

The Relationship between Coping Mechanisms and Mental Health in the Context of Stressful
Events: An Experience Sampling Study

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Abstract

Background: Cross-sectional studies on coping mechanisms have established adaptiveness for social support seeking and reappraisal and maladaptiveness for rumination and distraction regarding mental health outcomes. However, these studies cannot account for the context in which a coping mechanism is used. This study employs the Experience Sampling Methodology to analyse the association between coping mechanisms and mental health in the context of stressful events.

Method: Participants ($n = 31$, mean age = 29, 61% female, 39% male) were asked to self-report stressful events, negative state affect and momentary reappraisal use ten times a day for one week. Additionally, a baseline assessment of mental health, depression symptoms and anxiety symptoms were administered. Linear mixed models were used to analyse the associations between coping mechanisms after stressful events and state well-being. Pearson correlations were calculated to examine the association between coping mechanisms and trait mental health. **Results:** A significant positive association between momentary rumination and negative affect ($p < .001$) and a significant positive association between the relative frequency of rumination with anxiety symptoms ($p = .016$) was found. Distraction, social support seeking, and reappraisal were neither significantly associated with negative affect nor trait mental health.

Conclusion: Only rumination seems to be associated with maladaptive mental health outcomes in the context of stressful events, while distraction, social support seeking, and reappraisal seem not to be associated. It is encouraged to conduct studies which explore separate parts of rumination while accounting for stressful events with a more heterogeneous sample with differing mental health states and trajectories while also measuring recovery to baseline affect states.

Introduction

Stressful events are part of daily life for every human being. Exposure to stressful events seems to be associated with psychological problems (Kendler & Gardner, 2010). One factor that can influence mental health positively by facilitating recovery from stressful events is resilience. Resilience has been defined as having the capacity to quickly recover from stressful events (Ahern et al., 2006; Bohlmeijer & Westerhof, 2021; Smith et al., 2008; Tusaie & Dyer, 2004). Adaptation to adverse events can happen through different resources with either adaptive or maladaptive mental health outcomes. A critical part of resilience for successful adaptation to stressful events is an individual's coping mechanisms (Frydenberg, 2017). While on the other hand, barriers, such as dysfunctional cognitions, emotions, and behaviour, lead to an unsuccessful adaptation of the event and cause mental well-being to stagnate or decrease even further (Bohlmeijer & Westerhof, 2021).

Resilience and coping have been studied thoroughly within the last decade because they seem connected to well-being and mental illness symptoms (Frydenberg, 2017). Coping is critical to building one's own or society's resilience. Resilience can be seen as the learned result of knowing and being able to overcome adverse life events while coping can be seen as the process that may facilitate or hinder adaptation (Ghanei Gheshlagh et al., 2017). Adaptive coping mechanisms make it more likely for individuals to adapt to life's hassles by regulating emotions. Adaptive coping mechanisms have in common that they work by regulating emotions after stressful events successfully (Gross, 1998). Regulating emotions adaptively is associated with positive well-being outcomes (Doorley & Kashdan, 2021). In contrast, maladaptive coping mechanisms could be useless in regulating emotions and even propagate the problem(s), possibly leading to increased mental illness symptoms (Kraiss et al., 2020). Although research has investigated the relationship between resilience and overall mental health, less is known about coping mechanisms.

Studies have tried to investigate the relationship between putatively adaptive and maladaptive coping mechanisms and how it affects the individual at the moment but did not account for the context of a stressful event to a satisfactory extent. Recent studies relied on cross-sectional designs to analyse mental health outcomes for putatively maladaptive and adaptive coping strategies, which can only account for general tendencies of coping styles (Ben-Zur, 2009; Martos Martínez et al., 2021). The mentioned studies' design cannot examine these coping mechanisms in daily life and their direct relation to the context. This suggests that the findings rely on the assumption that maladaptive coping mechanisms always lead to harmful

and adaptive coping strategies always lead to positive mental health outcomes. However, depending on the specific context, these outcomes could vary.

