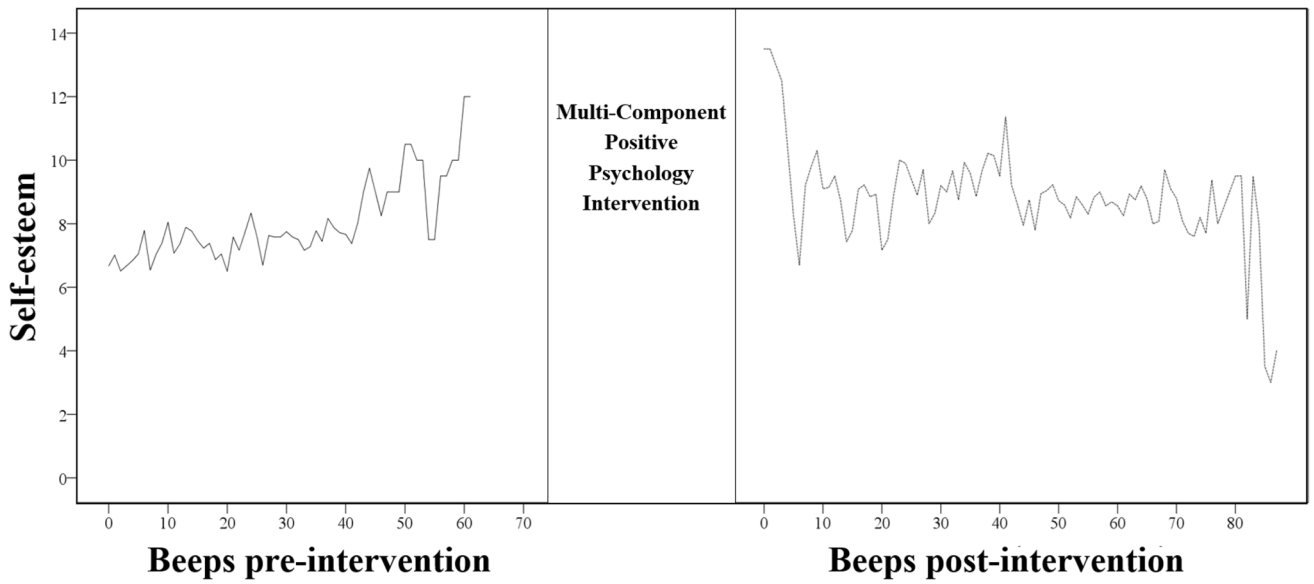

Fig. 4 Self-Esteem as a function time before and after the treatment

had a significant linear upward trajectory before the treatment. Additionally, a main effect of time after the treatment was found, F (1, 236.98) = 9.01, p = .003, such that scores in well-being had a significant linear downward trajectory after the treatment (see Fig. 3). To summarize, even though participants reported significantly higher well-being after (vs. before) the treatment, well-being was increasing before and during the treatment, but decreasing as time went on after the treatment.

Self-Esteem A multilevel analysis showed a main effect of treatment, F (1, 422.34) = 28.01, p < .001, such that participants reported higher overall self-esteem after the treatment (M = 8.39, SE = .36) than before the treatment (M = 7.08, SE = .36). Additionally, the interaction between time (beep) × treatment on self-esteem was significant (time × treatment F (1, 348.91) = 8.47, p = .002), meaning that the impact of time on self-esteem significantly differed before vs. after the treatment.

To analyze the two-way interaction between time (beep) × treatment on self-esteem, we tested the change in trends across time before and after the treatment, a multilevel piecewise growth model was run with self-esteem as the dependent variable and time before the treatment and time after the treatment as the independent variables. Results showed a main effect of time before the treatment was found, F (1, 345.95) = 30.08, $p < .001$, such that scores in self-esteem had a significant linear upward trajectory before the treatment. No effect after the treatment was found, F (1, 284.59) = 1.95, $p = .164$. (see Fig. 4). To summarize, even though participants reported significantly higher self-esteem after (vs. before) the treatment, self-esteem was increasing as time passed before and during the treatment, but it no longer was after the treatment.

Positive Affect A multilevel analysis showed a main effect of treatment, F (1, 434.59) = 26.31, $p < .001$, such that participants reported higher overall positive affect after the treatment ($M = 14.25$, $SE = .37$) than before the treatment ($M = 11.93$, $SE = .36$). No further effects reached significance, $F < 885$, $p > .348$. Also, results of ***Negative Affect*** showed that, after treatment, participants reported marginally lower negative affect ($M = 6.91$, $SE = .44$) than before the treatment ($M = 7.88$, $SE = .44$) but, this main effect did not reach significance, F (1, 396.10) = 3.11, $p = .07$. No further effects were significant, $F < 127$, $p > .724$.

