The Relationship Between Acceptance, Cognitive Reappraisal, and
Positive Affect: An Experience Sampling Study

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Abstract

Objective: The attempt to change one's emotional response can improve physical and psychological well-being. Previous research has identified acceptance and cognitive reappraisal as two adaptive strategies for regulating emotions. However, the extent to which these strategies are related to positive affect in individuals' daily lives remains unclear. This study aims to disentangle between- and within-person associations of acceptance, cognitive reappraisal, and positive affect in daily life. **Method:** The experience sampling method was used to assess momentary positive affect, cognitive reappraisal, and acceptance by asking participants ($N = 55$) to complete ten state questionnaires at semi-random times a day over 7 days. Linear mixed models (LMM) were used to examine the between- and within-person associations of positive affect, acceptance, and cognitive reappraisal. Person-mean and person-mean centred scores were calculated and included in the models. Visual representations were created to compliment the LMMs and illustrate individual cases. **Results:** Acceptance was significantly and weakly positive associated with positive affect within people ($\beta = .27$, $p < .001$), as for between individuals this significant association was moderate positive ($\beta = .40$, $p = .003$). The within-person association between cognitive reappraisal and positive affect was significant and negative ($\beta = -.07$, $p = .001$), the between-person association was not significant ($\beta = .03$, $p = .885$). **Conclusion:** Up to the researcher's knowledge, the current study was the first of its kind to assess the relationship between positive affect, cognitive reappraisal, and acceptance within and between individuals in their daily lives. The findings highlight the importance of integrating acceptance and cognitive reappraisal techniques into daily routines.

Keywords: positive affect, emotion-regulation, acceptance, cognitive reappraisal, experience sampling method

The Relationship Between Acceptance, Cognitive Reappraisal, and Positive Affect:
An Experience Sampling Study

Emotion regulation, the process of changing our emotions, holds the opportunity to enhance well-being through a shift towards more positive emotions (Fredrickson, 1998; Gross, 2002; Lyubomirsky et al., 2005). However, the existing research predominantly relies on controlled laboratory studies or cross-sectional designs, which do not fully capture individual nuances and daily fluctuations (Curran & Bauer, 2011; Diener, 2009; Loney & Nagelkerke, 2014). This research gap can be best addressed by employing the Experience Sampling Method (ESM) entailing the potential to capture both, emotion regulation in real-life context and individual fluctuations. Further investigating emotion regulation holds the potential to offer valuable insights and create interventions aimed at enhancing well-being in daily life.

Positive Emotions

Experiencing more positive emotions in daily life was found to be associated with improved well-being, including increased happiness, life satisfaction, and positive relationships (Lyubomirsky et al., 2005). Moreover, they can act as a buffer against the negative effects of stress and adversity, aiding rapid recovery from challenging experiences (Tugade & Fredrickson, 2004). Additionally, research emphasises that individuals frequently experiencing positive emotions enjoy cardiovascular health benefits, as well as improved neuroendocrine and immune functioning (Kiecolt-Glaser et al., 2002; Middleton & Byrd, 1996). Thus, cultivating positive emotions contributes to overall well-being.

Fredrickson's Broaden and Build theory (1998) aims to explain these benefits by using a spiral metaphor. She claims that experiencing a 3:1 ratio of positive to negative emotions can lead to an upward spiral, where positive emotions broaden one's perspective, allowing for more exploratory and novel thoughts and actions. While these short-term advantages are important, they also lay a foundation to build psychological, cognitive, and social resources. For instance, when students receive a good grade, they are likely to experience joy, pride, and a sense of accomplishment. These momentary positive emotions can motivate them to study harder and take a deeper interest in related topics. Over time, personal resources, such as intellectuality and curiosity, can be built which may help support future success and maintain a positive spiral of growth and achievement (Fredrickson, 1998).

Emotion Regulation

Research in emotion regulation becomes an imperative factor in understanding the shift towards greater positive affect and thus increasing well-being. Emotion regulation

describes the conscious and deliberate actions taken to influence the intensity, duration, and expression of emotions in a given situation (Gross, 2002). Acceptance and cognitive reappraisal are two prominent emotion regulation strategies, commonly acknowledged for their adaptive nature, fostering positive outcomes, and even theorised to be protective against psychopathology (Aldao et al., 2010; Gross & John, 2003).

Acceptance involves the act of acknowledging and accepting one's emotional experiences without judgement, control, or suppression (Hayes et al., 2012). For example, when receiving an insufficient grade for an essay, feelings of disappointment and frustration may occur. By accepting these feelings as a normal reaction to the given situation, they can be experienced fully without feeling resistance or avoidance. While acceptance does not aim to directly change one's emotional state, cognitive reappraisal is specifically focused on that (Gross, 2015; Lazarus & Folkman, 1984). Cognitive reappraisal involves the reinterpretation of an emotional stimulus in a more positive or constructive light, which can alter one's emotional response to it (Gross, 2002). In the case of receiving an insufficient grade, cognitive reappraisal could involve viewing the situation as an opportunity for improvement, increasing a feeling of inspiration.

The effects of reappraisal and acceptance on the subjective experience of positive emotions as well as physiological responses during and after the recovery from a sad movie clip were investigated using a within-subject design (Troy et al., 2018). The findings of the laboratory study revealed that participants who applied cognitive reappraisal reported a greater increase in positive emotions, a greater decrease in negative emotions, faster recovery, and reduced physiological reactivity compared to participants who applied acceptance. Interestingly, no difference in perceived effort in applying each emotion regulation strategy was reported, but participants perceived themselves to be more successful in implementing acceptance than reappraisal (Troy et al., 2018).

Similarly, Shiota and Levenson (2012) conducted an experimental study investigating the effect of using different reappraisal strategies (positive vs. detached reappraisal) when watching a sad film clip. They found that both reappraisal strategies led to a significant change in the subjective experience of positive emotions, with a stronger effect observed in men compared to women. Both experimental studies provide further evidence supporting the notion that applying acceptance and cognitive reappraisal as emotion regulation strategies can have short-term effects on individuals' experience of positive emotions (Troy et al., 2018; Shiota & Levenson, 2012).