As already mentioned, there are many coping mechanisms individuals use, but on average, some coping mechanisms seem to be more beneficial than others. A meta-analysis by Kraiss et al. (2020) analysed the following two coping strategies for the relationship between each strategy and well-being; reappraisal “(i.e. cognitively reinterpreting a situation)” and rumination “(i.e. repetitively focusing on cognitions or emotions)”. A significant weak positive relationship between cognitive reappraisal could be found with well-being. Rumination was reported to have a significant small negative correlation with well-being. Another meta-analysis on the relationship between psychopathology and coping mechanisms found a significant strong positive association between rumination and psychopathology and a significant weak negative association between reappraisal and psychopathology (Aldao et al., 2010). The third coping mechanism, distraction, is used if the individual changes their attention to something other than the event. In a study including students, the coping mechanism distraction revealed significant positive correlations with symptoms of depression, anxiety, and stress (Mishra et al., 2021; Saxon et al., 2016). Although distraction is a controversial coping mechanism, it might help reduce momentary distress. The fourth coping mechanism, social support seeking, is connected to individuals discussing their stressors with others. A study on people in nursing programs concluded that social support seeking is beneficial in dealing with the effects of stress and increasing well-being (Reeve et al., 2013).

Due to the mentioned relationship between well-being and mental health, the strategies of rumination and distraction will be regarded as maladaptive strategies, while social support seeking and positive/negative reappraisal will be regarded as adaptive coping strategies (Aldao et al., 2010; Kraiss et al., 2020; Mishra et al., 2021; Reeve et al., 2013; Saxon et al., 2016). Varying study designs, samples, and contexts have been used to study coping strategies as being adaptive or maladaptive, making it difficult to generalise these findings. One vital variable to consider when studying the adaptability of coping strategies is the context in which they occur. Previous studies often did not specifically examine the context in which coping mechanisms are used.

To account for the context that a coping mechanism is used directly after a stressful event instead of examining it as a general tendency of people, the experience sample method (ESM) is suitable. The Experience Sampling Method (ESM) examines what people do, feel, and think daily (Larson & Csikszentmihalyi, 2014). It involves various subjective measurements during a typical week of waking hours to ask subjects to submit systematic self-reports. Collecting

these self-reports from a sample of people results in a record of daily life. Several ESM studies already examined the relationship between resilience and mental health. A study by Kuranova et al. (2020) looked at how quickly adolescents with varied mental health trajectories recovered from minor setbacks in daily life to predict changes in psychopathological symptoms, measured by their affective state. They found that adolescents who experience increasingly more symptoms the following year recover from negative experiences measured by their affective state more slowly than those with stable symptoms. Another similar study by De Calheiros Velozo et al. (2023) found that risk groups for developing depression have significantly longer recovery times of their affective state after a stressful event than a non-risk group. A third study by Vaessen et al. (2019) compared groups of people in early stages and chronic psychosis and concluded that individuals in the early stages of psychosis needed significantly longer recovery after daily life stressors than healthy individuals and individuals with chronic psychosis. These findings suggest that individuals in unstable states (whether healthy or not), e.g., with currently deteriorating mental health need more time to recover from stressful events measured by the affective state. However, these studies did not investigate the use of coping mechanisms when dealing with a stressful event. The following research questions will be answered:

Research Question 1: How is the frequent use of maladaptive and adaptive coping strategies after stressful events associated with momentary negative affect?

Research Question 2: Is frequent use of maladaptive coping strategies after stressful events associated with overall mental illness symptoms and well-being?

Research Question 3: Is frequent use of adaptive coping strategies after stressful events associated with fewer overall mental illness symptoms and more well-being?

Hypothesis 1: Using putatively maladaptive coping strategies after stressful events is positively correlated with negative affect, while using putatively adaptive coping strategies after stressful events are negatively correlated with negative affect.

Hypothesis 2: People who, on average, engage more frequently in putatively maladaptive coping strategies experience more mental illness symptoms and less well-being.

Hypothesis 3: People who, on average, engage more frequently in putatively adaptive coping strategies experience fewer mental illness symptoms and more well-being.

Methods

Participants

Selective convenience sampling was used to draw in 239 individuals from three waves of data collection by various researchers. Selective convenience sampling is a non-probability sampling technique in which participants are chosen for the study depending on their availability and inclination to participate, so individuals in the researchers' networks were asked to participate. According to a meta-analysis of sample sizes in mobile ESM studies (van Berkel et al., 2018), the most recent ESM studies had a median of 19 participants, which aligns with standard sample sizes in social sciences (Caine, 2016). Since ESM studies can be demanding, as participants must stop their current activity by filling in a questionnaire multiple times per day for a week, low compliance rates could become problematic (Hsieh et al., 2008). After testing sample sizes based on excluding participants with varying compliance rates, a cut-off point of 33.3% overall compliance was chosen (n= 58) to have a satisfying balance of participants and compliance to be conclusive (Myin-Germeys & Kuppens, 2021).

