

**Emotion Regulation: The Role of Rumination in the Experience of Negative Affect. An  
Experience Sampling Study**

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## Abstract

**Background:** Previous cross-sectional studies have shown that there is a negative association between the emotion-regulation strategy of rumination and mental wellbeing. Specifically, rumination is strongly and positively associated with negative affect and stressful events. However, no study to date assessed within- and between-person associations regarding this topic. Therefore, this longitudinal ESM study aimed to assess the association between rumination and negative affect within- and between-persons. Besides, the possible moderating role of rumination on the relationship between negative affect and stressful events was examined.

**Method:** The online smartphone experience sampling method was applied. To recruit participants, convenience sampling was used. Participants ( $N=60$ ) took part in the online study for 14 days, filling out four semi-randomly scheduled questionnaires per day and the baseline questionnaire once. The baseline questionnaire measured participants' trait levels of rumination as well as other traits. The daily questionnaire assessed participants' state levels of rumination, negative affect and stressful events. Linear Mixed Models were used to analyse the data. For the assessment of between and within-person associations, person mean and person mean-centred scores were calculated.

**Results:** A moderately strong positive association between rumination and negative affect across individuals was found ( $\beta = 0.47, p = < .001$ ). Within persons, this association can be described as weak to moderate ( $\beta = 0.31, p = < .001$ ). The moderation analysis showed a significant interaction between rumination and stressful events ( $\beta = 0.03, p = .043$ ).

**Conclusion:** This study was the first to disentangle within- and between-person associations between rumination and negative affect in daily life. It was found that rumination was associated with negative affect both within- as well as between persons. Moreover, rumination was found to moderate the relationship between stressful events and negative affect. This study's findings can be an important milestone in tailoring clinical treatments to patients' individual needs.

## **Emotion Regulation: The Role of Rumination in the Experience of Negative Affect. An Experience Sampling Study**

Emotions form an integral part of humans' everyday lives. Humans can experience them, respond to them and modify them accordingly. However, differences in how individuals deal with emotions exist. When emotions are not regulated sufficiently, emotional-, eating- and anxiety disorders, among others, can be developed (Joormann & Vanderlind, 2014; Kraiss et al., 2020; Michl et al., 2013; Smith & Alloy, 2009). Emotion regulation can be defined as an individual's ability to influence and choose the emotions they have, how they experience them, when they experience them, and lastly, how they express them (Gross, 1998). Because of its clinical importance, a large amount of research has focused on emotion regulation and its relationship to mental well-being (Joormann & Vanderlind, 2014; Joormann & D'Avanzato, 2010; Kraiss et al., 2020). One specific emotion-regulation strategy is rumination. Rumination was shown to be positively related to stressful events and negative affect (Moberly & Watkins, 2008; Watkins & Roberts, 2020). However, this relationship was so far mainly examined on a between-person level, while the possible association between rumination, stressful events and negative affect *within* individuals is less clear.

### **Rumination**

Rumination is most prominently described as an emotion-regulation strategy in which individuals' direct attention to their distress and problems, as well as their causes and consequences (Nolen-Hoeksema, 1991). Moreover, rumination increases individuals' level of self-blame, which intensifies negative experiences, feelings and thoughts (Nolen-Hoeksema, 1991; Wisco & Harp, 2021). Nolen-Hoeksema (1991) called this *depressive rumination* and supposes that it is an unconscious, automatic coping process. An example of rumination could be a person that feels *sad and tired, wondering if this is going to continue that way. If it does, one might lose their job because nobody wants to work with a tired, unmotivated person.* If rumination is implemented habitually, it can have multiple consequences on individuals' mental well-being.

So do Watkins and Roberts (2020) propose that the effect of rumination on mental well-being is fourfold. First, when individuals are in a negative mood, engaging in rumination leads to prolonged negative mood and mood-associated thoughts. These thoughts tend to become more extreme when ruminating (Nolen-Hoeksema, 1994; Watkins & Roberts, 2020). Second, by making individuals more pessimistic, rumination impedes problem-solving skills. Third, rumination

impedes goal-directed behaviour by reducing individuals' willingness to engage in pleasurable activities (Lyubomirsky & Nolen-Hoeksema, 1993; Watkins & Roberts, 2020). Lastly, rumination weakens individuals' abilities to concentrate by distracting them from relevant stimuli in the environment (Lyubomirsky et al., 2003; Watkins & Roberts, 2020). These effects influence mental well-being in various ways. Interestingly, a study by Lyubomirsky & Nolen-Hoeksema (1993) found that individuals engage in rumination to gain insight into their problems. However, instead of solving the problem by repetitively thinking about it, problems deteriorate and negative mood states prolong. Rumination thus strengthens the experience of negative affect and by doing so, preserves depressive symptoms (Smith & Alloy, 2009). Moreover, Sun et al. (2014) state that individuals who were confronted with a traumatic, stressful event and experience negative emotions, think about the causes and consequences of these negative emotions perpetually. By doing this, previous negative memory is activated and causes negative reactions to present situations. Nolen-Hoeksema's Response Styles Theory (1991) supports this by stating that negative thoughts bias individuals' perceptions of their situation negatively. This leads to symptoms such as an increase in suicidal ideation, more severe depression and both decreased motivation and concentration (Jones et al., 2008; Miranda & Nolen-Hoeksema, 2007; Smith & Alloy, 2009; Watkins & Roberts, 2020).

Experimental studies have supported this and showed that rumination decreases not only individuals' goal-directed behaviour, but additionally the motivation to engage in pleasurable activities (Lyubomirsky & Nolen-Hoeksema, 1993; Ward et al., 2003). This reduced motivation is positively associated with less confidence in making plans and strengthen depressive symptoms (Lyubomirsky & Tkach, 2008). In turn, depressive symptoms strengthen ruminative thoughts and inhibit goal-directed behaviour (Linville, 1996, as cited in Mor & Daches, 2015). This may imply that positive stimuli are overlooked more easily. As a consequence, individuals who engage in rumination are more likely to make inferences from irrelevant sources of information (Watkins & Roberts, 2020). These irrelevant stimuli can make individuals vulnerable to develop, among others, eating disorders, depression, anxiety disorders and more, while also leading individuals to have a distorted perception of themselves (Michl et al., 2013, Smith et al., 2018; Wang et al., 2017; Wisco & Harp, 2021). Consequently, rumination was associated with both body surveillance and a distorted perception of one's weight (Grabe et al., 2007, as cited in Smith et al., 2018; Wang et al., 2017).

### **Rumination as a barrier for mental resilience**

Not all individuals are prone to develop the consequences rumination, negative affect and stressful events may bring with. So do differences in individuals' abilities to handle stressful events exist. How people deal with stressful events and adversity is called resilience (Luthar et al., 2000; Southwick et al., 2014). Highly resilient individuals are able to adapt to stressors well, whereas individuals with lower levels of resilience have difficulties recovering from stressors (Southwick et al., 2014; Tung et al., 2014). Consequently, a large amount of cross-sectional research supported the positive association between perceived stress, higher levels of rumination and lower levels of resilience (Mezo & Baker, 2012; Tung et al., 2014; Willis & Burnett Jr., 2016). Troy & Mauss (2011) have found lower levels of resilience in individuals who ruminate and experience stressful events. A diary study by Genet & Siemer (2012) found that stressful, unpleasurable events predict higher levels of negative affect in individuals that reported higher levels of rumination. Similarly, a cross-sectional study by Bucknell et al. (2022) found lower levels of resilience and well-being in individuals with higher levels of rumination. From this, it can be inferred that individuals with a higher level of ruminative thought may lack the buffering capacity of resilience that helps individuals to recover from stressful events (Bucknell et al., 2022; Seery & Quinton, 2016).

### **The link between rumination, negative affect and stressful events**

Rumination plays an important role in the experience of such stressors and is found to be related to the experience of stressful events and negative affect (Mezo & Baker, 2012; Michl et al., 2013; Moberly & Watkins, 2008). An experience sampling study by Moberly & Watkins (2008) examined the relationship between negative life events, ruminative self-focus and negative affect. As a result, participants showed higher levels of negative affect when a negative event was experienced. Negative events were moreover associated with higher negative affect at the next measure. Momentary ruminative self-focus mediated the relationship between negative events and negative affect partially (Moberly & Watkins, 2008). Hence, the degree to which an individual ruminates after negative events or stressors occurred plays an important role in the experience of negative affect.

A more recent experience sampling study by Connolly & Alloy (2017) investigated the interaction of rumination and life stress. This study focused on momentary ruminative self-focus and stress-reactive rumination in the experience of depressive symptoms. Momentary ruminative self-focus interacted with depressive symptoms and predicted an increase in such symptoms at a

later point (Connolly & Alloy, 2017). Rumination was thus shown to have an effect on future levels of mood.

### **Experience Sampling Method and between- and within-person associations**

To examine the fluctuations of rumination and negative affect, a special approach needs to be applied. In cross-sectional and ESM studies with a between-person design, rumination has already been shown to impact negative affect and mental well-being crucially (Connolly & Alloy, 2017; Goldschmidt et al., 2014; Moberly & Watkins, 2008). However, rumination and negative affect have not been studied *within* persons yet. Between-person associations are usually applied in cross-sectional studies taking one measurement per individual only (Curran & Bauer, 2011; Mroczek et al., 2003). For instance, between-person associations can be used to examine whether individuals who experience on average more ruminative thought than others also experience more negative affect. A person's distinct degree of rumination represents the between-person variable and can then be compared to other individuals. Even though between-person associations do not provide information about the fluctuations of certain traits *within* individuals over time, findings are often still generalised. This can lead to incorrect conclusions on the individual level, such as inference errors, and wrong predictions of future behaviour (Curran & Bauer, 2011; Diener, 2009; Fisher et al., 2018; Hamaker et al., 2007; Larson & Csikszentmihalyi, 2014; Loney & Nagelkerke, 2014). Hence, between-person associations and within-person associations need to be distinguished to prevent the false generalisation of findings. In contrast, within-person variations indicate the fluctuations *within* a person in relation to himself and show whether a person's feelings and emotions are stable or inconstant over time. (Beck & Jackson, 2021; Diener, 2009; Mroczek et al., 2003). To give an example, within-person associations can measure whether an individual who reports a higher degree of rumination than usual also reports a higher degree of negative affect at the same time. To establish how rumination fluctuates over time, within-person associations with a longitudinal design and multiple measures per day are thus crucial to take.