Disentangling Between-and Within-Person Associations

Despite the evidence from previous research indicating an association between acceptance, cognitive reappraisal, and positive affect, further investigation is warranted due to limitations in the design choices. For example, previous studies relied on cross-sectional or longitudinal designs with a limited number of measurement points, as well as the conduction in laboratory settings (Shiota & Levenson, 2012; Troy et al., 2018). Cross-sectional studies only take one measurement per participant at a time, allowing for research questions related to between-subject associations (Curran & Bauer, 2011). Often cross-sectional research findings are generalised to infer within-individual differences, a practice that can result in inference errors or inaccurate predictions of future behaviour (Fisher, 2018). Research has consistently shown that the magnitude or direction of findings can differ significantly between these two approaches (Curran & Bauer, 2011; Diener, 2009; Fisher et al., 2018; Larson & Csikszentmihalyi, 2014; Loney & Nagelkerke, 2014).

Instead, longitudinal research allows for investigating within- and between-individual differences over time. One particularly intensive type of longitudinal research is ESM, which provides the opportunity to examine fluctuations of acceptance and cognitive reappraisal within and between participants. ESM is a self-report diary technique that allows individuals to report on their subjective experiences in real-time (Csikszentmihalyi et al., 1977; Hektner et al., 2007). It has several benefits, such as high ecological validity (representativeness and generalisability of findings) and reduced vulnerability to recall biases (Mehl & Conner, 2012). By utilising ESM in this research, it is aimed for new insight into the application of adaptive emotion regulation strategies in a real-life setting.

Current Study

To the researcher's knowledge, this was the first study examining the within- and between-person association between acceptance, cognitive reappraisal, and positive affect in real-life setting. Until now, acceptance and cognitive reappraisal have been widely studied in the laboratory setting to primarily examine between-person differences (Shiota & Levenson, 2012; Troy et al., 2018). However, between-subject findings are often falsely generalised to infer within-subject findings (Curran & Bauer, 2011; Diener, 2009; Fisher et al., 2018; Larson & Csikszentmihalyi, 2014; Loney & Nagelkerke, 2014). Thus, by utilising ESM this study aimed to extend previous findings in two aspects. First, the current study investigated acceptance and cognitive reappraisal in relation to positive affect in individuals' daily life. Secondly, within- and between-participant fluctuations of acceptance, cognitive reappraisal, and positive affect were examined. Accordingly, the following research questions emerged:

RQ1: *To what extent is acceptance related to state positive affect within and between individuals at the same moment in time?* RQ2: *To what extent is cognitive reappraisal related to state positive affect within and between individuals at the same moment in time?* Based on previous findings, the following hypotheses were proposed: H1: *Acceptance is positively related to positive affect between individuals*. H2: *Acceptance is positively related to positive affect within individuals*. H3: *Cognitive reappraisal is positively related to positive affect between individuals*. H4: *Cognitive reappraisal is positively related to positive affect within individuals*.

Method

Participants

This study employed convenience sampling by recruiting participants from the network of the researchers (Ackoff, 1953; Stratton, 2021). Inclusion criteria required participants to be over 18 years, possess proficient English language abilities, and have access to a smartphone with iOS or Android. The sample size ($N = 55$) is considered feasible, aligning with the average sample size ($N = 50$) in ESM studies (Van Berkel et al., 2017).

Materials

As part of a larger research project, the study consisted of a one-time baseline questionnaire (Appendix B) and a daily state questionnaire (Appendix C). The current study solely focused on six items of the daily state questionnaire (further referred to as ESM questionnaire).

ESM Questionnaire

Positive Affect

To measure state positive affect, four items were obtained from the ESM repository, an open collection of ESM items established by Kirtley and colleagues (2022). The items' psychometric qualities have been assessed in previous studies (e.g., Achterhof et al., 2022; Bamps et al., 2022). One example item asked ''How satisfied do you feel right now?''. Responses were measured using a 7-point Likert scale, ranging from 1 (*not at all*) to 7 (*very much*). The split-half reliability was identified by correlating the person-mean (PM) of one-half of the data with the second half of the data, resulting in good reliability, $r = .78$, $p < .001$ over time (Steinke & Kopp, 2020). Validity was assessed by correlating the trait measure score of positive affect (the first three questions of the Mental Health Continuum - short form) with the PM score of state positive affect, revealing good convergent validity of the state measure positive affect ($r = .51$, $p < .001$).

Emotion Regulation Strategies

State acceptance was assessed using the item ''In the last hour, I could let go of my negative thoughts and feelings without acting upon them'' (Kirtley et al., 2022). Participants responded on a 7-point Likert scale, ranging from 1 (*not at all*) to 7 (*very much*). The internal reliability was acceptable ($r = .63$, $p <.001$), while the items' validity was insignificant ($r = .25$, $p = .067$).

State cognitive reappraisal was assessed using a modified item from the Emotion Regulation Questionnaire (ERQ, Gross & John, 2003). The phrase ''In the last hour'' was added to adapt the item ''I tried to look at my problems from a different perspective'' which participants rated on a 7-point Likert scale, ranging from 1 (*not at all*) to 7 (*very much*). In this study, excellent internal reliability and consistency of performance over time were found ($r = .91$, $p <.001$). However, a moderate negative correlation between the ERQ and the PM score of state cognitive reappraisal ($r = -.30$, $p = .025$) suggests that state cognitive reappraisal may not be a valid measure in this study.

Design and Procedure

The study received approval from the Ethics Committee of Behavioural, Management, and Social Sciences of the University of Twente (request number: 2330038). Participants received an email (see Appendix A) containing a project summary and detailed instructions for downloading the mobile application Ethica, a widely utilised longitudinal research tool for collecting real-time data in real-world settings (Ethica Data, n.d.). Participants provided online informed consent by registering for the study on Ethica, thereby gaining access to the baseline and ESM questionnaires.

On the opening day of the study, participants were invited to complete the baseline questionnaire and provide demographic information. Throughout the 7-day long study, participants received ten notifications a day to complete the questionnaire within semi-random intervals occurring in 90-minute blocks between 7:30 am and 10:30 pm. Responding to these questionnaires took less than 2 minutes. A 15-minute time limit was set to ensure timely reporting of their experiences. This approach aimed to capture a range of natural responses while minimising any potential participant burden (Mehl & Conner, 2012).