Personal evaluations were given to every "active" (minimum of 33.3% overall compliance rate) participant. A 40€ Amazon/Bol voucher was awarded randomly to one of the active participants to create an additional incentive for compliance. The study was also posted on SONA (sona-systems.com), a University of Twente internal recruitment tool that rewards psychology students with SONA credits for participating in research to increase the sample size. The only requirements were the minimum age requirements of 18, a smartphone for self-reporting the data and a reasonable degree of English proficiency.

Materials

Demographics

To find out the demographics of the participants as well as trait levels of mental well-being, depression and anxiety symptoms, a baseline questionnaire had to be filled in once at the beginning of the study. The participants were asked about their age, gender, nationality, occupation, and the highest degree obtained.

Baseline questionnaire

Mental Health Continuum Short Form. The Mental Health Continuum Short Form (MHC-SF) scale was used to assess general well-being, including emotional, psychological, and social well-being (Lamers et al., 2010). The instrument has 14 items that can be answered

in one of six ways, ranging from 1 (never) to 6 (every day), and it measures how frequently people experience good mental health symptoms (Lamers et al., 2010). The total of the items ranges from 0-70, with higher scores indicating higher levels of well-being, according to Lamer et al. (2010). According to the previous study, the questionnaire has excellent internal reliability ($\alpha = 0.89$). In this Dutch sample, convergent validity and overall reliability were also supported.

Patient Health Questionnaire-9. The Patient Health Questionnaire-9 (PHQ-9) was used to measure depression symptoms (Kroenke et al., 2001). The instrument has nine items that can be answered in one of six ways, ranging from 1 (never) to 6 (every day). The items range from 0-45, with higher scores indicating more depression symptoms. According to Kroenke et al. (2001), the PHQ-9 is a reliable and valid measure of depression symptoms. The questionnaire has excellent internal reliability ($\alpha = 0.89$), while the test-retest reliability was also excellent in the study of (Kroenke et al., 2001).

General Anxiety Disorder-7. General Anxiety Disorder-7 (GAD-7) was also added to measure general anxiety symptoms in the participants (Spitzer et al., 2006). The total item score ranges from 0-21, with higher scores representing more anxiety symptoms. The article (Spitzer et al., 2006) suggests that the GAD-7 is a valid and reliable tool for accessing generalised anxiety disorder severity in individuals. The GAD-7's internal consistency was excellent ($\alpha = .92$), and the intraclass correlation value of .83 indicated that test-retest reliability was also good, according to the previous article.

Daily questionnaire

Negative affect. To measure momentary negative affect, four items have been selected. According to an ESM-item database, these items measure negative affect, which grants items specially designed for ESM questionnaires ("Esmitemrepository.com," n.d.). The four items "How 'anxious', irritable, 'down' and 'guilty' do you feel right now?" assess momentary negative affect. Response options ranged from 1 (not at all) to 7 (very much) on a 7-point Likert scale, with higher scores suggesting higher momentary negative affect for the four items. These items have been used in previous ESM studies (Schleich, 2022; Schwabe, 2022).

Stressful event + coping. The participants were asked to answer six items to evaluate how unpleasant an event in the recent last hour was and which coping mechanism was used. These given items have also been extracted from the ESM-item database ("Esmitemrepository.com," n.d.). The first item asks the participant to "Think of the most striking event or activity in the last hour. How (un)pleasant was this event or activity?" Answers on this item can range from -3 (very unpleasant) to +3 (very pleasant) to distinguish between stressful and non-stressful events. The last four items ask the participants to clarify which

coping mechanism(s) were used by asking, “I kept thinking about it (rumination/savouring)”, “I tried to distract my attention from it (distraction)”, “I talked to others about it (social support seeking)”, and “I tried to look at it in a different way (positive/negative reappraisal)”, which can be answered with either “yes” or “no”. This set of items has been used in previous ESM studies (Schleich, 2022; Schwabe, 2022).

Design and Procedure

The final data collection used for this research is made up of a total of 3 waves of data collection; the two first waves were conducted by students at the University of Twente for their bachelor's or master's theses in 2022 and 2023, with the same study design at separate time points prior to the current study. The third wave of data collection is the current study, which was collected from April 16, 2023, until April 22, 2023. This study is part of a larger randomised controlled trial in which individuals were randomised into two questionnaire types (VAS and Likert). At the same time, only the Likert condition participants will be used for this study ($n = 67$).