When studying these individual differences in everyday life, the experience sampling method (ESM) is an appropriate longitudinal approach that can be used for both within- and between-person associations (Larson & Csikszentmihalyi, 2014; Myin-Germeys & Kuppens, 2022). ESM measures momentary states by putting emphasis on the situational nature of feelings, thoughts, emotions and behaviours. Thereby, individual micro-level experiences as well as contextual factors and their possible influence on individuals can be examined and visualised

(Myin-Germeys et al., 2018; Myin-Germeys & Kuppens, 2022). This is done by individuals tracking down their feelings, thoughts and emotions at one specific moment during the day when notified. That way, retrospective recall bias, which is problematic in cross-sectional research, is reduced (Myin-Germeys et al., 2018; Napa Scollon et al., 2009). Moreover, unlike most longitudinal studies, ESM has the advantage of collecting a large amount of data within a relatively short time by having participants filling out questionnaires multiple times per day (Kansky & Diener, 2017). This also increases the ecological validity, hence the generalisability of findings (Curran & Bauer, 2011; Diener, 2009; Larson & Csikszentmihalyi, 2014).

### **The current study**

Until now, rumination in relation to negative affect and stressful events has been widely studied between persons (Connolly & Alloy, 2017; Michl et al., 2013; Moberly & Watkins, 2008). However, such between-person studies only reveal interpersonal associations, hence the interpretation of group associations on the individual level (Curran & Bauer, 2011; Mroczek et al., 2003). To understand the fluctuations of rumination and negative affect *within individuals*, a within-person design needs to be applied. As such longitudinal within-person designs are rare, no study to date assessed the specific association between rumination and negative affect *within individuals*. Therefore, the present study extends previous research in the following two aspects. First, the association between rumination and negative affect will be assessed both between- and within individuals. This has the advantage of exploring fluctuations and the possible role of rumination in the experience of negative affect more precisely *within* a person over time. Second, it will be examined whether rumination moderates the relationship between stressful events and negative affect. Therefore, the following research questions are formulated: RQ1: *How is rumination associated with negative affect within- and between individuals?* And RQ2: *Does rumination moderate the relationship between stressful events and negative affect?* Based on previous literature, the following hypotheses are proposed: H1: *Rumination is strongly associated with negative affect* H2: *Rumination is stronger associated with negative affect within individuals compared to between individuals* and H3: *Rumination moderates the relationship between stressful events and negative affect.*

### **Method**

The study was approved by the Ethics Committee of Behavioural, Management and Social Sciences of the University of Twente (request number: 220285).

## Participants

To recruit participants, the convenience sampling method was used. Convenience sampling, a non-probability sampling method, includes participants that were motivated to participate in a study while also being easily accessible to the researcher (Etikan et al., 2016; Stratton, 2021). Moreover, convenience sampling is a quick and cost-efficient strategy to recruit participants and is common in ESM studies (Conner & Lehman, 2012; Etikan et al., 2016; Stratton, 2021). Sampling was hence done by using the researcher's personal contacts, as well as the University of Twente's test subject pool SONA.

To fulfil the established inclusion criteria, participants had to be at least 18 years old, possess sufficient English language skills and an availability of a smartphone. As the average number of participants in ESM studies is circa 50 participants, a sample size of at least 50 participants was aimed at (van Berkel et al., 2018). A total of 60 participants were recruited ( $N=60$ ) with a mean age of 23.41 ( $SD=8.01$ ). The majority of participants were female (58.4%), followed by male participants (41.6%). Nationalities varied with 70% German participants, 16.7% Dutch participants, and 13.3% participants of other nationalities, such as Albanian, Italian, Finnish, Ecuadorian, Italian, Polish, Turkish and Russian. In line with previous ESM literature, only participants with a response rate of at least 50% were included in the data analysis (Conner & Lehman, 2012). In ESM studies, this is especially important for the reliability of the collected data (van Berkel et al., 2019). Therefore, a total of 54 participants were removed from the data set.

## Design and Procedure

The application Ethica was used. Ethica is a common tool for Experience Sampling studies as it allows for real-world data collection (*Ethica Blog*, n.d.). Before the actual study started, the researchers conducted a two-day pilot test. That way, feasibility, technical issues and possible bugs could be reviewed. The actual data collection started on the 13th of April 2022 and went until the 27th of April 2022 with a total duration of 14 days, which is a both feasible and appropriate duration for ESM studies (Conner & Lehman, 2012; van Berkel et al., 2018). All participants started on the same date and received the link to the study via e-mail, where they were informed about how to register for the study. For that, the smartphone application Ethica had to be downloaded. When participants registered for the study in the application Ethica, they were informed about the confidentiality of data, and the possibility to withdraw from the study at any time and were able to



give consent. Participation was therefore voluntary and active online consent was given in the app before the study started (Appendix A). Student participants from the University of Twente were awarded 3.5 SONA credits at the end of the study that are needed to be collected to graduate with a Bachelor's degree at the University of Twente. There was no compensation for the remaining participants.

The study consisted of two distinct questionnaires: a one-time administered baseline questionnaire (Appendix B) and a daily state questionnaire (Appendix C) that had to be filled out four times a day for 14 consecutive days. The daily questionnaires took about two to three minutes to complete. Each daily questionnaire measured the momentary states of participants and was induced by notification and a beep on participants' smartphones. Using signal-contingent sampling, participants were asked to fill out the short questionnaires within a semi-random schedule four times a day. Daily questionnaires were triggered randomly within each pre-defined time slot. The first time slot was from 10 am to 11 am, the second time slot from 1:30 pm to 2:30 pm, the third time slot from 5pm to 6 pm and the last time slot from 8:30 pm to 9:30 pm. This semi-random schedule has a high ecological validity as measures are triggered rather unexpectedly and participants are unlikely able to avoid questionnaires or plan activities around them (Larson & Csikszentmihalyi, 2014; Myin-Germeys & Kuppens, 2021; Thomas & Azmitia, 2015). Hence, the randomised intervals increase the likelihood of participants reporting their feelings and thoughts as authentically as possible. To enhance the compliance of participants, reminders to complete the questionnaire were sent to participants if the questionnaire was not answered yet. After one hour, the questionnaire expired. Moreover, the duration of 14 days with four measurements per day is in line with previous signal-contingent ESM research and was chosen because of two reasons (van Berkel et al., 2018). First, with four measurements per day, daily behaviours and emotions can be correlated and internal processes investigated systematically without having too many data points (Larson & Csikszentmihalyi, 2014). Besides that, four measures per day are appropriate as previous ESM studies have shown decreases in compliance with higher sampling frequencies or questionnaires that took too long to complete (Eisele et al., 2020). The time-intensive design of ESM studies can thus be a burden for participants. Still, individuals' fluctuations of specific phenomena across time can be investigated (Larson & Csikszentmihalyi, 2014; Napa Scollon et al., 2009).

The single-time administered baseline questionnaire was available to the participants on day two of the study and took about ten to 15 minutes to complete. It included information about participants' demographic background such as age, gender, nationality, educational background and occupation, as well as items about different psychological constructs and trait measures. The baseline questionnaire could be filled out at any time during the second day with reminders to fill it out after eight, 24 and 72 hours. The baseline questionnaire did not expire.

### **Trait Measures**

The data was collected for multiple research projects. Therefore, various psychological constructs were measured. In this current study, only relevant constructs and variables are discussed. As such, the relevant trait measures mental-wellbeing, anxiety, depression and rumination were assessed. Moreover, state measures of rumination, negative affect and stressful events were taken in order to answer the research questions.

**Mental well-being.** The Mental Health Continuum Short Form (MHC-SF) was used to measure the general level of emotional, social and psychological well-being in the baseline questionnaire. The MHC-SF contains 14 items to the experiences participants had over the last month on a six-point Likert scale ranging from 0 (never) to 5 (every day). An example item is *During the past month, how often did you feel satisfied with life?* A higher score indicates that an individual perceived a higher level of well-being during the past month, and a lower score a lower level of well-being. The MHC-SF has been widely established and there is a large amount of research that confirms its good internal consistency and criterion validity with a Cronbach's alpha of .91 (Lamers et al., 2010; Luijten et al., 2019; Lupano Perugini et al., 2017). Likewise, convergent- and divergent validity were supported (Lamers et al., 2010; Luijten et al., 2019; Lupano Perugini et al., 2017). A Cronbach's alpha was calculated for the current study. The internal consistency can be described as excellent ( $\alpha = .92$ ).

**Anxiety symptoms.** As part of the baseline questionnaire, participants' trait level of anxiety was measured by the General Anxiety Disorder-7 (GAD-7). The GAD-7 comprises seven items on a four-point Likert scale ranging from 0 (never) to 3 (every day) (Spitzer et al., 2006). Questions concern how often participants have been bothered by a certain problem. An example item is *Over the last two weeks, how often have you been bothered by worrying too much about different things?* Higher mean scores therefore indicate higher anxiety symptoms, whereas lower mean scores indicate lower symptoms of anxiety (Spitzer et al., 2006). With a Cronbach's Alpha of .89, the

reliability of the GAD-7 can be classified as good (Dhira et al., 2021; Spitzer et al., 2006; Zhong et al., 2015). Moreover, the GAD-7 has good convergent validity, as well as a high level of internal consistency (Dhira et al., 2021; Zhong et al., 2015). Likewise, a Cronbach's alpha was calculated for the present study, showing good internal consistency ( $\alpha = .87$ ).

**Depressive Symptoms.** The Perceived Health Questionnaire 9 (PHQ-9) was part of the baseline questionnaire and measured participants' state level of depression. It consists of nine items concerning the problems experienced over the last two weeks. The PHQ-9 is constructed of a four-point Likert-scale from 0 (never) to 3 (nearly every day). *Over the last two weeks, how often have you been bothered by little interest or pleasure in doing things* is an example item of the PHQ-9. Higher mean scores indicate a higher level of depressive symptoms and lower mean scores a lower level of such. The PHQ-9 can be described as a reliable measure with a Cronbach's alpha of .89 and excellent test-retest reliability (Kroenke et al., 2001; Seo & Park, 2015). Moreover, there is strong support for the validity of the PHQ-9 (Kroenke et al., 2001). All in all, the PHQ-9 is a both reliable and valid measure for the severity of depressive symptoms. For this study, a Cronbach's alpha was calculated showing good internal consistency ( $\alpha = .87$ ).