Data Analysis

Data were analysed using SPSS Statistics version 27 (IBM Corp., 2020). The baseline and ESM datasets were merged based on Person's ID code, and items irrelevant to the study were excluded. The descriptive statistics of the baseline questionnaire were analysed to obtain an overview of the participant's demographic information. Next, PM scores and person-mean

centred (PMC) scores were calculated for acceptance, cognitive reappraisal, and positive affect, to assess within- and between-person associations (Curran & Bauer, 2011). The PM was calculated by summing each measurement point for every participant and dividing it by the number of measurements, while the PMC score was obtained by subtracting the PM from each observed time-varying score (Curran & Bauer, 2011). The variables were standardised (z-scores) for ease of interpretation. Cohen's (1988) rule of interpretation was used to interpret the z-scores, with coefficients of <.3 considered weak, coefficients from .3 to .5 considered moderate, and coefficients of >.5 considered strong.

To test the hypotheses, linear mixed modelling (LMM) was used. As a statistical method that is specifically designed to handle the complexity of ESM data, it can effectively model within- and between-person differences (Bolger & Laurenceau, 2013). Furthermore, LMM accounts for dependencies and variability inherent in ESM data by including random effects for participants. Within this study, random slopes and random intercepts for participants were included. To account for correlated measurements over time, a first-order autoregressive structure (AR1) was employed, assuming that each data point is linearly influenced by its preceding value (Simpson et al., 2010).

To answer the first research question, three LMMs were run. The first model contained the standardised scores of acceptance as the fixed covariate and positive affect as the dependent variable. The second model was run with the standardized PM scores of acceptance as fixed covariate and positive affect as the dependent variable to enable the between-person analysis. The third model assessed within-person associations by using the PMC standardised scores for acceptance as the fixed covariate and positive affect as the dependent variable. Similarly, for the second research question, three separate LMMs were used to examine within-and between-person associations. In all three distinct models, positive affect served as the dependent variable, with the standardized scores, the PM, and the PMC of cognitive reappraisal serving as the fixed covariate.

Finally, line graphs were plotted to visually inspect the observed scores of positive affect, cognitive reappraisal, and acceptance. Three individuals who reported a response rate of over 50% were selected for visualisation, providing a glimpse of the variables over time. One participant with high PM scores (PM = 5-7) in positive affect, acceptance, and cognitive reappraisal was chosen, along with one participant with a moderate PM score (PM = 3-5) in acceptance and cognitive reappraisal were visualised. This approach allowed for a closer examination of how these variables vary over time for individual participants, complementing the LMM analysis which provides an average association across all participants.

Result

Sample Characteristics and Descriptive Statistics

To improve the reliability of the findings, only participants with a response rate of at least one third were included in the data analysis. After excluding 53 participants, the resulting sample size was 55. Within this sample, the response rate was 57%, with 2212 out of 3850 ESM questionnaires being completed. Moreover, only 30 participants conducted the baseline questionnaire, leading to a response rate of 55%. On average, participants completed 40 ESM questionnaires, with responses ranging between 23 and 65. The majority of the participants were female (60%) and in their twenties ($M = 22.97$, $SD = 6.6$), with most of them being of German (63%) or Dutch (30%) nationality. Participant demographics are displayed in Table 1.

Table 1

Demographics of Participants at Baseline (N = 55)

Characteristics	*n*	%	*M*	*SD*	Min	Max
Age			22.97	6.21	18	53
Gender						
Female	18	60				
Male	10	33				
Non-binary	2	7				
Nationality						
Dutch	9	30				
German	19	63				
Other	2	7				
Occupation						
Working	5	17				
Self-employed	1	3				
Student	18	60				
Studying and working	6	20				
Educational level						
Middle school	1	3				
High school	15	50				
Bachelor	12	40				
Master	1	3				
PhD	1	3				

Note. Only 30 of the 55 participants of this sample completed the baseline questionnaire.

Association Between Positive Affect and Acceptance Within and Between Individuals

In total, three LMMs were conducted to assess the association of acceptance and positive affect within and between individuals (see Table 2). In the first model, which did not distinguish between- and within-person associations, a significant, weak, and positive association between positive affect and acceptance was found, $\beta = .28$, $p < .001$. In the second model the between-person association of cognitive reappraisal (PM) and positive affect was investigated, indicating a significant, moderate, positive association between them, $\beta = .40$,

$p = .003$. Likewise, in the third model a significant, weak, and positive association of acceptance (PMC) and positive affect was found within persons, $\beta = .27$, $p < .001$.

      Figure 1 displays the unstandardised PM scores of positive affect and acceptance for all participants. Each participant is represented in two bars, one for their mean score in positive affect (red) and another for their mean in acceptance (blue). The graph shows that for most participants their mean of positive affect is approximately the same level as their mean of acceptance, with exceptions for participants 2,7, 25, 36, and 51. Overall, the graph suggests a positive association between the mean scores of positive affect and acceptance among participants. However, it is important to note that individual fluctuations may not be captured as the average scores have been used.
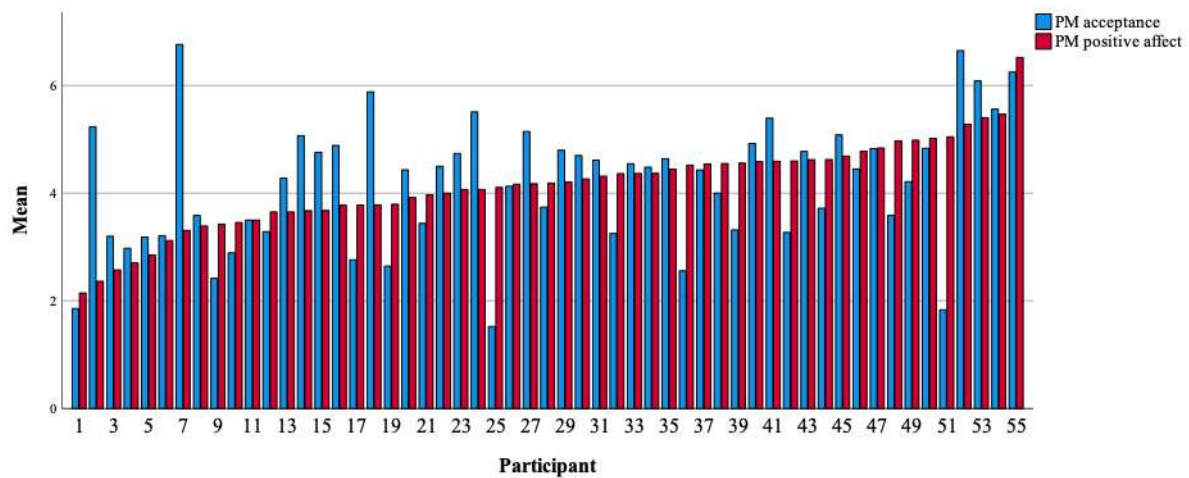
Table 2