The study was uploaded to the platform Ethica Data (<https://ethicadata.com/>) after receiving approval from the University of Twente's Behavioural, Management, and Social Sciences Ethics Committee (request nr: 230038). The Ethica Data app was available for download, and participants were invited to join using the study code the researchers gave. Participants have forwarded the informed consent form after enrolling on the study (Appendix A, B). After receiving consent, the 20-minute baseline questionnaire was launched at 9 am on the first day of the trial, and if it was not completed, reminders were sent at 8, 24, and 72 hours later. The baseline questionnaire (Appendix C) only required to be completed once and was available for the complete trial duration. The semi-structured sampling approach was used to initiate daily questions, which were anticipated to take 3 minutes to complete. This sample plan suggests that questionnaires are randomly suggested within a predetermined time frame (Myin-Germeys & Kuppens, 2021). The ESM questionnaires (Appendix D) were triggered randomly within 90-minute minutes with a notification, but without reminder, starting from 7.30 to 22.30 and expired after 15 minutes. Comparing it to a fixed sampling scheme, which is constrained by high predictability, one benefit of such a scheme is its comparatively high ecological validity (Myin-Germeys & Kuppens, 2021). Furthermore, semi-fixed intervals benefit the compliance rate compared to a random interval design, which prompted questionnaires to happen at random time points (Myin-Germeys & Kuppens, 2021).

Data analysis

The data based on the questionnaires were obtained from the Ethica website and evaluated via the statistical programme RStudio. As used in earlier ESM work (Schwabe, 2022), the data sets were created by excluding participants without a completed baseline assessment and a compliance rate of less than 33.3%. The longitudinal study design with several measurements per individual is typical for ESM data. Fixed effect models do not help analyse this data type, so more complex statistical models are needed to obtain more accurate results (Hox, 1998). The Linear Mixed Model (LMM) allows for the analysis of the given data without violating the independence assumption and considers random errors, missing data, and the clustered structure of the data (Brown, 2021).

To test the first research question, the data had to be rearranged to only show observations after stressful events and complete cases for the relevant variables. After that, relevant variables had to be fit for a linear mixed model. For the dependent variable, the scores of the momentary negative affect scale (4 questions) have been summed and divided by 4 to get the mean momentary negative affect for each observation. Each coping mechanism was used as a binary variable for the independent variables. The participant variable has been used as a random effect to account for clustering within participant observations.

To test the second and third research questions, the relative frequency of each coping mechanism after a stressful event was calculated for each participant. This was done by summing the total number of observations after a stressful event where a coping mechanism was used for each participant and then dividing the sum by the total number of observations after a stressful event for each participant. After that, the total scores for the MHC-SF, PHQ-9, and GAD-7 questionnaires were added together separately to generate a score for each questionnaire. Finally, Pearson correlations were calculated to determine the association between the relative frequency of coping mechanisms and the well-being and mental illness questionnaires. Only one observation per participant was used to avoid a unit-of-analysis error. Utilising standardised ratings, the classification system developed by (Cohen, 1988) was applied to categorise the associations' strengths. The following relationships are each categorised as weak: $r < 0.3$; moderate: $r = 0.3- 0.5$ or strong: $r > 0.5$

Results

Sample Characteristics

The dataset was cleared for complete baseline questionnaires and a 33.3% compliance rate in the ESM questionnaires ($n = 31$; female = 19, male = 12). The participant's ages ranged from 20 to 62, with a mean age of 29.09 (SD = 13.26). The dataset mainly consisted of Germans studying and working with a minimum of a high school degree. Note that the analysis only

regarding the ESM questionnaires has more participants due to lost baseline data from one of the data collection waves. The given sample has a mean of 3.02 ($SD = .88$) for the MHC-SF, 0.60 ($SD = .54$) for the PHQ-9 and 0.80 ($SD = .59$) for the GAD-7 questionnaire per question. In a general Dutch population sample (Lamers et al., 2010) ($n = 1662$), the mean was 3.98 ($SD = .85$) for the MHC-SF per question; in a general German population sample (Tomitaka et al., 2018) ($n = 5018$) the mean was 0.32 ($SD = .39$) for the PHQ-9 per question and in a general population sample from Germany (Löwe et al., 2008) ($n = 5030$) the mean was .42 ($SD = .49$) for the GAD-7 questionnaire per question. Therefore, this study's sample has lower mental well-being, more depression and anxiety symptoms than general Western European samples.