**Rumination.** The Cognitive Emotion Regulation Questionnaire (CERQ) measured participants' general level of rumination in the baseline questionnaire. The CERQ consists of different subscales, including a rumination subscale. Four items about thoughts and feelings concerning individuals' state-trait of rumination that are answered on a five-point Likert scale. More specifically, rumination in response to stressful events is assessed (Feliu-Soler et al., 2017). The scale ranges from “almost never” (1) to “almost always” (5). Two example items are *I want to understand why I feel the way I do about what I have experienced*” and *I dwell upon the feelings the situation has evoked in me*”. Scores range from four to 20, where higher mean scores indicate a higher degree of rumination (Feliu-Soler et al., 2017). Multiple studies confirm the adequacy of construct reliability, internal consistency, convergent validity and discriminant validity of the CERQ scale (Betegón et al., 2022; Feliu-Soler et al., 2017). The CERQ is thus a reliable measure of, among others, the emotion regulation strategy of rumination. For the current study, the calculated Cronbach's alpha showed an acceptable internal consistency ( $\alpha = .76$ ).

### **State measures**

To assess both between-person associations and within-person associations, four items, among other for this study irrelevant ones, were included in the daily questionnaires. Two items

measuring rumination and one item measuring stressful events were chosen and derived from a previous ESM study (Brans et al., 2003; Kirtley et al., 2020). The rumination items *In the last hour, I have been thinking about my problems* and *In the last hour, I had repetitive thoughts about my problems* were assessed on a seven-point Likert scale ranging from 1 (not at all) to 7 (very much).

The stressful event item *Think of the most striking event or activity in the last hour. How stressful was this event or activity?* Was assessed with a seven-point Likert scale ranging from 1 (not at all) to 7 (very much) (Kirtley et al., 2020). This item was treated as a dichotomous variable with 0 = I did not think about my problems in the last hour at all to 1 = I did think about my problems in the last hour. Scores from 0 to 3 suggested the absence of a stressful event, whereas scores from -3 to -1 indicated the experience of a stressful event.

### **Data Analysis**

Items not relevant to this study were excluded. To ensure reliability of data, only participants with a response rate of at least 50% were included in the data analysis, which is typical for ESM studies (Conner & Lehman, 2012; van Berkel et al., 2019). Therefore, from 114 recruited participants, 54 participants who answered less than 50% of daily questionnaires or did not answer the baseline questionnaire were removed from the data set. To get an overview of the demographic information of participants, descriptive statistics were examined (see table 1). All calculations and examinations were made with SPSS version 27. For the variables rumination and negative affect, both person-mean scores (PM), as well as person-mean centred scores (PMC), were calculated to assess between- and within-person associations. To calculate the PM score, scores of daily rumination were accumulated for every participant. The same was done with daily negative affect scores. To get the PMC score, the PM was subtracted from each participant's daily rumination or negative affect scores. For ease of interpretation, z-scores were calculated for the variables rumination, negative affect, stressful events, the PM and PMC scores and all baseline measures. Followingly, all models were also run with standardised scores. Cohen's (1988) rule of interpretation was chosen to interpret the calculated z-scores. A coefficient of  $< .3$  can be interpreted as weak, whereas coefficients from  $.3$  to  $.5$  equal moderate scores. Lastly, coefficients of  $> .5$  can be interpreted as strong correlations. To visualise the results, Microsoft Excel was used.

To answer the research questions, linear mixed models were run (LMM). This was necessary as LMM's can deal with missing data at random, as well as handle both random and fixed effects (Myin-Germeys & Kuppens, 2022; Puspongoro et al., 2017). Moreover, LMM's

prevent the suggestion of false associations with aggregated data (Fisher et al., 2018; Yang et al., 2014). LMM's apply a correction for that by increasing the power and using random effects (Yang et al., 2014). Besides, LMM's can handle nested, multilevel data (Fisher et al., 2018).

To answer the first research question concerning the association between rumination and negative affect between and within persons, a LMM with rumination as the dependent variable and negative affect as the covariate was run. The first-order autoregressive structure (AR1) was used as it assumes that measurements are lesser correlated the more time is between measurements. Another LMM with both PM and PMC scores of rumination as fixed covariates and negative affect being the dependent variable was run. Then, with standardised scores for negative affect and both PMC and PM scores of rumination, another LMM was run. Followingly, using Excel, unstandardised negative affect and rumination scores across individuals as well as unstandardised individual scores were plotted for visualisation. Individuals were selected by calculating the mean scores and standard deviations for the variables rumination and negative affect. Consequently, three individuals with either high or low rumination and negative affect scores were selected for visualisation.

The second research question was answered by running another LMM with negative affect as the dependent variable, stressful events as independent variable and (daily) rumination as the moderating variable. Then, the LMM was run again with standardised variables. Again, the AR1 structure was used.

## Results

The average response rate of both types of questionnaires was 76.6% and can therefore be described as high for an ESM study (van Berkel et al., 2018). For the daily questionnaires, the response rate was 72.93%. Mean scores and standard deviations of trait measures as well as for the daily measures were calculated (see table 2). Moreover, the two rumination items from the daily questionnaires were merged and a total daily rumination score was computed. Participants showed low levels of daily rumination with a mean of 2.67 ( $SD = 1.36$ ). The mean score of daily negative affect can be described as low as well ( $M = 2.11$ ,  $SD = 1.11$ ). Likewise, the mean score of daily stressful events can be described as low ( $M = 1.12$ ,  $SD = 0.33$ ).

This sample's score on the MHC-SF can be described as relatively low ( $M = 2.62$ ,  $SD = 0.90$ ) in comparison to a previous study that used a non-clinical Dutch and adult sample ( $M = 3.01$ ,  $SD = 0.65$ ) (Lamers et al., 2011). Likewise, as compared to previous studies with non-clinical

samples ( $M = 3.3$ ,  $SD = 3.8$ ), the current sample scored high on the PHQ-9 ( $M = 8.35$ ,  $SD = 5.88$ ). Compared to a non-clinical student sample ( $M = 9.87$ ,  $SD = 6.05$ ), this sample also scored high on the GAD-7 ( $M = 8.62$ ,  $SD = 4.93$ ) (Dhira et. al, 2021). The average score on the rumination scale of the CERQ ( $M = 7.08$ ,  $SD = 2.76$ ) was also higher compared to previous clinical studies ( $M = 3.25$ ,  $SD = 1.38$ ) (Feliu-Soler et. al, 2017). This means that the current sample has lower mental health and higher anxiety symptoms as well as higher depressive symptoms. Moreover, the current sample uses the emotion-regulation strategy of rumination more compared to samples in previous studies (Feliu-Soler et. al, 2017).

Further, bivariate correlations for the trait measures as well as the daily measures of rumination and negative affect were computed. Except for correlations between the CERQ and PHQ as well as the CERQ and MHC-SF, all correlations were significant (see table 2).

**Table 1***Sample characteristics (N=60)*

<i>Variable</i>	<i>Category</i>	<i>%</i>	<i>N</i>
Age	Range: 18 to 65 (M= 23.41, SD= 8.01)	-	60
Gender	Male	41.6	26
	Female	58.4	34
Nationality	Dutch	16.7	10
	German	70	42
	Other	13.3	8
Educational Level	Bachelor	6.7	4
	Master	5	3
	High School	86.7	52
	Other	1.7	1
Occupation	Working	8.3	5
	Student	56.7	34
	Studying and working	30	18
	Not working	3.3	2
	Other	1.7	1

**Table 2***Mean Scores, Standard Deviations and Bivariate Pearson Correlations of State- and Daily Measures*

	<i>Mean</i>	<i>SD</i>	1	2	3	4	5
1. MHC-SF	2.62	0.90	-				
2. GAD-7	8.62	4.93	-.05**	-			
3. PHQ-9	8.35	5.88	-.32**	.70**	-		
4. CERQ	7.08	2.76	-.06*	.38**	.17*	-	
5. Daily Rumination	2.67	1.36	-.16**	.32**	.25**	.13**	-
6. Daily Negative Affect	2.11	1.11	-.20 **	.38**	.34**	.16**	.63**

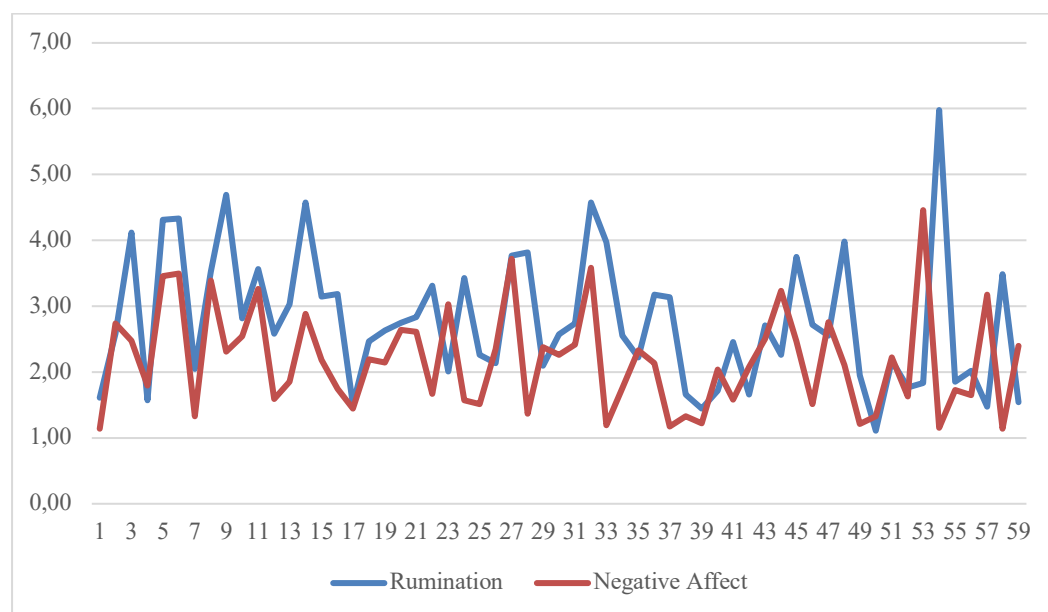
\* $p < .05$  \*\*  $p < .01$

### Visualisation of trait rumination and negative affect

The fluctuations of the variables rumination and negative affect across individuals are visualised in Figure 1. The unstandardised person mean scores of all participants were plotted. Overall, the line plot suggests a moderate to strong positive association between rumination and negative affect across individuals. On the x-axis, participants plotted as 11, 27 and 51, among others, show strong positive associations between rumination and negative affect. When the level of rumination increased, the level of negative increased as well. However, some strong negative associations can be reported as well. On the x-axis, participants plotted as nine, 22, 24, 33, 46, 54 and 58, among others, visualise strong negative associations between rumination and negative affect. This means that a higher level of rumination was not associated with a higher level of negative affect for these individuals. The level of rumination increased, while the level of negative affect decreased. Likewise, participants plotted as 34, 44, 47 and 57. among others, visualise strong negative associations between rumination and negative affect. Here, a higher level of negative affect was not associated with a higher level of rumination. Interestingly, for these individuals, the level of negative affect increased, whereas the level of rumination decreased for these individuals.

