An experience sampling study on self-compassion and stress response in the daily lives of university students

Nele Feldbusch

Supervision and Examination Committee
Dr. Matthijs Noordzij
Gerko Schaap

Faculty of Behavioural, Management and Social Sciences
Department of Psychology, Health and Technology
University of Twente

Enschede, July 2022

Abstract

Background: Previous studies have shown that high levels of trait self-compassion buffer against stress responses in individuals. There is, however, little research on the influence of momentary levels of self-compassion, although it would be interesting to investigate as research shows high variability of self-compassion within a person over time. Additionally, the Lazarus stress response theory and past research pose that cognitive reappraisal might influence not only self-compassion but also stress response levels.

Objective: This study investigated the association between stress response and self-compassion over time as well as on average by utilising Experience Sampling Method (ESM). Additionally, the association between state stress response and cognitive reappraisal was investigated.

Methods: Data was collected from 31 participants (M_{age}= 21.5). To measure the trait levels, a one-time questionnaire including the SSCS-L, the SRS-10, and the ERQ was utilised. To capture the momentary fluctuations, daily repeated surveys, including the adjusted SSCS-S, the SNRS, the daily hassle scale and the ERQ, were utilised. This survey was administered 5 times a day over the course of 7 days in the app Ethica.

Result: Linear Mixed Model (LMM)analysis revealed a significant negative association between stress response and both state (β= -.44, p< .001) and average state self-compassion (β= -.54, p< .001). There was no significant within-subject association between state stress response and cognitive reappraisal (β=-.02, p= .057). Additionally, state stress response was significantly negative related to self-compassion both between and within subjects, tough the within-subject level had a higher predictive value.

Conclusion: This study shows novel insights into the association between self-compassion and stress response in students' daily lives, providing a theoretical ground for further studies. Showing a negative relationship, this study could either predict that self-compassion functioned as a buffer or show that students became harsher and less self-compassioned when experiencing a stress response. Furthermore, it was shown that both state and average weekly state self-compassion levels were able to predict stress response. Nevertheless, state self-compassion significantly varied on the within-person level, suggesting that further studies should focus on both trait and state self-compassion.

Keywords*:* Stress Response, Self-Compassion, Cognitive-Reappraisal, ESM-Study, Students

An experience sampling study on self-compassion and stress response in the daily lives of university students

Stress responses are something most people frequently experience in their daily life, and responses of a chronic nature can potentially lead to considerable mental and physical health issues (Adler, & Matthews, 1994; Chrousos, 2009; Ensel, & Lin, 1991). Because of the wide prevalence and range of consequences, researchers have devoted great effort into discovering possible factors influencing stress-response levels in the past years. One interesting finding was the positive relation between self-compassion and the ability to cope with adverse life events as well as psychological wellbeing (Allen, & Leary, 2010; Kirkpatrick et al., 2006), suggesting that there could also be a correlation between self-compassion and stress-response (Harkness, & Hayden, 2020). However, research on this is hardly applicable to a person's daily life as it only measured trait levels of the participants at single time points and therefore disregards daily fluctuations and state levels. Therefore, this study will aim to decrease this limitation by investigating whether possessing a high level of self-compassion in a stressful situation buffers against a high stress response and what coping processes could be involved in that by using the experience sampling method (ESM).

Stress-response

Defining stress is difficult; Hans Seley, often perceived as the father of stress (Fink, 2016), said: “Everyone knows what stress is, but nobody really knows” (Seley, 1956). This is due to different factors, including its dependency on a person's sensitivity, the context, the individuality of the bodily response and the field of research it is applied to (Fink, 2016; Glanz, & Schwartz). For the purpose of this research paper, a stress response is regarded as a multicomponent psychological reaction (Lazarus, & Folkman, 1986) to a stressor, which is an external event varying in its effect depending on the individual’s resilience and vulnerability (Fink, 2016; Krohne, 2001).

This definition is in accordance with the Lazarus stress response theory, which identifies two variables determining the intensity of a stress response: the person's cognitive appraisal and the individual ability to cope (Lazarus, & Folkman, 1986), which will be elaborated upon in the following. First, cognitive reappraisal can be defined as "an individual's evaluation of the significance of what is happening for their wellbeing" (Fink, 2001). It is based on the assumption that the stress response level depends on the stressor's perceived significance and outcome

(DeLongis, & Lazarus, 1983). The appraisal of this significance takes place on two levels: the perceived importance of the stressor to the individual regarding wellbeing, values and beliefs and the perceived ability to deal with the stressor with readily available resources. Secondly, the ability of the individual to cope with the external event can be defined as: "the cognitive and behavioural efforts made to master, tolerate, or reduce external and internal demands and conflicts among them" (Lazarus, & Folkman, 1980). There are numerous coping strategies which can happen on different cognitive levels. Lazarus and Folkman (1980) proposed that there are two dimensions: problem-focused coping, which is eliminating the source of stress, and emotion-focused coping, which is working on regulating the negative emotions of the stressful external event. Recent research has, however, criticised that these categories are overly broad, and individuals tend to engage in both categories equally (Allen, & Leary, 2010; Dubow, 2011).