Table 1

Sample characteristics (n=31)

		n	%
Gender	Female	19	61.3
	Male	12	38.7
Nationality	Dutch	1	3.2
	German	30	96.8
Occupation	Working	12	38.7
	Student	10	32.3
	Studying and working	8	25.8
	Other	1	3.2
	High school	12	38.7
	Bachelor	13	41.9
	Master	5	16.1
Other	1	3.3	

Research Question 1

When using the linear mixed model to test the association between the use of each coping mechanism after stressful events and momentary negative affect, one significant and several insignificant relationships were found (see Table 2). Firstly, there was a significant

positive association between the rumination coping strategy and momentary negative affect ($B = .50, p < .001$). However, the results for the other coping strategies showed non-significant associations with momentary negative affect. The distraction coping strategy displayed a non-significant negative association ($B = -0.12, p = .257$) to negative affect. Similarly, the social support-seeking coping strategy demonstrated a non-significant negative association ($B = -.09, p = .402$). Furthermore, using the positive/negative reappraisal coping strategy also showed a non-significant negative association ($B = -0.03, p = .780$).

Table 2

Linear mixed model, fixed effects fit by maximum likelihood to test the association between the use of each coping mechanism after stressful events (separately) and momentary negative affect.

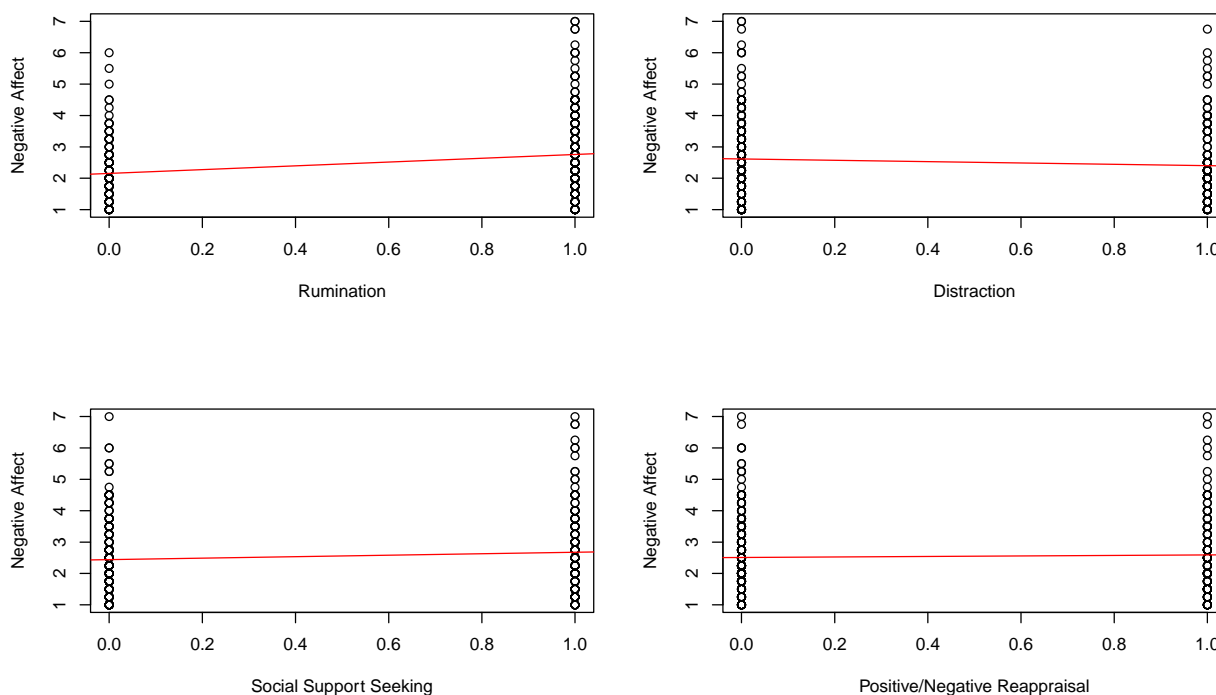
Parameter	<i>B</i>	<i>SE</i>	<i>df</i>	<i>t</i>	Sig	Lower bound*	Upper bound*
Intercept	2.26	.13	85.99	17.10	<.001	2.00	2.52
Rumination	.50	.10	400.05	5.05	<.001	.30	.69
Intercept	2.61	.13	66.33	20.51	<.001	2.36	2.86
Distraction	-.12	.11	408.90	-1.14	.257	-.33	.09
Intercept	2.60	.13	68.91	19.83	<.001	2.34	2.87
Social							
Support	-.09	.10	406.85	-.84	.402	-.29	.12
Seeking							
Intercept	2.57	.13	65.69	20.22	<.001	2.32	2.83
Positive							
Reappraisal	-.03	.11	405.93	-.28	.780	-.24	.18

Note. level 1 = 424, level 2 = 58, *: 95% Confidence Interval

The relationships between the use of each coping mechanism after stressful events and momentary negative affect are depicted with regression lines using plots to visualise the association (see Figure 1).