Summary of LMMs Estimated Fixed Effects Tables of Standardised Acceptance on Standardised Positive Affect

Model	Parameter	*B*	*ß*	*SE*	*df*	*t*	CI 95% Lower bound	Upper bound
1 (overall)	Acceptance	.20**	.28**	.02	2204	13.35	.24	.32
2 (between-person)	Acceptance PM	.26*	.40*	.13	54	3.10	.14	.66
3 (within-person)	Acceptance PMC	.19**	.27**	.02	2207	13.17	.23	.31

Note. $N = 55$; *$p < .01$; **$p < .001$

Figure 1

Bar Chart of Between-Person Association of Positive Affect (PM) and Acceptance (PM) by Participant

Association Between Positive Affect and Cognitive Reappraisal Within and Between Individuals

Three LMMs were conducted to assess the association of positive affect and cognitive reappraisal within and between individuals (see Table 3). In the fourth model, which did not distinguish between- and within-person associations, a significant and negative association between positive affect and cognitive reappraisal was found, $\beta = -.07$, $p = .002$. In the fifth model, a non-significant association between positive affect and cognitive reappraisal between persons was found, $\beta = .03$, $p = .885$. In the sixth model, a significant weak negative association between cognitive reappraisal and positive affect was found within persons, $\beta = -.07$, $p = .001$.

Figure 1 displays the unstandardised PM scores of positive affect and acceptance for each participant and is represented in two bars, one for their mean score in positive affect (red) and another for their mean in cognitive reappraisal (green). Consistent with the findings of the fifth LMM analysis, the graph does not indicate any discernible relationship between the variables, as evidenced by the fluctuating green bars. However, findings are inconclusive as solely the person means are being represented which is no measure to assess individual fluctuation over time.

Table 3

Summary of LMMs Estimated Fixed Effects Tables of Standardised Cognitive Reappraisal on Standardised Positive Affect

| | | | | | | | CI 95% | |
| | | | | | | | Lower | Upper |
Model	Parameter	*B*	*ß*	*SE*	*df*	*t*	bound	bound
4 (overall)	Cognitive reappraisal	-.06*	-.07*	.23	2198	-3.12	-.12	-.03
5 (between-person)	Cognitive reappraisal PM	.02	.03	.14	54	.18	-.25	.29
6 (within-person)	Cognitive reappraisal PMC	-.07*	-.07*	.02	2207	-3.25	-.11	-.03

Note. N = 55; **p* < .01; ***p* < .001

Figure 2

Bar Chart of Between-Person Association of Positive Affect (PM) and Cognitive Reappraisal (PM) by Participant
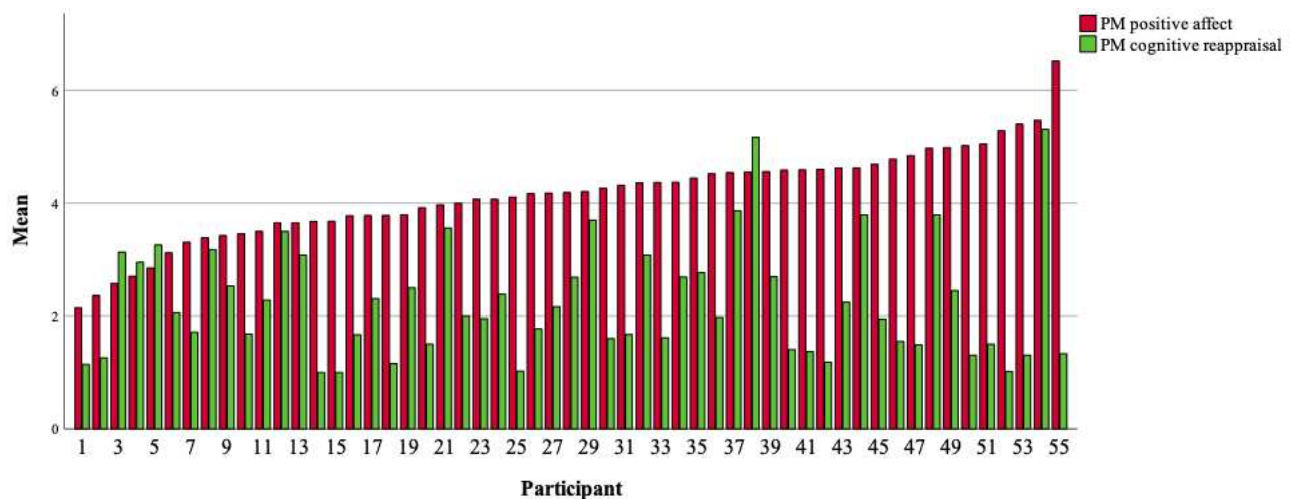
Association of Positive Affect and Acceptance Within Individuals

The LMM was conducted using the PMC to capture within-participant fluctuations, which merely represents the average association across all participants. To examine individual cases more closely, line graphs were plotted for participants' observed scores. Firstly, participant 62568, who had a high positive affect PM score (*M* = 5.47), as well as high PM scores in acceptance (*M* = 5.56) was plotted. Figure 3 visually indicates a strong positive

association between positive affect and acceptance over time, with examples of this association indicated in measures 24 to 35 and 57 to 70. Additionally, a Pearson correlation coefficient was computed to assess the linear relationship between positive affect and acceptance for participant 62568. A strong positive correlation between the two variables was found, $r(38) = .77$, $p < .001$.