**Figure 1**

*Fluctuations of State Rumination and State Negative Affect between Persons over Time*



*Note:* Unstandardised scores of calculated rumination and negative affect person-mean scores have been used



### Association of rumination and negative affect within and between individuals

Between the variables rumination and negative affect, a significant positive association was found on both between- and within-person level. Between persons, an increase in rumination was moderately to strongly associated with an increase in negative affect ( $\beta = .47$  [0.42 - 0.52],  $p = < .001$ ). Likewise, a significant weak to moderate association between rumination and negative affect was found within persons ( $\beta = .31$  [0.28-0.35],  $p = < .001$ ). This means that a higher level of rumination at the time of the trigger was weakly to moderately associated with higher levels of negative affect compared to the individual's average level of rumination. The first hypothesis *Rumination is strongly associated with negative affect* can thus be approved ( $\beta = .47$ ,  $p = < .001$ ). The second hypothesis *Rumination is stronger associated with negative affect within individuals compared to between individuals* needs to be rejected. Even though the association was significant, rumination was not shown to be stronger associated with negative affect within individuals compared to between individuals (see table 2). Regarding the confidence intervals of both within and between-person associations, it is noticeable that these do not overlap, suggesting that the between-person association is significantly stronger.

**Table 3**

*Standardised and Unstandardised Multilevel Analyses of the Association between Rumination and Negative Affect as Independent Variable*

Parameter	$\beta$	$B$	$SE$	$df$	$t$	$p$	95% CI	
							LL	UL
Rumination	.53	0.38	0.12	2189.459	30.64	< .001	0.35	0.4
Rumination PM	.47	1.21	0.62	502.078	19.27	< .001	1.08	1.32
Rumination PMC	.31	0.64	0.32	2300.786	19.82	< .001	0.57	0.7

*Note: SE = Standard Error; CI = Confidence Interval; LL= Lower Limit; UL: Upper Limit*

### Within-Person Analysis: Individual Cases

Three individual cases were explored. Participant 34649 showed low levels of negative affect and higher levels of rumination (see figure 2). Interestingly, the level of negative affect seemed to be relatively stable, whereas the level of rumination fluctuated more. So do measures one, 25 and 43 to 45 show relatively high levels of rumination, whereas in measures 19 to 24, lower

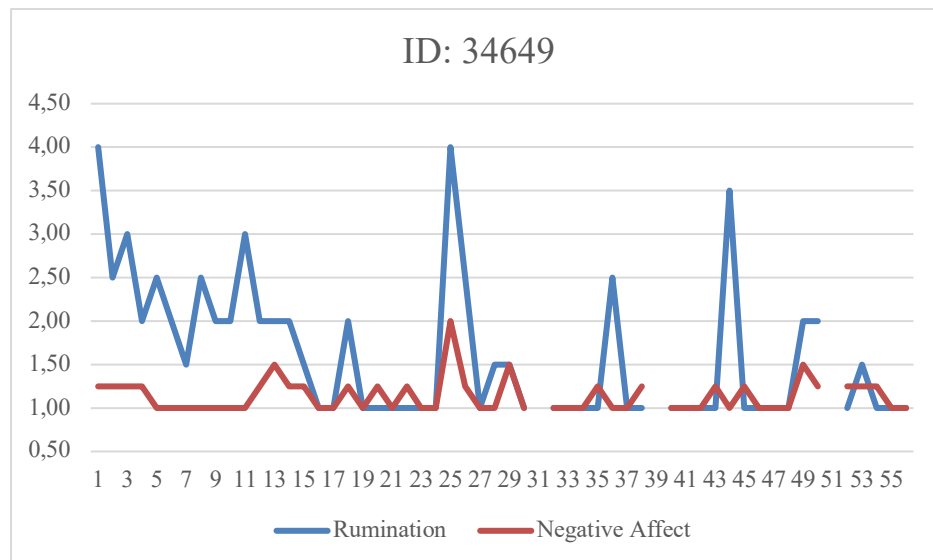
levels of rumination were observed. Negative affect was, with exception of measures 23 to 26, low throughout the whole study.

For participant 38382 (see figure 3), predominantly strong positive associations between rumination and negative affect were observed. Measures 14 to 15 and 41 to 43 can be named as examples. This means that an increase in rumination was associated with an increase in negative affect. However, some negative associations can be spotted as well. Measures 43 to 45 and 49 to 51 show that an increase in rumination was not associated with an increase in negative affect.

Figure four visualises participant 50904 with high rumination scores. Where mostly positive associations between rumination and negative were observed, measures 10 to 11 show for example a negative association.

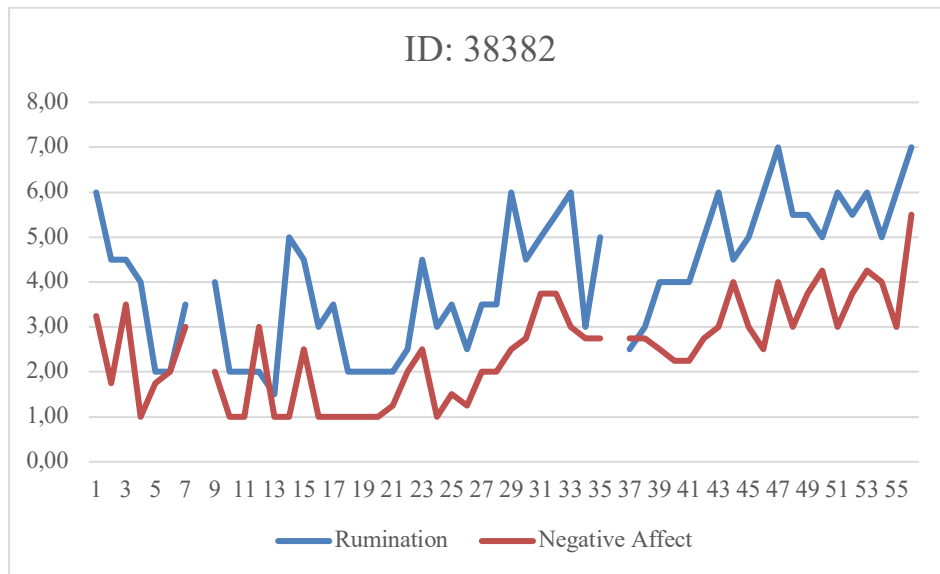
## Figure 2

*Observed Scores of Rumination and Negative Affect of Participant 34649*

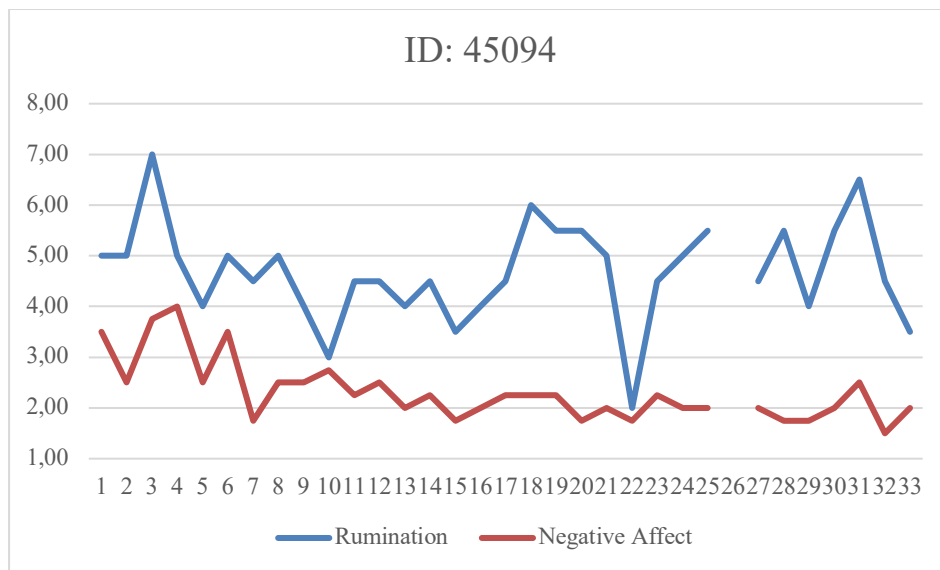


**Figure 3**

*Observed Scores of Rumination and Negative Affect of Participant 38382*

**Figure 4**

*Observed Scores of Rumination and Negative Affect of Participant 45094*



### **Association between rumination, negative affect and stressful events**

A significant standardised interaction between rumination and stressful events was found  $F(1, 4.114) = 0.03, p .043$ . Therefore, rumination moderates the relationship between stressful events and negative affect significantly (see table 4). The hypothesis *Rumination moderates the relationship between stressful events and negative affect* can thus be approved.

**Table 4***Scores of an LMM Moderation Analysis between Negative Affect, Stressful Events and Rumination*

Parameter	$\beta$	<i>B</i>	<i>SE</i>	<i>df</i>	<i>t</i>	<i>p</i>	95% CI	
							LL	UL
Intercept	.00	0.002	0.23.	2154.738	16.84	< .001	0.99	1.25
Stressful Events	.10	0.005	0.20	2176.173	2.49	.013	0.10	0.09
Rumination	.50	0.29	0.21	2329.378	12.55	< .001	0.23	0.31
Interaction Term <sup>a</sup>	.03	0.02	0.005	2159.893	3.93	< .001	0.01	0.03

*Note:* *SE* = Standard Error; *CI* = Confidence Interval; *LL*= Lower Limit; *UL*: Upper Limit

<sup>a</sup>Rumination\*Stressful Events

### Discussion

The current study aimed to investigate the association between rumination and negative affect in daily life. Previous cross-sectional and longitudinal ESM research supported this association (Moberly & Watkins, 2008; Mor & Daches, 2015). Nevertheless, no study to date has examined within- and between-person associations in relation to rumination and negative affect. To prevent false generalisations and to draw conclusions on the individual level, this study uniquely assessed the association between rumination and negative affect both between- and within individuals over time (Fisher et al., 2018). Moreover, it was aimed to investigate the possible moderating role of rumination in the association between stressful events and negative affect.