Figure 1

Visualised association between the use of each coping mechanism after stressful events and momentary negative affect using plots with regression lines.



Note. The use of coping mechanisms was coded as 0 = not used and $x = 1$ used.

Research Questions 2 & 3

The correlation analysis examined the relationships between each of the coping mechanisms and the MHC-SF (well-being), GAD-7 (anxiety symptoms), and PHQ-9 (depression symptoms) questionnaires. The correlations revealed a significant association between rumination and GAD-7 ($r = 0.43, p = .016$). According to Cohen (1988), the strength of this correlation is moderate. The associations between distraction and anxiety symptoms ($B = .28, p = .127$), social support seeking and anxiety symptoms ($B = .25, p = .175$), and reappraisal and trait well-being ($B = .20, p = .281$) were the three pairs with the smallest p-values, although still insignificant. All other correlations were weak and insignificant. Concludingly, only rumination after a stressful event is partly associated with mental illness symptoms.

Table 3

Pearson correlations between the coping mechanisms, well-being, anxiety, and depression.

	MHC-SF	GAD-7	PHQ-9
Rumination	0.05	0.43*	0.06
Distraction	0.08	0.28	0.11
Social Support Seeking	-0.09	0.25	0.13
Reappraisal	0.20	-0.08	-0.07

Note. n = 31, *. Correlation is significant on the level of .05 (two-sided)

Discussion

This study examined the relationship between coping mechanisms after a stressful event and negative affect. Previous research (Aldao et al., 2010; Kraiss et al., 2020; Mishra et al., 2021; Reeve et al., 2013; Saxon et al., 2016) indicated that maladaptive coping strategies are associated with unfavourable mental health outcomes, while adaptive coping mechanisms are associated with favourable mental health outcomes. To explore if these findings extend to state mental health, the association between negative affect and coping mechanisms after stressful events was analysed. Contrary to the hypothesis, distraction, social support seeking, and reappraisal showed no significant association with negative affect, indicating no significant association with state mental health. However, rumination after stressful events was positively associated with negative affect, suggesting a significant negative impact on state mental health. The second objective was to examine the association between coping mechanisms after stressful events and general mental health. Previous studies (Aldao et al., 2010; Kraiss et al., 2020; Mishra et al., 2021; Reeve et al., 2013; Saxon et al., 2016) suggested that frequent use of maladaptive coping mechanisms is associated with more mental illness symptoms and less well-being, while frequent use of adaptive coping mechanisms is associated with fewer mental illness symptoms and more well-being. However, distraction, social support seeking, and reappraisal did not significantly affect mental health, in contrast to the hypothesis. On the other hand, rumination was positively associated with anxiety symptoms, indicating a weak positive association with mental illness.

These findings hint at varying implications about the effects of using a particular coping mechanism after stressful events and short- and long-term outcomes on mental health. Since distraction, social support seeking and reappraisal after stressful events neither showed

significant associations with negative affect nor trait mental health; it can be concluded that the adaptive and maladaptive labelling of these three coping mechanisms is misleading, at least in the context of stressful events. One possible explanation is that these labels imply a static view of coping mechanisms, regardless of context, which might need to be more complex. The cross-sectional studies (Aldao et al., 2010; Kraiss et al., 2020; Mishra et al., 2021; Reeve et al., 2013; Saxon et al., 2016) might have come to their conclusion about the maladaptiveness or adaptiveness of coping mechanisms because the retrospective design of the questionnaires only collected general tendencies of participants (traits). This suggests that state observations might find different associations between mental health outcomes and coping mechanisms than trait observations.

When interpreting the findings of this study with the cross-sectional findings of previous studies (Aldao et al., 2010; Kraiss et al., 2020; Mishra et al., 2021; Reeve et al., 2013; Saxon et al., 2016), one could argue that state coping of distraction, social support seeking, and reappraisal have no association with negative affect and mental health after stressful events because these coping mechanisms might be context-independent. This would mean that the tendency to use these coping mechanisms would have the proposed adaptive or maladaptive effects on mental health outcomes instead of there being a specific coping mechanism to use after stressful events.