Secondly, participant 62699, who reported a moderate PM score in positive affect ($M = 4.54$) and acceptance ($M = 4.43$), was examined further. Figure 4 displays a consistent positive correlation between positive affect and acceptance over time, with most time points indicating that higher levels of positive affect are more strongly correlated with higher levels of acceptance. A strong positive correlation between positive affect and acceptance was found, $r(50) = .82$, $p < .001$. Conclusively, both cases represent a strong positive within-person association between positive affect and acceptance.
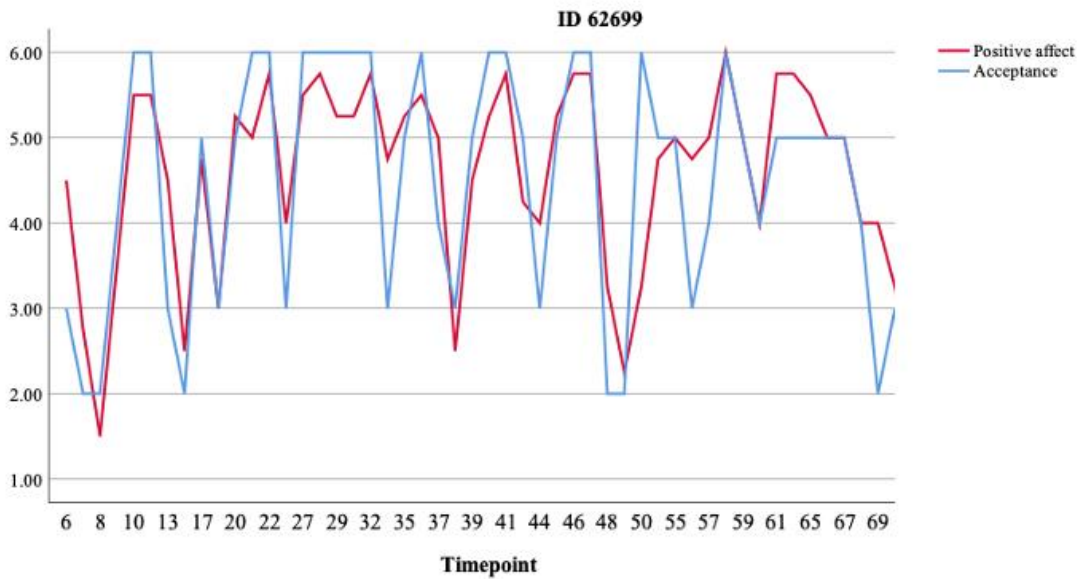
Figure 3

Line Graph with Observed Scores of Positive Affect and Acceptance of Participant 62568

Figure 4

Line Graph with Observed Scores of Positive Affect and Acceptance of Participant 62699

Association of Positive Affect and Cognitive Reappraisal Within Individuals

Participant 62568, who had a high positive affect PM score ($M = 5.47$), as well as high PM scores in cognitive reappraisal ($M = 5.31$) was plotted. Figure 5 visually indicated a strong positive association between positive affect and cognitive reappraisal. Furthermore, participant 62568's scores of positive affect and cognitive reappraisal showed a strong association over time, as evidenced by correlations observed at time points 11 to 25 and 45 to 70. The Pearson correlation coefficient suggests a moderate positive association between positive affect and cognitive reappraisal, $r(38) = .62$, $p < .001$.

Finally, participant 62778 exhibited a moderate PM score in positive affect ($M = 4.56$) and a low PM score in cognitive reappraisal ($M = 2.70$) over time. Generally, Figure 6 illustrates a strong negative association between cognitive reappraisal and positive affect over time, as observed from time points 18 to 48 and 51 to 63. However, at time points 8 to 10, it appears that cognitive reappraisal and positive affect behave in similar directions. The correlational analysis of participant 62778 shows a moderate negative association between positive affect and cognitive reappraisal, $r(63) = -.52$, $p < .001$.

While Figure 6 provides support for the outcomes of the LMM, indicating a negative association between positive affect and cognitive reappraisal, the findings in Figure 5 do not align with the LMM outcomes as they propose a strong positive association between cognitive reappraisal and positive affect.

Figure 5

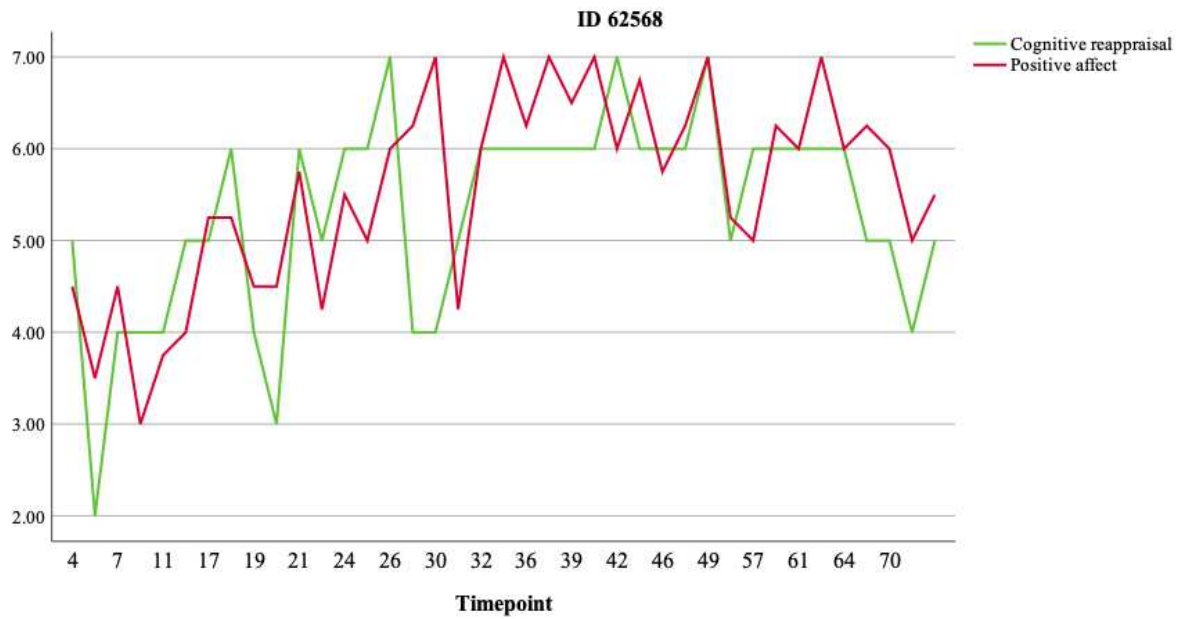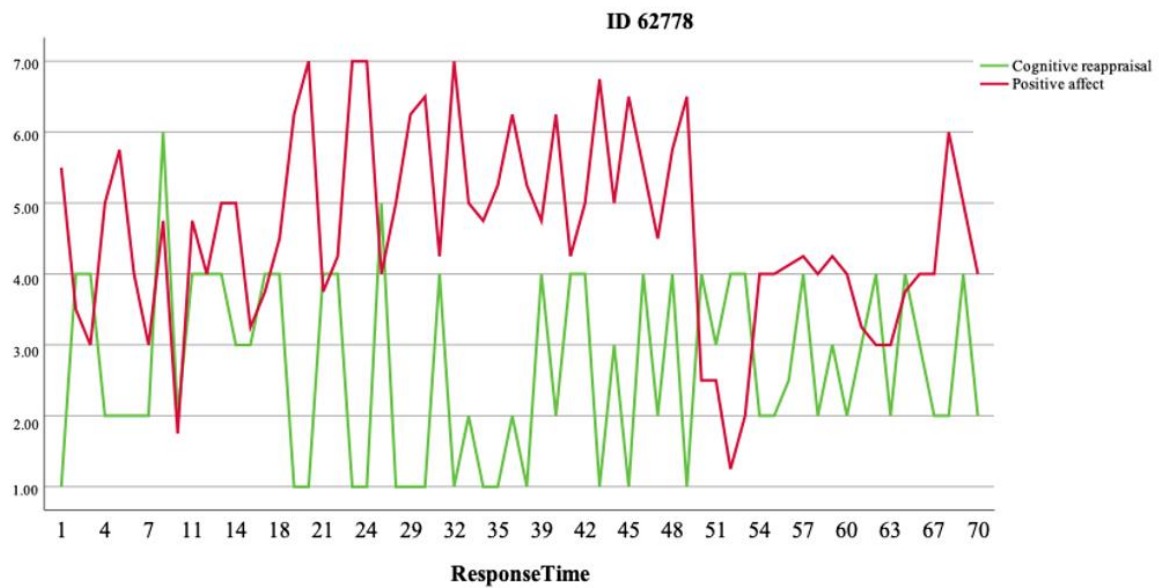*Line Graph with Observed Scores of Positive Affect and Cognitive Reappraisal of Participant 62568*