Closeness to Others Analyses showed a main effect of treatment, F (1, 427.46) = 18.70, $p < .001$, such that participants reported higher overall closeness to others after the treatment ($M = 6.07$, $SE = .27$) than before the treatment ($M = 4.83$, $SE = .27$). No further effects reached significance, $F < 1.50$, $p > .231$.

Experiential Avoidance A multilevel analysis did not show a significant interaction (time × treatment F (1, 345.47) = 2.95, $p = .08$). The impact of time on experiential avoidance did not differ before vs. after the treatment ($M = 3{,}4$, $SE = .31$ vs $M = 4.3$, $SE = .31$, respectively). No further effects were significant, $F < 1.81$, $p > .179$.

Finally, multilevel analysis of ***Paranoid Thinking*** did not show significant effects, $F < 0.726$, $p > .395$.

Discussion

In the current study, we used ESM during one week before and after the implementation of a multi-component psychological group intervention in order to explore its effects on momentary primary outcomes (i.e., well-being, self-esteem, positive affect, and closeness to others) and secondaries outcomes (i.e., negative affect, experiential avoidance, and paranoid thinking). Our findings pointed to the ESM as a promising tool for the evaluation of psychological intervention, in this case for people in psychotherapy with high levels of paranoid thinking, enabling us to accurately monitor momentary changes in primary and secondary outcomes.

In particular, our results showed that ESM was able to capture a mean effect of the treatment in well-being and self-esteem. The mean of both variables was significantly higher after implementing the protocol, suggesting that the treatment was effective in improving their levels of well-being and self-esteem. These results are in line with previous studies using traditional pre-post evaluation with this type of intervention (Valiente et al., 2020). This is perfectly aligned with the objectives of the group, as it was focused on elements such as the identification of strengths and the development of self-acceptance, similar to previous studies with clinical samples (Chaves et al., 2017; Fava et al., 1998).

Furthermore, the application of ESM as a tool to assess treatment effects provides valuable information for studying the temporal dynamics of targeted processes. Specifically, the multilevel piecewise growth model showed that there was also a significant change in trends over time in well-being and self-esteem. It is noteworthy that both variables showed an upward trajectory before the intervention. That is, the participants seemed to anticipate the positive effects of the intervention, which could probably be the result of the encouragement and installation of positive expectations by their therapists. In addition, the use of new technologies may have increased the attractiveness of the intervention, as the sample consisted of young people very fond of them. Furthermore, well-being showed a slightly downward significant trajectory after the intervention, suggesting that, although well-being means were higher in the post compared to the pre-assessment, the treatment effect on well-being tended to dampen over time. In order to explore the long-term effects of these psychological interventions, future research would benefit from comparing the post-treatment trajectories of different intervention protocols (e.g., in comparison to treatment as usual), as well as longer-term follow-up measures after the end of treatment.

In relation to the ESM results on positive affect and consistent with the traditional pre-post evaluation of the intervention (Valiente et al., 2020), participants reported a significant increase of positive affect levels in daily life after treatment. These improvements may be associated with participants feeling more optimistic about their future and feeling more able to make their own decisions. Thus, they were experiencing higher levels of positive emotions in their daily lives. We consider this finding to be of relevance since previous research has suggested that people with psychotic symptoms, consistently, report less

positive emotion than healthy control participants (Cho et al., 2017). The current intervention, however, did not have an effect on negative affect, which is consistent with the results found by using cross-sectional questionnaires used to the same intervention (Valiente et al., 2020).

Our results indicate that the intervention, which included a specific component promoting positive relationships, significantly improved the feeling of closeness to others. It is worth noting that increased levels of closeness with others can promote a sense of belonging and identification, with positive effects on both health symptoms and perception of the self (Haslam et al., 2009). In this sense, closeness to others is a key social aspect related to paranoid beliefs that have been identified in recent studies as a possible target for intervention in reducing paranoia (Contreras et al., 2020; McIntyre et al., 2018).

Finally, in contrast to the traditional pre-post assessment of the intervention (Valiente et al., 2020), no significant decrease in paranoid ideation was found. These differences may be due to several reasons. Firstly, it could be that the psychological intervention is not effective in reducing levels of paranoid ideation in everyday life, which was not a primary goal of the intervention, incidentally. In this line, a recent meta-analysis on PPIs has reported a non-significant effect for psychopathology across RCT available (Geerling et al., 2020). Second, it is possible that there was a floor effect given that participants had subclinical levels of paranoid thinking, which skews the distribution of scores and makes it impossible to ascertain changes at that low level. Third, because the questions selected to measure paranoid ideation in daily life could not be sensitive enough to detect occasions in which these tendencies fluctuate or emerge. The time frame used to assess paranoid beliefs differs, as they are modified to be "retrospective reports of experiences" (i.e., "Since the last beep..."). Retrospective reports may involve retrieval and retrospective evaluation but if the individual is, for example, struggling with experiences of avoidance or persecution, it may be difficult to respond at that given time (Palmier-Claus et al., 2019). Also, these items showed an internal consistency lower than the other measures of this study. These reasons could explain why the group intervention was efficacious to change well-being related constructs but not paranoid tendencies.