Another explanation for the insignificant associations with mental health outcomes could be that this study and previously mentioned studies only analyse group models but not looking at within-person results. This is crucial, especially in the field of psychology, as most theories and models aim to conclude something about within persons (Curran & Bauer, 2011; Hamaker et al., 2007). When not strictly separating all statistical effects, the results contain a mix of between- and within-person effects (Curran & Bauer, 2011; Wang & Maxwell, 2015). This means that this study can say something about German students in general but not about participants' differences, which would be important for the meaningfulness of labels of either adaptive or maladaptive coping mechanisms. Participants still vary in terms of many variables, which could moderate the relationship between coping strategies and negative affect. A study by Sing Chai (2015) found that personality dimensions and stress level predicted the choice of coping mechanism in a student sample. Another study revealed that age determined which situation was seen as stressful and which coping mechanism was tendentially used (De Minzi & Sacchi, 2005). The findings of the previous two studies are also based on group models but still hints at possible other explanations between coping mechanism and negative affect. To test this possible explanation, future research could use an ESM design to separate the variables

from extracting within-person measurements while accounting for mediating variables, such as age and personality.

Another factor that seems to be important to understand if coping mechanisms are adaptive or maladaptive is the time it takes for negative affect to recover to baseline after a stressful event. A meta-analysis by (Houben et al., 2015) found that low well-being is associated with more intensive emotions, more significant fluctuations between consecutive moments and recovery to the baseline affect state to take longer, especially regarding negative affect. A study by Myin-Germeys et al., (2018) adds that slower recovery time to baseline affect level before an affect-changing event indicates more maladaptive coping mechanisms. These findings open the possibility that distraction, social support seeking, and reappraisal might unfold their affect change over a more extended period so that they could display a significant association. This could be tested in future research by measuring the affect state before the stressful event and analysing how long it takes for the affect state to get back to the affect level before the stressful event. Applying an ESM design in future research makes it possible to account for the context of a stressful event while also adding analysis of the time it takes for negative affect to drop to baseline after a stressful event to measure recovery time like it was used in previous ESM studies (De Calheiros Velozo et al., 2023; Kuranova et al., 2020; Vaessen et al., 2019)

However, rumination seems to be associated with disadvantages in the short- and long-term for mental health, also when accounting for stressful events, according to this study. Research by (Treyner et al., 2003) suggests that a unidimensional definition of rumination might be misleading because it entails two concepts instead of one, proposing a dual definition. The first is brooding, characterised by *“a passive comparison of one’s current situation with some unachieved standard”*. At the same time, reflective pondering is *“a purposeful turning inward to engage in cognitive problem solving to alleviate one’s depressive symptoms”* (Treyner et al., 2003). Further studies incorporating this differentiation found adaptive effects for reflective pondering and maladaptive associations for mental health outcomes (Joormann et al., 2006; Treyner et al., 2003). These studies might benefit ruminations if reflective pondering is used instead of brooding. This gives a more nuanced perspective on rumination and illustrates the importance of clarifying the concept, as outcomes seem to differ. Applying this dual definition of rumination to the findings of this study, the sample might have engaged more in brooding, although this is only speculation. Future research might analyse if the coping mechanism rumination after stressful events still displays similar associations with mental health outcomes when the measurements for rumination account for brooding and reflective pondering.

Strengths and Limitations

One of the major strengths of this study is the longitudinal design combined with the ESM approach, which makes it possible to collect many within-person observations with context knowledge to account for the use of coping mechanisms after a stressful situation instead of measuring a coping mechanism without context knowledge (Myin-Germeys et al., 2018).

The generalizability of the results of this study is restricted due to the relatively small and homogenous sample. On the other hand, this study can give some insights about (German) students and their relationship with coping mechanisms, negative affect, and mental health.

Although ESM can measure observations about the moment and within one week, there might be an issue with accounting for external changes for the students, which occur over more extended periods than one week. Momentary present events/environments affect individuals, such as upcoming deadlines, social stressors, weather, or other events related to students' affect level (Cooke et al., 2006), which might be present for a week but change over more extended periods. The data collection in waves could benefit since each of the three waves might have been exposed to varying circumstances, possibly generating a more diverse and thus realistic sample than if all the data was collected during the same week.