Figure 6

Line Graph with Observed Scores of Positive Affect and Cognitive Reappraisal of Participant 62778

Discussion

By employing ESM, this research aimed to disentangle the within-and between-person association of acceptance, cognitive reappraisal, and positive affect in a real-life context.

The Association Between Acceptance and Positive Affect Within and Between Individuals

Acceptance showed to be significant and weakly positive associated with positive affect within persons, indicating that persons with acceptance scores above their average, also tend to experience more positive affect at that moment. Additionally, a moderate positive association between acceptance and positive affect was found between persons. This finding suggests that people with higher momentary acceptance than others experience more positive affect on average. Overall, these findings are in line with previous research conducted on acceptance (Troy et al., 2018).

Interestingly, when visually inspecting the scores of two participants over time, a stronger association between acceptance and positive affect was observed at an individual level. This variation in individual slopes could be explained by Fredrickson's Broaden and Build theory (1998), which suggests that experiencing frequent positive emotions can help individuals develop resilience, allowing them to recover more quickly from negative emotions or stressful situations (Tugade & Fredrickson, 2004). In support of this assumption, a prospective study by Fredrickson et al. (2003) investigating resilience following the terrorist attacks on September 11th, 2001, found that positive emotions contributed to posttraumatic growth and reduced depressive symptoms.

This suggests that individuals who experience more positive emotions on average might also be more resilient and therefore better equipped to accept momentary negative affect as they are capable of experiencing positive emotions concurrently. Conversely, those who do not report trait positive affect may lack this resilience, making it more challenging for them to accept negative situations. This implies that resilience could act as a moderator in the positive association between acceptance and positive affect.

The Association Between Cognitive Reappraisal and Positive Affect Within and Between Individuals

The within-person association between cognitive reappraisal and positive affect was significant, weak, and negative, denoting that a person who scores lower in cognitive reappraisal than his or her average, also tends to experience more positive affect at that moment. Surprisingly, no significant association between cognitive reappraisal and positive affect was found between individuals. These findings contrast previous studies indicating a

strong positive association between cognitive reappraisal and positive affect between-individuals (Shiota & Levenson, 2012; Troy et al., 2018).

A possible explanation for these findings could be that individuals with high state positive affect may have less reason to change their emotional response, which is the main aim of cognitive reappraisal (Gross, 2015; Lazarus & Folkman, 1984). Contextual factors, such as the presence of others, could also influence this relationship. According to the Diffusion of Responsibility theory (Darley & Latane, 1968), people feel less accountability when being surrounded by others, leading to reduced emotional investment. Thus, being in the company of other people might reduce the need to alter emotional responses, since they might experience less emotional fluctuations and therefore not require the application of cognitive reappraisal.

Furthermore, the within-person models used in this study were based on individual average levels, which most likely do not generalise to specific individuals. Through the inspection of individual line graphs, differences in individual slopes suggest that what might be considered a large fluctuation for one individual may not be the same for another. Consequently, making inferences about individuals solely based on group models is inadequate (Kraiss et al., 2022; Salthouse, 2007).

Another explanation for the inconclusive findings is the possibility that the momentary measures of cognitive reappraisal used in the study lacked validity, supported by the negative correlation observed between trait and state measures of cognitive reappraisal. However, it is important to note that the two measures differ in content and nature, and thus, this negative correlation should not be the sole criterion used to judge the convergent validity of the state measure (Rauthmann et al., 2019). It is possible that some participants may have interpreted the cognitive reappraisal item differently than others, leading to non-significant results between participants.

Strengths and Limitations

ESM provides a unique opportunity to investigate individual fluctuations and offers novel insights into the emotion regulation in participants' daily lives. Through the timely completion of ESM surveys in natural surroundings retrospective bias is minimised and ecological validity is increased (Mehl & Conner, 2012; Myin-Germeys et al., 2022; van Berkel et al., 2019). Furthermore, using a semi-random sampling strategy enhances participants' awareness of triggers and reduces anticipation. Additionally, the identification of individual variation is enhanced since the analysis included 2212 measurement points (Van

Berkel et al., 2017). Finally, including the PMC in the analysis allows for the disentanglement between- and within-person associations (Curran & Bauer, 2011).

Despite the strengths of this study, several limitations need to be acknowledged. First, due to the use of convenience sampling and the researchers' limited accessibility to other groups, the majority of the sample were female students in their early twenties. The lack of diversity decreases the generalisability of findings and increases the potential of biases (Ackoff, 1953; Stratton, 2021). Second, while the use of ESM provided ecologically valid data, it has limitations, including the potential for social desirability bias due to the self-report aspect of the measure. Third, a common dilemma in ESM research is the trade-off between the richness of data versus the minimisation of participant burden. The high participant burden in completing multiple questionnaires per day resulted in the exclusion of around half of all participants and therefore in a potentially selective sample.