#### **The association between rumination and negative affect within-and between individuals**

The current study supports previous research reporting a strong link between rumination and negative affect (Moberly & Watkins, 2008; Mor & Daches, 2015). More specifically, a moderately strong positive association between state rumination and state negative affect was found across individuals. This is in line with the ESM study by Moberly & Watkins (2008) who have found a positive link between rumination and negative affect. Within individuals, the present study found a rather weak to moderate positive association between state rumination and state negative affect. The rather weak to moderate, positive association between state rumination and state negative affect within individuals suggests that an individual that scores higher on rumination than its usual level, is likely to experience an increased level of negative affect at the moment of measurement. Stated differently, the strong between-person association may indicate that people with a higher level of ruminative thought experience more negative affect on average. The within-

person association may indicate that individuals that score higher on certain measurements than they usually do, are also more likely to experience an increase in negative affect at the same measurement (Curran & Bauer, 2011; Hamaker et al., 2007). Interestingly, the association between rumination and negative affect was not similarly strong and positive for all participants. It was notable that certain participants scored higher on rumination and lower on negative affect, suggesting a strong negative association. This might be explained by the two factor model of rumination by Treynor et al. (2003) that parts rumination into two distinct dimensions. The first dimension, reflective pondering, refers to an individual turning inwards to reflect on situations and feelings to solve problems accordingly (Treynor, 2003). Analysing one's situation and trying to understand why one is feeling a certain way can be an example. The second dimension, brooding, focuses on the negative aspects of one's self or situation, comparing one's current situation with a not-achieved goal or a more desired state (Treynor, 2003). An example could be focusing and thinking about one's failures, negative feelings and outcomes repetitively. Therefore, reflective rumination may explain the strong negative association between rumination and negative affect for some individuals, whereas brooding may explain the strong positive association between rumination and negative affect for other individuals.

An alternative reason for the moderate to strong between-person association might be explained by the response style theory. This theory attributes a predictive role of rumination to the endurance of depressive symptoms and hence negative affect (Nolen-Hoeksema, 1991). Individuals who engage in rumination when in a negative mood are likely to experience more enduring levels of depression and negative affect (Nolen-Hoeksema, 1991). This may explain why individuals who scored on average higher on rumination, in turn, scored higher on negative affect. The current study's findings of the within-person association might be used to broaden the response style theory, suggesting that negative affect might also increase by ruminating more than one does on average.

A different theory, the analytical rumination theory, suggests that rumination might be a way for individuals to respond to- and solve problems (Andrews & Thomson, 2009). This theory focuses on the complexity of the problems individuals' experience, stating that more complicated problems lead to ruminative thought and cause negative affect (Andrews & Thomson, 2009). In line with the current study's findings, there might be a bi-directional relationship between rumination and negative affect, where rumination increases negative affect and negative affect

increases rumination subsequently. A possible explanation could be that individuals find short-term benefits in engaging in rumination, trying to make sense of situations and feelings, whereas in the long-term, rumination actually leads to more negative affect subsequently (Lyubomirsky & Nolen-Hoeksema, 1993; Vine et al., 2014).

Affect dynamics could play a role in that. More specifically, a closer look at inertia of negative affect needs to be taken. According to Brose et al. (2014), “Inertia of negative affect reflects how much negative emotions carry over from moment to moment” (p. 1). Moreover, inertia preserves the experience of negative affect for longer and has been shown to be an indicator of mental health problems (Brose et al., 2014; Houben et al., 2015). Hypothetically, rumination might increase the preservation of negative affect. As this current study has shown, rumination is positively associated with an increase in negative affect. It is thus possible that individuals with higher levels of ruminative thought may also experience higher levels of inertia, thus preserving negative mood states. Further, it may be that negative affect results from an imbalance of emotions or emotion regulation capacities. Possibly, individuals who are less capable of regulating negative emotions use the emotion regulation strategy of rumination more and hence experience more depressive symptoms and negative affect (Silk et al., 2003). This may explain the fluctuational nature of rumination and negative affect.

Exploring individual line graphs, fluctuations of rumination and negative affect were found. Interestingly, unlike hypothesised, the within-person association between rumination and negative affect was only weak to moderate, whereas the between-person association was moderate to strong. This might be because between-person associations make judgements about the effect of one variable on another (Curran & Bauer, 2011; Kraiss et al., 2022). So can between-person associations for example assume that an increase in rumination leads to an increase in negative affect generally. However, within-persons, there is more variability, as scores are compared to individuals’ own means, therefore taking individual fluctuations into account (Kraiss et al, 2022; Salthouse, 2007). What a large fluctuation would be for one individual, might not be a large fluctuation for another individual. This can be a possible explanation for the between person association being stronger than the within person association.

### **Rumination as a moderator: the relationship between stressful events and negative affect**

It was hypothesised that rumination would moderate the relationship between stressful events and negative affect. This was in line with previous longitudinal ESM research that suggested a strong link between the use of rumination after a stressful event and the experience of negative affect subsequently (Moberly & Watkins, 2008). Rumination was found to moderate the relationship between stressful events and negative affect. Specifically, rumination might increase the impact stressful events have on negative affect. As such, experiencing a stressful event and then ruminating about it may result in an increase of negative affect.

Likewise, rumination is linked to a multitude of mental disorders, including anxiety disorders, mood disorders, eating disorders and more (Jones et al., 2008; Smith et al., 2018; Wang et al., 2017). Because these mental disorders, as for example depression or bipolar disorder, are known to be linked to negative affect, rumination was expected to moderate the relationship between stressful events and negative affect (Iqbal & Dar, 2015). Besides, a link to dynamic networks can be drawn. There is a possibility that multiple variables influence each other over the course of time (Bringmann et al., 2013). One variable that could be involved in this dynamic network might be resilience.

### **Resilience as a potential buffer**

Resilience might be a potential influencing factor that acts as a buffer in the interaction of rumination and stressful events on negative affect. According to Bringmann et al. (2013) mental disorders result from a multitude of symptoms that interact and activate each other. The extent to which these symptoms interact differ from person to person and explain individual differences (Bringman et al., 2013). It may therefore be that the experience of a stressful event activates ruminative thinking and negative affect subsequently. For some individuals, this connection between stressful events, rumination and negative affect might be weaker than for others. This may be due to the reason that some individuals inherently possess higher levels of mental resilience. This is in line with previous research that has found lower levels of resilience in individuals that have higher levels of rumination (Troy & Mauss, 2011). More research is needed to assess the possible role of resilience in the association of rumination and negative affect.

### **Strengths and limitations**

The design of the current study brought about a handful of advantages. The longitudinal experience sampling design made the collection of multiple everyday life, in situ measurements

per participant possible. That way, 56 momentary measures of rumination, negative affect and stressful events have been collected per person within a short period of time. Thereby, the unique fluctuations of rumination and negative affect were able to be assessed both at an individual as well as at the group level. This is relevant as findings from the group level cannot be applied to an individual level (Curran& Bauer, 2011; Fisher et al, 2018). Another strength is the collection of data in participants' natural surroundings and immediately when questionnaires were triggered by a beep on participants' own smartphone. Thereby, both ecological validity and retrospective recall-bias were reduced, which are two weaknesses of cross-sectional research (Myin-Germeys et al., 2018; van Berkel et al., 2018). Besides, the daily questionnaires had a response rate of 76.6%, which is comparably high for ESM studies (van Berkel et al., 2018).

Nevertheless, some limitations have to be reported. This study has used the convenience sampling method. This method has the advantage of recruiting participants that are easily accessible, therefore being both time- and cost efficient in nature (Etikan et al., 2016; Jager et al., 2017). However, results can only be generalised with caution as it is questionable whether the present sample is representative of the whole population. Moreover, results run the risk to be biased, as participants were conveniently recruited using the researcher's personal contacts (Jager et al., 2017). It was notable that the majority of the sample consisted of students, making the sample homogenous. Further, having to complete multiple measurements per day can be very interruptive and individuals with more time, as for example students, might be more likely to participate in such a study compared to individuals with full-time employment (Napa Scollon et al., 2009). Hence, homogeneity of data and generalisability of findings to the broader population has to be questioned once again.

It has to be mentioned that this study cannot draw conclusions about causal processes or temporal precedence. To be able to draw conclusions on causal processes, experiments have to be conducted (Imai et al., 2012). Cross-lagged designs are needed to understand temporal processes (Kearney, 2017). Moreover, ESM studies tend to measure the same variables over again by using identical items every day. Therefore, repeatedly asking the same questions may influence and prime participants mood states and feelings (Napa Scollon et al., 2009). Perhaps, participants levels of rumination and negative affect, as well as the perception of experiencing a stressful event, were influenced by repeatedly asking about these feelings and states in particular.



### **Implications and future research**

The current study's findings can be relevant to both future research as well as to clinical practice, highlighting the dynamics between rumination, negative affect and stressful events. It was found that levels of rumination and negative affect can vary during the day and may change from moment to moment. It is of clinical importance to find out more about the underlying reasons of the fluctuations of rumination and negative affect to tailor mental health care and therapy to individuals' needs. One way to personalise care is the use of transdiagnostic treatment protocols (Fisher, 2015). Transdiagnostic treatment protocols contain a number of interventions that are suitable for a multitude of mental disorders (Fisher, 2015; Fisher et al., 2019). Moreover, individual symptoms and not only one specific illness is in focus in transdiagnostic treatment (Gutner et al., 2016). By using this approach, dynamics and symptoms that possibly influence each other can be taken into account and common features of different disorders can be considered (Fisher, 2015; Gutner et al., 2016)

Besides, it would be beneficial to investigate why the within-person association was statistically weaker compared to the between-person association. Stated differently, it is recommended to investigate the underlying reasons of when and why particular individuals ruminate more. When disentangling between and within-person associations, there can be a substantial amount of variability in individual slopes (Kraiss et al., 2022). It can thus be that there is an association between rumination and negative affect for some individuals, whereas for others there might not be such an association. To dive into inter-individual variabilities more deeply, it would be beneficial to conduct more ESM studies assessing within-person associations between rumination and negative affect. That way, possible causes of fluctuations, and not only correlations, can be identified.