Since one wave of baseline questionnaires was missing due to a technical error, the models to analyse the first research question had more data points but missing information about the demographics and trait questionnaires for some participants. Statistical power was also lower than anticipated due to the low compliance rate. This could potentially change some of the outcomes for the second and third research questions because more data would yield higher statistical power to analyse the association between the use of coping mechanisms after stressful events and trait mental health.

Conclusion

The current study investigated the relationship between using maladaptive and adaptive coping mechanisms after stressful events with negative affect and mental health. The findings suggest that rumination was associated with negative affect and that this coping mechanism is positively correlated with anxiety symptoms. Otherwise, distraction, social support seeking, and reappraisal were not significantly associated with negative affect or mental health. For future research, it is encouraged to conduct studies exploring rumination with the proposed dual definition while accounting for stressful events with a more heterogenous and more significant sample size with differing mental health states and trajectories while measuring recovery with negative affect and accounting for possible mediating variables such as age and personality.

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Appendix A

Invitation Form

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 bachelor of 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 into the behaviour 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 at 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, April 17. 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 at 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 to 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 sign up in Ethica, login into the Ethica application using your username and password.

After logging in, click on the following link on your phone:

<https://ethicadata.com/study/2349/>

Alternatively, you can also directly enter the registration code **2349** in the Ethica application.

On the next window, click on "Register" to enrol 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 researchers involved. If you have any questions, you can contact one of the following students who are involved in data collection or the supervisors. The contact details can be found below.

Students

Simon Brune (s.j.brune@student.utwente.nl)

Nick Delventhal (n.a.delventhal@student.utwente.nl)

Jan Derksen (j.derksen-3@student.utwente.nl)

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

Kind regards, also on behalf of the whole study team,

Jan

Appendix B

Informed Consent

Dear participant,

Thank you for your participation in this study.

Brief summary of the project

The study is using the Experience Sampling Method (ESM) to obtain data. This means that 10 times a day, there will be a prompt to answer a questionnaire containing about 20 items, which will take about 1 minute to complete. The questions regard your psychological well-being at the specific moment you are receiving the questionnaire and the time in-between questionnaires. It is important to fill out as many questionnaires as possible to ensure the success of the project.

To participate in this study, we need to ensure that you understand the nature of the research, as outlined in the participant information sheet. Please confirm at the bottom of the page to indicate that you understand and agree to the following conditions:

I confirm that I have read the participant information sheet for this study. I have had the opportunity to consider the information, ask questions, and have had these answered satisfactorily

I understand that to take part in this study, I should

- o Be at least 18 years old
- o Possess a basic level of English

I understand that personal data about me will be collected for the purposes of the research study, including age, gender, nationality, level of education, current studies, and primary occupation, and this data will be processed completely anonymously and in accordance with data protection regulations.

I understand that taking part in this study involves that I will be filling in 10 questionnaires every day for one week.

I am voluntarily taking part in this research, and I know that I can stop the research at any time without giving any reason, without my rights being affected

I don't expect to receive any benefit or payment for my participation.

I understand that I am free to contact the researchers or supervisor with any questions I may have in the future.

I understand that the data collected in this study will be anonymised and only be used for academic purposes, i.e., writing a thesis for the bachelor and/or master.

I understand that personal data that will be collected within this study will not be shared with anyone other than the study team.

I agree to take part in this study.

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee/domain Humanities & Social Sciences of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by ethicscommittee-hss@utwente.

Appendix C

Baseline Questionnaire

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 like 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
 - a. Never
 - b. Once or twice
 - c. About once a week
 - d. About 2 or 3 times a week
 - e. Almost every day
 - f. 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 hurting yourself
 - a. Not at all
 - b. Several days

- c. More than half the days
- d. Nearly every day

Appendix D

Daily 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!

- How *cheerful* do you feel right now?
 - How *enthusiastic* do you feel right now?
 - How *satisfied* do you feel right now?
 - How *relaxed* do you feel right now?
 - How *anxious* do you feel right now?
 - How *irritable* do you feel right now?
 - How *down* do you feel right now?
 - How *guilty* do you feel right now?
- 1 (not at all) to 7 (very much)

Stressful event + coping

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

- -3 (very unpleasant) to +3 (very pleasant)

How did you deal with this event?

- I kept thinking about it (rumination/savouring)
 - I tried to distract my attention from it (distraction)
 - I expressed my emotions (emotion expression)
 - I talked to others about it (social support seeking)
 - I tried to look at it in a different way (positive/negative reappraisal)
- Yes/no