Despite this, it is important to note that integrative models of mental health indicate that well-being and symptoms are not simply opposite ends of a continuum but are two separate dimensions that need to be addressed independently (Keyes, 2007). By doing so, services will be more humane and less stigmatizing since these intervention modalities have a wider range of therapeutic objectives that go beyond the disorder, dealing with goals that are central to all human beings such as feeling good (Seligman, 2011; Slade, 2010). In fact, Slade (2010) has argued that the development of evidence-based interventions to improve well-being could complement the process of recovery from mental disorder by providing an ecological overview of the processes by which people can develop a purposeful and meaningful life.

Theory and research support the sustainability of positive interventions. That is, the pursuit of happiness requires enhancing eudaimonic well-being through the intentional selection of activities that improve levels of purpose in life, positive relationships, environmental mastery, personal growth, self-acceptance and autonomy. That these activities are practiced with effort and that this practicing in varied and changing ways can create for oneself a constant cycle of satisfying and positive experiences, thus increasing the likelihood of remaining at high levels of well-being and happiness (Sheldon and Lyubomirsky, 2021).

Importantly, we consider the present study to be a valuable pilot of the feasibility of ESM as a tool for capturing momentary changes associated with a positive psychological treatment, although it is not without its limitations. First, we believe that future studies could benefit from a larger sample representing the whole continuum of paranoia, as the current sample was composed only of people with subclinical levels of paranoid thinking. Secondly, although our participants provided a satisfactory number of observations for the analysis, the use of the ESM is a very demanding method for individuals, which can lead to low compliance affecting the quality of the data (Palmier-Claus et al., 2019). And therefore, factors that may decrease the likelihood of compliance, such as the degree of disturbance by a "beep" or the use of medication, should be taken into account (Rintala et al., 2020). In this vein, perhaps the high number of beeps in our design (10 notifications per day) might have caused some reactance. Although the use of a random ESM design may significantly decrease reactivity, we believe it would be beneficial for future studies to include fewer "beeps" per day and increase the number of days. Thus, this could allow assessment of the evolution of the processes without compromising compliance, both in the general and clinical populations (Hartley et al., 2014; Rintala et al., 2019). Moreover, our design did not include a follow-up ESM assessment, which precludes inferring to what extent the effects associated with the intervention are maintained over time. Third, the current study was implemented with an uncontrolled design. In other words, the present design does not allow for an inference about the efficacy of the group intervention, so we encourage futures studies to include a comparison group to determine the effectiveness of this intervention using ESM methodology.

Nevertheless, the current study also showed a number of strengths. First of all, to our knowledge, it is one of the few studies that combine the use of ESM to examine the changes associated with a psychological intervention

in people with paranoid tendencies. We believe that the identification of potential challenges related to the use of ESM and the target population can help future studies to overcome potential limitations. Also, the use of ESM also presents several advantages (Myin-Germeys et al., 2018; Palmier-Claus et al., 2019). First, it evaluates psychological phenomena as they occur, reducing potential retrospective recall biases. Second, the ESM assessment is more accurate as it offers an understanding of how symptoms evolve in daily life over time. Third, it allows to directly examine the momentary experience and its relationship with, in this case, a psychological intervention. Fourth, given that psychological phenomena are measured in the context of daily life, it has an increased ecological validity. In sum, ESM provides a fine-grained picture of a momentary mental state by being very sensitive to capturing momentary changes than cross-sectional self-reports.

Conclusion

In summary, we believe that the present study offers important contributions to the field of mental health research, by providing evidence for the usefulness of the ESM as a complementary tool in assessing the effects of psychological interventions on well-being for people with paranoid tendencies. Additionally, the study reveals significant information in terms of potential challenges that researchers may face when designing an ESM study and identifying potential changes in paranoid-related process (i.e., well-being, self-esteem, positive and negative affect, closeness to others and experiential avoidance). We consider this type of exploratory research valuable for future clinical research implementing ESM.

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Data Availability Data supporting Table 1 and Figs. 1-4 are not publicly available in order to protect patient privacy but are available from the corresponding author on reasonable request.

Declarations

Conflict of Interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

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