Moreover, future research is advised to examine the interaction of rumination and stressful events on negative affect in more detail, as this interaction can bring about a multitude of consequences for mental wellbeing. The ESM study by Ruscio et al. (2015) has found that rumination is frequently used after the experience of stressors. As a consequence, individuals were more sensible to new stressors while also recovering from such more slowly (Ruscio et al., 2015). It is hence of clinical importance to find out more about this interaction in order to prevent the consequences rumination brings with. In addition, it would be valuable to include resilience in future models. According to Troy & Mauss (2011) individuals with higher levels of rumination

possess lower levels of resilience. Therefore, higher levels of ruminative thought may cause an increased reactivity to stress in individuals with lower levels of resilience. It is hence advisable to take up mental resilience in follow-up research.

## **Conclusion**

The present study was the first one to disentangle the association between rumination and negative affect both on an individual and group level. Previous cross-sectional studies findings were supported and extended. Between persons, a moderate to strong association between rumination and negative affect was found. Within-persons, the association was weak to moderate. This might be due to possible variability in individuals' slopes. For some individuals, there might be a strong positive association between rumination and negative affect, whereas for others, not. The dimensions of rumination, namely brooding and reflection, might explain this. In order to understand intra-individual processes in the association between rumination and negative affect better, more longitudinal research needs to be conducted. Further, a significant interaction between rumination and stressful events on negative affect was found. The findings should not only be taken as a beginning point for further research, but also as a beginning to enhance individual treatments in clinical settings.

## References

- Andrews, P. W., & Thomson, J. A. (2009). The bright side of being blue: Depression as an adaptation for analyzing complex problems. *Psychological Review*, *116*(3), 620–654. <https://doi.org/10.1037/a0016242>
- Beck, E. D., & Jackson, J. J. (2021). Within-person variability. *The Handbook of Personality Dynamics and Processes*, 75–100. <https://doi.org/10.1016/b978-0-12-813995-0.00004-2>
- Betegón, E., Rodríguez-Medina, J., del-Valle, M., & Iruetia, M. J. (2022). Emotion Regulation in Adolescents: Evidence of the Validity and Factor Structure of the Cognitive Emotion Regulation Questionnaire (CERQ). *International Journal of Environmental Research and Public Health*, *19*(6), 3602. <https://doi.org/10.3390/ijerph19063602>
- Brans, K., Koval, P., Verduyn, P., Lim, Y. L., & Kuppens, P. (2013). The regulation of negative and positive affect in daily life. *Emotion*, *13*(5), 926–939. <https://doi.org/10.1037/a0032400>
- Bringmann, L. F., Vissers, N., Wichers, M., Geschwind, N., Kuppens, P., Peeters, F., Borsboom, D., & Tuerlinckx, F. (2013). A Network Approach to Psychopathology: New Insights into Clinical Longitudinal Data. *PLoS ONE*, *8*(4), e60188. <https://doi.org/10.1371/journal.pone.0060188>
- Brose, A., Schmiedek, F., Koval, P., & Kuppens, P. (2014). Emotional inertia contributes to depressive symptoms beyond perseverative thinking. *Cognition and Emotion*, *29*(3), 527–538. <https://doi.org/10.1080/02699931.2014.916252>
- Bucknell, K. J., Kangas, M., & Crane, M. F. (2022). Adaptive self-reflection and resilience: The moderating effects of rumination on insight as a mediator. *Personality and Individual Differences*, *185*, 111234. <https://doi.org/10.1016/j.paid.2021.111234>
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). L. Erlbaum Associates.
- Connolly, S. L., & Alloy, L. B. (2017). Rumination interacts with life stress to predict depressive symptoms: An ecological momentary assessment study. *Behaviour Research and Therapy*, *97*, 86–95. <https://doi.org/10.1016/j.brat.2017.07.006>
- Connor, T. S., & Lehman, B. (2012). *Getting Started: Launching a Study in Daily Life* (M. R. Mehl, Ed.; 1st ed.). The Guilford Press.

- Curran, P. J., & Bauer, D. J. (2011). The Disaggregation of Within-Person and Between-Person Effects in Longitudinal Models of Change. *Annual Review of Psychology*, *62*(1), 583–619. <https://doi.org/10.1146/annurev.psych.093008.100356>
- Dhira, T. A., Rahman, M. A., Sarker, A. R., & Mehareen, J. (2021). Validity and reliability of the Generalized Anxiety Disorder-7 (GAD-7) among university students of Bangladesh. *PLOS ONE*, *16*(12), e0261590. <https://doi.org/10.1371/journal.pone.0261590>
- Diener, E. (2009). *Assessing Well-Being : The Collected Works of Ed Diener* (Vol. 39). Springer Netherlands.
- Eisele, G., Vachon, H., Lafit, G., Kuppens, P., Houben, M., Myin-Germeys, I., & Viechtbauer, W. (2020). The Effects of Sampling Frequency and Questionnaire Length on Perceived Burden, Compliance, and Careless Responding in Experience Sampling Data in a Student Population. *Assessment*, *29*(2), 107319112095710. <https://doi.org/10.1177/1073191120957102>
- Ethica Blog*. (n.d.). Ethica Blog. Retrieved April 7, 2022, from <https://ethicadata.com/blog/>
- Etikan, I., Musa, S. A., & Alkassim, R. S. (2016). Comparison of convenience sampling and purposive sampling. *American Journal of Theoretical and Applied Statistics*, *5*(1), 1–4. <https://doi.org/10.11648/j.ajtas.20160501.11>
- Feliu-Soler, A., Reche-Camba, E., Borràs, X., Pérez-Aranda, A., Andrés-Rodríguez, L., Peñarrubia-María, M. T., Navarro-Gil, M., García-Campayo, J., Bellón, J. A., & Luciano, J. V. (2017). Psychometric Properties of the Cognitive Emotion Regulation Questionnaire (CERQ) in Patients with Fibromyalgia Syndrome. *Frontiers in Psychology*, *8*. <https://doi.org/10.3389/fpsyg.2017.02075>
- Fisher, A. J. (2015). Toward a dynamic model of psychological assessment: Implications for personalized care. *Journal of Consulting and Clinical Psychology*, *83*(4), 825–836. <https://doi.org/10.1037/ccp0000026>
- Fisher, A. J., Bosley, H. G., Fernandez, K. C., Reeves, J. W., Soyster, P. D., Diamond, A. E., & Barkin, J. (2019). Open trial of a personalized modular treatment for mood and anxiety. *Behaviour Research and Therapy*, *116*, 69–79. <https://doi.org/10.1016/j.brat.2019.01.010>
- Fisher, A. J., Medaglia, J. D., & Jeronimus, B. F. (2018). Lack of group-to-individual generalizability is a threat to human subjects research. *Proceedings of the National Academy of Sciences*, *115*(27), E6106–E6115. <https://doi.org/10.1073/pnas.1711978115>

- Genet, J. J., & Siemer, M. (2012). Rumination moderates the effects of daily events on negative mood: Results from a diary study. *Emotion, 12*(6), 1329–1339. <https://doi.org/10.1037/a0028070>
- Goldschmidt, A. B., Wonderlich, S. A., Crosby, R. D., Engel, S. G., Lavender, J. M., Peterson, C. B., Crow, S. J., Cao, L., & Mitchell, J. E. (2014). Ecological momentary assessment of stressful events and negative affect in bulimia nervosa. *Journal of Consulting and Clinical Psychology, 82*(1), 30–39. <https://doi.org/10.1037/a0034974>
- Gross, J. J. (1998). The emerging field of emotion regulation: An integrative review. *Review of General Psychology, 2*(3), 271–299. <https://doi.org/10.1037/1089-2680.2.3.271>
- Gutner, C. A., Galovski, T., Bovin, M. J., & Schnurr, P. P. (2016). Emergence of Transdiagnostic Treatments for PTSD and Posttraumatic Distress. *Current Psychiatry Reports, 18*(10). <https://doi.org/10.1007/s11920-016-0734-x>
- Hamaker, E. L., Nesselroade, J. R., & Molenaar, P. C. M. (2007). The integrated trait–state model. *Journal of Research in Personality, 41*(2), 295–315. <https://doi.org/10.1016/j.jrp.2006.04.003>
- Houben, M., Van Den Noortgate, W., & Kuppens, P. (2015). The relation between short-term emotion dynamics and psychological well-being: A meta-analysis. *Psychological Bulletin, 141*(4), 901–930. <https://doi.org/10.1037/a0038822>
- Imai, K., Tingley, D., & Yamamoto, T. (2012). Experimental designs for identifying causal mechanisms. *Journal of the Royal Statistical Society: Series a (Statistics in Society), 176*(1), 5–51. <https://doi.org/10.1111/j.1467-985x.2012.01032.x>
- Iqbal, N., & Dar, K. A. (2015). Negative affectivity, depression, and anxiety: Does rumination mediate the links? *Journal of Affective Disorders, 181*(1), 18–23. <https://doi.org/10.1016/j.jad.2015.04.002>
- Jager, J., Putnick, D. L., & Bornstein, M. H. (2017). More than Just Convenient: the Scientific Merits of Homogeneous Convenience Samples. *Monographs of the Society for Research in Child Development, 82*(2), 13–30. <https://doi.org/10.1111/mono.12296>
- Jones, N. P., Siegle, G. J., & Thase, M. E. (2008). Effects of Rumination and Initial Severity on Remission to Cognitive Therapy for Depression. *Cognitive Therapy and Research, 32*(4), 591–604. <https://doi.org/10.1007/s10608-008-9191-0>