Future research could address these limitations by incorporating a more diverse sample. Moreover, to improve response rates, researchers could establish a closer relationship with participants by regularly asking for progress updates as well as questions and highlighting the significance of the study and the valuable contributions of the participants.

Implications and Future Research

The findings of this study could become relevant when considering clinical implications and future research. When interpreting the findings, it should be noted that all models, whether within or between subjects, are group models, and individual associations may differ among people. Understanding these differences is crucial for personalised mental health care. When selecting a therapeutic approach, it is important to consider patients' current emotion regulation abilities to change maladaptive coping. In therapies, such as Acceptance and Commitment Therapy (ACT), acceptance is employed as an adaptive coping strategy, as is cognitive reappraisal in Cognitive Therapy (CT) and Cognitive Behavioural Therapy (CBT).

One key aspect of ACT is the acknowledgment and allowance of difficult emotions, thoughts, and behaviours without avoidance or repression (Hayes et al., 2012). Consequently, individuals can develop greater psychological resilience as they become better equipped to tolerate negative feelings and thoughts. Furthermore, incorporating acceptance into their daily lives can enhance their capacity to make healthier behavioural changes aligned with their values and goals (Hayes et al., 2012; Zhang et al., 2018).

In addition to clinical settings, cultivating positive emotions can be beneficial in individuals' daily lives. Positive emotions have been linked to improved psychological and

physiological health, increased happiness, life satisfaction, and positive relationships (Kiecolt-Glaser et al., 2002; Kraiss et al., 2020; Lyubomirsky et al., 2005; Middleton & Byrd, 1996; Tugade & Fredrickson, 2004). The findings of this study suggest that interventions promoting acceptance during times of low positive affect could enhance momentary positive affect.

Within CT and CBT, cognitive reappraisal is used to modify emotional responses by changing perspectives. This is typically achieved by identifying and challenging maladaptive thoughts and reframing them in a more balanced, adaptive, or positive way (Beck & Beck, 2011; Hofmann et al., 2013). Both therapies have proven effective in treating mental disorders and promoting well-being (Abramowitz et al., 2010; Butler et al., 2006; Hofmann et al., 2012; Kraiss et al., 2020; Seligman et al., 2006).

Regarding the findings, it would be intriguing to explore why the association between positive affect and cognitive reappraisal did not reach statistical significance between individuals, despite being significant within individuals. Variability in individuals' slopes could account for this difference, suggesting that for some individuals an association between positive affect and cognitive reappraisal is present, while for others this may not be the case. Furthermore, ESM studies could investigate these fluctuations and potential underlying reasons. For example, it could be proposed that individuals who are undergoing cognitive therapies may apply cognitive reappraisal in times of low negative affect and do not experience positive affect simultaneously.

To design more personalised interventions, it is crucial to understand the complex interplay between positive affect, acceptance, and cognitive reappraisal. Cluster analysis could be employed in future research to identify specific groups of individuals for whom acceptance or cognitive reappraisal is strongly associated with momentary positive affect. This knowledge can be translated into practical applications, such as mental health apps that send push notifications to users reporting low positive affect, providing encouraging messages, and prompting acceptance or reframing perspectives. Such interventions have the potential to impact personalised mental health care or improve overall well-being in daily life.

Conclusion

This study contributed to the existing research on acceptance, cognitive reappraisal, and positive affect in daily life through the use of ESM. The findings highlight the importance of integrating acceptance and cognitive reappraisal techniques into daily routines as well as into clinical practices to improve well-being. To maximise the practical implication of these findings, further research is warranted.

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Appendix A

Email with Instructions

Dear participant,

Thank you for your participation in the study on mental health in daily life. We are contacting you because you kindly agreed to participate in this study for the master track psychology at the University of Twente.

Brief summary of the project

The study you are participating in is a daily diary study. With this study we want to investigate how people feel and react to events in their day-to-day lives. By asking a few questions at several moments throughout the day, we get an insight in behavior of people in their everyday environment, which is necessary if we want to understand how people behave and feel in daily life. You will receive a notification on 10 random moments a day to answer a short questionnaire which will take about 1 minute to complete. We ask you to do this for 7 days in a row. The first questionnaire will be sent on Monday morning, the 13th of February. Of course, there are situations in which it is not possible to fill it out (such as when you are driving), but to get a good overview of your daily life it is important that you fill out as many of these questionnaires as possible. In addition to these short questionnaires, you will receive one questionnaire in the beginning of the study that takes about 20 minutes to complete. It's important that you complete this questionnaire as well.

How to get ready to participate

Before continuing, make sure to download the Ethica application on your smartphone. Clicking on the following links on your smartphone will bring you the app store.

Android:

https://play.google.com/store/apps/details?id=com.ethica.logger&hl=en_US&gl=US&pli=1
IOS: https://apps.apple.com/nl/app/ethica/id1137173052

Then follow these steps:

-    Open the Ethica application on your phone. **Please make sure to allow push notifications for the Ethica app on your phone!**
-    Click on "Sign up" and create an account.

- After you signed up in Ethica, login in to the Ethica application using your username and password.
- After logging in, click on the following link on your phone: https://ethicadata.com/study/1296/
- Alternatively, you can also directly enter the registration code **1296** in the Ethica application.
- On the next window click on "Register" to enroll in the study.
- The study should now be set up and you will receive the first questionnaire next Monday.

Contact details

This study is part of a larger project with many students involved. If you have any questions, you can contact one of the following master students who are involved in data collection or the supervisors. The contact details can be found below.

Master students

Antje Brot, Jenny Diephaus, Nele Feldbusch, Julia Höting, Carolin Landefeld, Antonia Schaffert, Lukas Schwemin

Supervisors

Jannis Kraiss & Thomas Vaessen

Thank you for participating in this study. Your contribution is greatly appreciated.

Kind regards, also on behalf of the study team.