- Joormann, J., & D'Avanzato, C. (2010). Emotion regulation in depression: Examining the role of cognitive processes. *Cognition & Emotion*, 24(6), 913–939. <https://doi.org/10.1080/02699931003784939>
- Joormann, J., & Vanderlind, W. M. (2014). Emotion Regulation in Depression. *Clinical Psychological Science*, 2(4), 402–421. <https://doi.org/10.1177/2167702614536163>
- Kansky, J., & Diener, E. (2017). Benefits of well-being: Health, social relationships, work, and resilience. *Journal of Positive Psychology and Wellbeing*, 1(2), 129–169. <https://journalppw.com/index.php/jppw/article/view/15>
- Kearney, M. W. (2017). Cross-Lagged Panel Analysis. *The SAGE Encyclopedia of Communication Research Methods*. <https://doi.org/10.4135/9781483381411.n117>
- Kirtley, O. J., Hiekkaranta, A. P., Kunkels, Y. K., Eisele, G., Verhoeven, D., Van Nierop, M., & Myin-Germeys, I. (2020). The Experience Sampling Method (ESM). *Item Repository*. <https://doi.org/https://doi.org/10.17605/OSF.IO/KG376>
- Kraiss, J. T., Kohlhoff, M., & ten Klooster, P. M. (2022). Disentangling between- and within-person associations of psychological distress and mental well-being: An experience sampling study examining the dual continua model of mental health among university students. *Current Psychology*. <https://doi.org/10.1007/s12144-022-02942-1>
- Kraiss, J. T., ten Klooster, P. M., Moskowitz, J. T., & Bohlmeijer, E. T. (2020). The relationship between emotion regulation and well-being in patients with mental disorders: A meta-analysis. *Comprehensive Psychiatry*, 102, 152189. <https://doi.org/10.1016/j.comppsy.2020.152189>
- Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2001). The PHQ-9: Validity of a brief depression severity measure. *Journal of General Internal Medicine*, 16(9), 606–613. <https://doi.org/10.1046/j.1525-1497.2001.016009606.x>
- Kroenke, K., Spritzer, R. L., & Williams, J. B. (2001). *Validity of a brief depression severity measure*. *J Gen Intern Med*. 2001;16(9):606-613. [https://www2.gov.bc.ca/assets/gov/health/practitioner-pro/bc-guidelines/depression\\_patient\\_health\\_questionnaire.pdf](https://www2.gov.bc.ca/assets/gov/health/practitioner-pro/bc-guidelines/depression_patient_health_questionnaire.pdf)
- Lamers, S. M. A., Westerhof, G. J., Bohlmeijer, E. T., ten Klooster, P. M., & Keyes, C. L. M. (2010). Evaluating the psychometric properties of the mental health Continuum-Short Form

- (MHC-SF). *Journal of Clinical Psychology*, 67(1), 99–110. <https://doi.org/10.1002/jclp.20741>
- Larson, R., & Csikszentmihalyi, M. (2014). The Experience Sampling Method. *Flow and the Foundations of Positive Psychology*, 21–34. [https://doi.org/10.1007/978-94-017-9088-8\\_2](https://doi.org/10.1007/978-94-017-9088-8_2)
- Lo, C. S. L., Ho, S. M. Y., & Hollon, S. D. (2009). The Effects of Rumination and Depressive Symptoms on the Prediction of Negative Attributional Style Among College Students. *Cognitive Therapy and Research*, 34(2), 116–123. <https://doi.org/10.1007/s10608-009-9233-2>
- Loney, T., & Nagelkerke, N. J. (2014). The individualistic fallacy, ecological studies and instrumental variables: a causal interpretation. *Emerging Themes in Epidemiology*, 11(1). <https://doi.org/10.1186/1742-7622-11-18>
- Luijten, C. C., Kuppens, S., van de Bongardt, D., & Nieboer, A. P. (2019). Evaluating the psychometric properties of the mental health continuum-short form (MHC-SF) in Dutch adolescents. *Health and Quality of Life Outcomes*, 17(1). <https://doi.org/10.1186/s12955-019-1221-y>
- Lupano Perugini, M. L., de la Iglesia, G., Castro Solano, A., & Keyes, C. L. M. (2017). The Mental Health Continuum–Short Form (MHC–SF) in the Argentinean context: Confirmatory factor analysis and measurement invariance. *Europe's Journal of Psychology*, 13(1), 93–108. <https://doi.org/10.5964/ejop.v13i1.1163>
- Luthar, S. S., Cicchetti, D., & Becker, B. (2000). The Construct of Resilience: a Critical Evaluation and Guidelines for Future Work. *Child Development*, 71(3), 543–562. <https://doi.org/10.1111/1467-8624.00164>
- Lyubomirsky, S., Kasri, F., & Zehm, K. (2003). Dysphoric rumination impairs concentration on academic tasks. *Cognitive Therapy and Research*, 27(3), 309–330. <https://doi.org/10.1023/a:1023918517378>
- Lyubomirsky, S., & Nolen-Hoeksema, S. (1993). Self-perpetuating properties of dysphoric rumination. *Journal of Personality and Social Psychology*, 65(2), 339–349. <https://doi.org/10.1037/0022-3514.65.2.339>
- Lyubomirsky, S., & Tkach, C. (2008). The Consequences of Dysphoric Rumination. *Depressive Rumination*, 21–41. <https://doi.org/10.1002/9780470713853.ch2>

- Maas, C. J. M., & Hox, J. J. (2005). Sufficient Sample Sizes for Multilevel Modeling. *Methodology*, *1*(3), 86–92. <https://doi.org/10.1027/1614-2241.1.3.86>
- Marmor, G. S., & Montemayor, R. (1977). The Cross-Lagged Panel Design: A Review. *Perceptual and Motor Skills*, *45*(3), 883–893. <https://doi.org/10.2466/pms.1977.45.3.883>
- Mezo, P. G., & Baker, R. M. (2012). The Moderating Effects of Stress and Rumination on Depressive Symptoms in Women and Men. *Stress and Health*, *28*(4), 333–339. <https://doi.org/10.1002/smi.2417>
- Michl, L. C., McLaughlin, K. A., Shepherd, K., & Nolen-Hoeksema, S. (2013). Rumination as a mechanism linking stressful life events to symptoms of depression and anxiety: Longitudinal evidence in early adolescents and adults. *Journal of Abnormal Psychology*, *122*(2), 339–352. <https://doi.org/10.1037/a0031994>
- Miranda, R., & Nolen-Hoeksema, S. (2007). Brooding and reflection: Rumination predicts suicidal ideation at 1-year follow-up in a community sample. *Behaviour Research and Therapy*, *45*(12), 3088–3095. <https://doi.org/10.1016/j.brat.2007.07.015>
- Moberly, N. J., & Watkins, E. R. (2008). Ruminative self-focus, negative life events, and negative affect. *Behaviour Research and Therapy*, *46*(9), 1034–1039. <https://doi.org/10.1016/j.brat.2008.06.004>
- Moore, M. N., Salk, R. H., Van Hulle, C. A., Abramson, L. Y., Hyde, J. S., Lemery-Chalfant, K., & Goldsmith, H. H. (2013). Genetic and Environmental Influences on Rumination, Distraction, and Depressed Mood in Adolescence. *Clinical Psychological Science*, *1*(3), 316–322. <https://doi.org/10.1177/2167702612472884>
- Mor, N., & Daches, S. (2015). Ruminative Thinking: Lessons Learned From Cognitive Training. *Clinical Psychological Science*, *3*(4), 574–592. <https://doi.org/10.1177/2167702615578130>
- Mroczek, D. K., Spiro, A., & Almeida, D. M. (2003). Between- and within-person variation in affect and personality over days and years: How basic and applied approaches can inform one another. *Ageing International*, *28*(3), 260–278. <https://doi.org/10.1007/s12126-002-1007-z>
- Myin-Germeys, I., Kasanova, Z., Vaessen, T., Vachon, H., Kirtley, O., Viechtbauer, W., & Reininghaus, U. (2018). Experience sampling methodology in mental health research: new



- insights and technical developments. *World Psychiatry*, 17(2), 123–132. <https://doi.org/10.1002/wps.20513>
- Myin-Germeys, I., & Kuppens, P. (2022). *The Open Handbook of Experience Sampling Methodology* (2nd ed.). The center for Research on Experience sampling and Ambulatory methods Leuven (REAL) Belgium.
- Napa Scollon, C., Prieto, C.-K., & Diener, E. (2009). Experience Sampling: Promises and Pitfalls, Strength and Weaknesses. *Assessing Well-Being*, 157–180. [https://doi.org/10.1007/978-90-481-2354-4\\_8](https://doi.org/10.1007/978-90-481-2354-4_8)
- Nolen-Hoeksema, S. (1991). Responses to depression and their effects on the duration of depressive episodes. *Journal of Abnormal Psychology*, 100(4), 569–582. <https://doi.org/10.1037/0021-843x.100.4.569>
- Nolen-Hoeksema, S., Parker, L. E., & Larson, J. (1994). Ruminative coping with depressed mood following loss. *Journal of Personality and Social Psychology*, 67(1), 92–104. <https://doi.org/10.1037/0022-3514.67.1.92>
- Pratt, L. A., Brody, D. J., & Center, N. (2014). *Depression in the U.S. household population, 2009-2012*. U.S. Department Of Health And Human Services, Centers For Disease Control And Prevention, National Center For Health Statistics.
- Pusponegoro, N. H., Rachmawati, R. N., Notodiputro, K. A., & Sartono, B. (2017). Linear Mixed Model for Analyzing Longitudinal Data: A Simulation Study of Children Growth Differences. *Procedia Computer Science*, 116, 284–291. <https://doi.org/10.1016/j.procs.2017.10.071>
- Ruscio, A. M., Gentes, E. L., Jones, J. D., Hallion, L. S., Coleman, E. S., & Swendsen, J. (2015). Rumination predicts heightened responding to stressful life events in major depressive disorder and generalized anxiety disorder. *Journal of Abnormal Psychology*, 124(1), 17–26. <https://doi.org/10.1037/abn0000025>
- Salthouse, T. A. (2007). Implications of within-person variability in cognitive and neuropsychological functioning for the interpretation of change. *Neuropsychology*, 21(4), 401–411. <https://doi.org/10.1037/0894-4105.21.4.401>
- Seery, M. D., & Quinton, W. J. (2016). Understanding Resilience. *Advances in Experimental Social Psychology*, 54, 181–245. <https://doi.org/10.1016/bs.aesp.2016.02.002>