Appendix B

Baseline Questionnaire

Demographics

1. How old are you?

2. What gender do you identify as? (Female, Male, Other, If you prefer not to specify, you can skip this question)

3. What is your nationality? (Dutch, German, Other)

4. What is your current occupation? (Working, Self-employed, Student, Studying and Working, Not working, Other)

5. What is the highest degree or level of school that you have completed? If currently enrolled, mark the highest degree already received. (Middle school (such as MBO, MTS, MEAO or Haupt- or Realschule), High school (such as HAVO, VWO, HBS or Gymnasium/Berufsschule/Berufskolleg), Bachelor, Master, PhD, Other)

MHC-SF (Trait mental health)

Below are some statements about feelings and thoughts. Please indicate how often you felt this way during the past month. (Never, Once or Twice, About once a week, about 2 or 3 times a week, Almost every day, Every day)

1. Please indicate how often you felt happy during the past month

2. Please indicate how often you felt interested in life during the past month

3. Please indicate how often you felt satisfied with life during the past month

4. Please indicate how often you felt that you had something important to contribute to society during the past month

5. Please indicate how often you felt that you belonged to a community during the past month

6. Please indicate how often you felt that our society is a good place, or is becoming a better place for all people during the past month

7. Please indicate how often you felt that people are basically good during the past month

8. Please indicate how often you felt that the way our society works makes sense to you during the past month

9. Please indicate how often you felt that you liked most parts of your personality during the past month

10. Please indicate how often you felt good at managing the responsibilities of your daily life

11. How often did you feel hat you had warm and trusting relationships with others during the past month

12. How often did you feel hat you had experiences that challenged you to grow and become a better person during the past month

13. How often did you feel confident to think or express your own ideas and opinions during the past month

14. How often did you feel that your life has a sense of direction or meaning to it during the past month

GAD-7 (Anxiety)

Over the last two weeks, how often have you been bothered by the following problems? (Not at all, several days, more than half of the days, nearly every day)

1. Feeling nervous, anxious, or on edge

2. Not being able to stop or control worrying

3. Worrying too much about different things

4. Trouble relaxing

5. Being so restless that it is hard to sit still

6. Becoming easily annoyed or irritable

7. Feeling afraid as if something awful might happen

PHQ-9 (Depression)

Over the last two weeks, how often have you been bothered by the following problems? (Not at all, several days, more than half of the days, nearly every day)

1. Little interest or pleasure in doing things

2. Feeling down, depressed, or hopeless

3. Trouble falling or staying asleep, or sleeping too much

4. Feeling tired or having little energy

5. Poor appetite or overeating

6. Feeling bad about yourself or that you are a failure, or have let yourself or your family down

7. Trouble concentrating on things, such as reading the newspaper or watching television

8. Moving or speaking so slowly that other people could have noticed. Or the opposite, being so fidgety or restless that you have been moving around a lot more than usual

9. Thoughts that you would be better off dead, or hurting yourself

BRS (Resilience)

Below are some statements about the recovery from stress. Please indicate how much you agree or disagree with each of the statements. (Strongly disagree, disagree, neutral, agree, strongly agree)

1. I tend to bounce back quickly after hard times
2. I have a hard time making it through stressful events.
3. It does not take me long to recover from a stressful event.
4. It is hard for me to snap back when something bad happens.
5. I usually come through difficult times with little trouble.
6. I tend to take a long time to get over setbacks in my life

PSS (Perceived stress scale)

Please indicate to what degree you agree with each of the following statements (0 never, 1 almost never, 2 sometimes, 3 fairly often, 4 very often)

1. In the last month, how often have you been upset by something that happened unexpectedly?
2. In the last month, how often have you felt that you were unable to control the important things in your life?
3. In the last month, how often have you felt nervous and stressed?
4. In the last month, how often have you felt confident about your ability to handle your personal problems?
5. In the last month, how often have you felt that things were going your way?
6. In the last month, how often have you found that you could not cope with all the things that you had to do?
7. In the last month, how often have you been able to control irritations in your life?
8. In the last month, how often have you felt that you were on top of things?
9. In the last month, how often have you been angered because of things that happened that were outside of your control?
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

ERQ (Cognitive reappraisal)

Please indicate to what degree you agree with each of the following statements (strongly

disagree, mostly disagree, somewhat disagree, neither agree or disagree, somewhat agree, mostly agree, strongly agree)

1. When I want to feel a more positive emotion (such as joy or amusement) I change what I am thinking about

2. When I want to feel less negative emotion (such as sadness or anger) I change what I am thinking about

3. When I am faced with a stressful situation, I make myself think about it in a way that helps me stay calm

4. When I want to feel more positive emotion, I change the way I am thinking about the situation

5. I control my emotions by changing the way I think about the situation I am in

6. When I want to feel less negative emotion, I change the way I am thinking about the situation

CERQ (Rumination)

State how often do you think in the following manner when experiencing threatening or stressful life events (Almost never, occasionally, frequently, almost always)

1. I think that I have to accept that this has happened
2. I think that I have to accept the situation
3. I think that I cannot change anything about it
4. I think that I must learn to live with it
5. I often think about how I feel about what I have experienced
6. I am preoccupied with what I think and feel about what I have experienced
7. I want to understand why I feel the way I do about what I have experienced
8. I dwell upon feelings the situation has evoked in me

CERQ (Acceptance)

State how often do you think in the following manner when experiencing threatening or stressful life events (Almost never, occasionally, frequently, almost always)

1. I think that I have to accept that this has happened.
2. I think that I have to accept the situation.
3. I think that I cannot change anything about it.
4. I think I must learn to live with it.

Appendix C

Experience Sampling Methodology (ESM) Questionnaire

Positive and negative affect

Below you can find several questions about your current feelings. Please try to indicate how you felt right before you started to answer the questionnaire (1 not at all – 7 very much)

1. How cheerful do you feel right now?

2. How enthusiastic do you feel right now?

3. How satisfied do you feel right now?

4. How relaxed do you feel right now?

5. How anxious do you feel right now?

6. How irritable do you feel right now?

7. How down do you feel right now?

8. How sad do you feel right now?

Perceived stress

How stressed do you feel right now?

Positive and stressful events

Think of the most striking event or activity in the last hour. How (un)pleasant was this event or activity? (-3 very unpleasant – 3 very pleasant)

Think of the most striking event or activity in the last hour. How stressful was this event or activity? (1 not at all – 7 very much)

Social context

Who are you with right now? (Family member, friend, romantic partner, co-worker/ fellow student, unknown people/ others, I am alone)

If not alone:

I like this company (1 not at all – 7 very much)

I would rather be alone (1 not at all – 7 very much)

Cognitive reappraisal

In the last hour, I tried to look at the cause of my negative feelings from a different perspective (1 not at all – 7 very much)

Rumination

In the last hour, I have been thinking about my problems (1 not at all – 7 very much)

Acceptance

In the last hour, I could let go of my negative feelings without acting upon them (1 not at all –
7 very much)