- Seo, J.-G., & Park, S.-P. (2015). Validation of the Patient Health Questionnaire-9 (PHQ-9) and PHQ-2 in patients with migraine. *The Journal of Headache and Pain*, *16*(1). <https://doi.org/10.1186/s10194-015-0552-2>
- Silk, J. S., Steinberg, L., & Morris, A. S. (2003). Adolescents' Emotion Regulation in Daily Life: Links to Depressive Symptoms and Problem Behavior. *Child Development*, *74*(6), 1869–1880. <https://doi.org/10.1046/j.1467-8624.2003.00643.x>
- Smith, J. M., & Alloy, L. B. (2009). A roadmap to rumination: A review of the definition, assessment, and conceptualization of this multifaceted construct. *Clinical Psychology Review*, *29*(2), 116–128. <https://doi.org/10.1016/j.cpr.2008.10.003>
- Smith, K. E., Mason, T. B., & Lavender, J. M. (2018). Rumination and eating disorder psychopathology: A meta-analysis. *Clinical Psychology Review*, *61*, 9–23. <https://doi.org/10.1016/j.cpr.2018.03.004>
- Southwick, S. M., Bonanno, G. A., Masten, A. S., Panter-Brick, C., & Yehuda, R. (2014). Resilience definitions, theory, and challenges: Interdisciplinary Perspectives. *European Journal of Psychotraumatology*, *5*(1), 25338. <https://doi.org/10.3402/ejpt.v5.25338>
- Spitzer, R. L., Kroenke, K., Williams, J. B. W., & Löwe, B. (2006). A Brief Measure for Assessing Generalized Anxiety Disorder. *Archives of Internal Medicine*, *166*(10), 1092. <https://doi.org/10.1001/archinte.166.10.1092>
- Stratton, S. J. (2021). Population Research: Convenience Sampling Strategies. *Prehospital and Disaster Medicine*, *36*(4), 373–374. <https://doi.org/10.1017/s1049023x21000649>
- Sun, H., Tan, Q., Fan, G., & Tsui, Q. (2014). Different effects of rumination on depression: key role of hope. *International Journal of Mental Health Systems*, *8*(53). <https://doi.org/10.1186/1752-4458-8-53>
- Thomas, V., & Azmitia, M. (2015). Tapping Into the App. *Emerging Adulthood*, *4*(1), 60–67. <https://doi.org/10.1177/2167696815618489>
- Treynor, W., Richard, G., & Susan, N.-H. (2003). Rumination Reconsidered: A Psychometric Analysis. *Cognitive Therapy and Research*, *27*(3), 247–259. <https://doi.org/10.1023/a:1023910315561>
- Troy, A. S., & Mauss, I. B. (2011). Resilience in the face of stress: emotion regulation as a protective factor. *Resilience and Mental Health*, 30–44. <https://doi.org/10.1017/cbo9780511994791.004>

- Tung, K. S., Ning, W. W., & Alexander, K., LEE Tse Yan. (2014). Effect of Resilience on Self-Perceived Stress and Experiences on Stress Symptoms A Surveillance Report. *Universal Journal of Public Health*, 2(2), 64–72. <https://doi.org/10.13189/ujph.2014.020205>
- van Berkel, N., Ferreira, D., & Kostakos, V. (2018). The Experience Sampling Method on Mobile Devices. *ACM Computing Surveys*, 50(6), 1–40. <https://doi.org/10.1145/3123988>
- van Berkel, N., Goncalves, J., Lovén, L., Ferreira, D., Hosio, S., & Kostakos, V. (2019). Effect of experience sampling schedules on response rate and recall accuracy of objective self-reports. *International Journal of Human-Computer Studies*, 125, 118–128. <https://doi.org/10.1016/j.ijhcs.2018.12.002>
- Vine, V., Aldao, A., & Nolen-Hoeksema, S. (2014). Chasing Clarity: Rumination as a Strategy for Making Sense of Emotions. *Journal of Experimental Psychopathology*, 5(3), 229–243. <https://doi.org/10.5127/jep.038513>
- Wang, S. B., Lydecker, J. A., & Grilo, C. M. (2017). Rumination in Patients with Binge-Eating Disorder and Obesity: Associations with Eating-Disorder Psychopathology and Weight-bias Internalization. *European Eating Disorders Review*, 25(2), 98–103. <https://doi.org/10.1002/erv.2499>
- Ward, A., Lyubomirsky, S., Sousa, L., & Nolen-Hoeksema, S. (2003). Can't Quite Commit: Rumination and Uncertainty. *Personality and Social Psychology Bulletin*, 29(1), 96–107. <https://doi.org/10.1177/0146167202238375>
- Watkins, E. R. (2008). Constructive and unconstructive repetitive thought. *Psychological Bulletin*, 134(2), 163–206. <https://doi.org/10.1037/0033-2909.134.2.163>
- Watkins, E. R., & Roberts, H. (2020). Reflecting on rumination: Consequences, causes, mechanisms and treatment of rumination. *Behaviour Research and Therapy*, 127, 103573. <https://doi.org/10.1016/j.brat.2020.103573>
- Wichers, M., Lothmann, C., Simons, C. J. P., Nicolson, N. A., & Peeters, F. (2011). The dynamic interplay between negative and positive emotions in daily life predicts response to treatment in depression: A momentary assessment study. *British Journal of Clinical Psychology*, 51(2), 206–222. <https://doi.org/10.1111/j.2044-8260.2011.02021.x>
- Willis, K. D., & Burnett Jr., H. J. (2016). The Power of Stress: Perceived Stress and Its Relationship with Rumination, Self-Concept Clarity, and Resilience. *North American Journal of Psychology*, 18(3), 483–498.

- Wisco, B. E., & Harp, D. R. (2021). Rumination as a mechanism of the association between interpretation bias and depression symptoms: A longitudinal investigation. *Journal of Experimental Psychopathology*, *12*(2), 204380872110152. <https://doi.org/10.1177/20438087211015233>
- Yang, J., Zaitlen, N. A., Goddard, M. E., Visscher, P. M., & Price, A. L. (2014). Advantages and pitfalls in the application of mixed-model association methods. *Nature Genetics*, *46*(2), 100–106. <https://doi.org/10.1038/ng.2876>
- Zhong, Q.-Y., Gelaye, B., Zaslavsky, A. M., Fann, J. R., Rondon, M. B., Sánchez, S. E., & Williams, M. A. (2015). Diagnostic Validity of the Generalized Anxiety Disorder - 7 (GAD-7) among Pregnant Women. *PLOS ONE*, *10*(4), e0125096. <https://doi.org/10.1371/journal.pone.0125096>

## **Appendix A**

### **Informed Consent**

Dear participant,

Thank you for your participation in this study. Before you participate, it is important that you understand the goal of this research and what the study will ask from you. The purpose of this study is to find out how mental health is related to emotion regulation. To explore this relationship, we want to measure fluctuations in emotions in daily life.

For this study, we will ask you to fill in several questionnaires on your mobile phone. All questionnaires will be completed in the Ethica app. The study will start with a questionnaire concerning your demographics and general mental health. This initial questionnaire will take about 10 minutes to complete. Afterwards, you will receive four questionnaires per day for a period of two weeks. Notifications will remind you about the next questionnaire. One daily questionnaire takes approximately 3 minutes to complete. It is important that you answer the questionnaires as soon as possible. *Please make sure that you turn on the notifications for the Ethica app on your mobile device.*

The information that we collect from this research project will be kept confidential. This means that only the researchers have insight into your answers. All personal data (such as age, gender etc.) will be anonymized and will not be published and/or given to a third party. Your participation in this study is voluntary. You are free to withdraw from this study at any time and without giving a reason.

#### **Contact information**

If you have any questions regarding this study, you can contact the researchers of this research project Jasmin Wallner (j.wallner@student.utwente.nl), Paula Oberle (p.v.oberle@student.utwente.nl), Natalie Koop (n.koop@student.utwente.nl), Caroline Dauer (v.c.dauer@student.utwente.nl), Kia Lemmen (k.r.lemmen@student.utwente.nl) and Jenny Schwabe (j.schwabe@student.utwente.nl).

#### **Consent**

I have read and understood the information provided and had the opportunity to ask

questions. I understand that my participation is voluntary and that I am able to withdraw at any time, without a reason or cost. I hereby voluntarily agree to take part in this study.

## Appendix B

### Baseline Questions

#### Demographics

- Age: How old are you?
- Gender: What gender do you identify as? Male, female, other
- Nationality: What is your nationality? Dutch German Other
- Occupation: What is your current occupation? Student, Working, Self-employed, studying and working, not working, other
- Highest degree obtained: Middle school (such as MBO, MTS, MEAO or Haupt- oder Realschule), High school (such as HAVO, VWO, HBS or Gymnasium/ Berufsschule/ Berufskolleg), High school, Bachelor, Master, PhD, Other

#### Mental well-being (MHC-SF)

During the past month, how often did you feel...

1. Happy
2. Interested in life
3. Satisfied with life
4. That you had something important to contribute to society
5. That you belonged to a community
6. That our society is a good place or is becoming a better place, for all people
7. That people are basically good
8. That the way our society works makes sense to you
9. That you liked most parts of your personality
10. Good at managing the responsibilities of your daily life
11. That you had warm and trusting relationships with others
12. That you had experiences that challenged you to grow and become a better person
13. Confident to think or express your own ideas and opinions
14. That your life has a sense of direction or meaning to it
  1. Never

2. Once or twice
3. About once a week
4. About 2 or 3 times a week
5. Almost every day
6. Every day

#### Anxiety (GAD-7)

Over the last two weeks, how often have you been bothered by the following problems?

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
  - a. Not at all
  - b. Several days
  - c. More than half the days
  - d. Nearly every day

#### Depression (PHQ-9)

Over the last 2 weeks, how often have you been bothered by any of the following problems?

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 of hurting yourself

- a. Not at all
- b. Several days
- c. More than half the days
- d. Nearly every day

#### Rumination (CERQ)

State how often you think in the following manner when experiencing strong threatening or stressful life events.

- 1. I often think about how I feel about what I have experienced
- 2. I am preoccupied with what I think and feel about what I have experienced
- 3. I want to understand why I feel the way I do about what I have experienced
- 4. I dwell upon the feelings the situation has evoked in me

- a. Almost never
- b. Occasionally
- c. Frequently
- d. Almost always

## Appendix C

### Daily questionnaire

#### Stressful event

1. Think of the most striking event or activity in last hour. How (un)pleasant was this event or activity?
  - -3 (very unpleasant) to +3 (very pleasant)
  
2. Think of the most striking event or activity in the last hour. How stressful was this event or activity?
  - 1 (not at all) to 7 (very much)

#### Rumination

1. In the last hour, I have been thinking about my problems
  2. In the last hour, I had repetitive thoughts about my problems
- 1 (not at all) to 7 (very much)