Self-Compassion

One concept which affects the individual's coping ability with stress responses has been studied more recently is self-compassion. Therefore, the following part will focus on defining it and looking at past research results. Neff (2003a, 2003b) conceptualised self-compassion as a "healthy form of self-acceptance". It is composed out of three core dimensions: “self-kindness, common humanity, and mindfulness” (Allen, & Leary, 2010). Self-kindness mainly shows in being reassuring towards oneself and forgiving own mistakes. Common humanity refers to the person's insight that suffering is inevitable in every human life. Mindfulness refers to being attentive to one's constantly changing situation in a balanced and non-judgmental way (Allen, & Leary, 2010).

Astin et al. (2005) found that when practising mindfulness over a period of two months, perceived stress response decreased significantly. The same result was found by Biegel et al. (2007) when investigating the stress response level of undergraduate college students after practising Mindfulness-Based Stress Reduction (MBSR), as well as an increase in self-compassion. As mindfulness is one of the three core dimensions of self-compassion, this hints at some kind of buffering effect of self-compassion on stress response. Additionally, the study by Hirsch et al. (2015) has shown a significant direct relationship between stress-response and self-compassion in adolescents with chronic illness. Although promising, all of these studies were designed in a cross-sectional manner. This does not allow for measuring effects in real time and

life, making them prone to memory bias and measurement errors (Myin-Germeys, & Kuppens, 2022), ultimately reducing the ecological validity. However, a more recent and ecologic momentary assessment study by Deng et al. (2019) also showed off a decreasing effect of self-compassion on stress response at a state level. Though this study primarily focused on the effects of self-compassion on health-promoting behaviours, it shows off first attempts to deepen the knowledge and get further insights into daily fluctuations of self-compassion. All of this research hints at some kind of relationship between self-compassion and stress-response; therefore, the current study will focus on further examining the association, especially on the, until now, mostly disregarded momentary level.

Additionally, it will be investigated which measurement level of self-compassion would be best suited to predict the state stress-response level in individuals. Research until now only focused on determining the general predictive values of state or trait self-compassion but never compared them, although it would give first guidance on how to treat and ascribe predictive values to all cross-sectional research as well as how to design future research (Bauer, & Curran, 2011). The study by Deng et al. (2019), however, gives a first hint by showing significant variance on the within-person level of self-compassion, which suggests a great importance of the momentary assessment of self-compassion.

Cognitive Reappraisal

In general, cognitive reappraisal is conceptualised as viewing the stressor in a more favourable light by changing one's mindset, a form of active coping. Past research has shown that it is strongly related to self-compassion and, through that, decreases the stress response levels in individuals. For example, Dejitterat et al. (2005) showed that students high in self-compassion engaged in acceptance and positive reinterpretation after receiving bad grades. Additionally, research has shown that self-compassion relates negatively to avoidance-escape behaviour, which is the foundation for cognitive reappraisal and means individuals high in self-compassion are more likely to take responsibility for the situation (Allen, & Leary, 2010).

Apart from the studies ascribing the decreasing influence of cognitive reappraisal on stress response solely to its influence on self-compassion, there is also precious research suggesting a direct influence of cognitive reappraisal on stress response. Mollenholts et al. (2008) showed that inhibiting emotional reactions and not engaging in cognitive reappraisal is

associated with higher stress-response symptoms in undergraduate students. This, however, needs to be taken into account cautiously, as the studies showing off this connection are all cross-sectional, only regarding trait self-compassion and trait coping style, without real insight into the daily fluctuation of those variables and their correlation, significantly decreasing their ecological validity., (Solem, 2015). Nonetheless, this research would align with the Lazarus stress-response theory (Lazarus, & Folkman, 1986), which identifies cognitive reappraisal as one of the two broad factors influencing the intensity of the stress response in individuals.

Therefore, it is interesting to see whether there is any connection between stress response and cognitive reappraisal not only because research assumes that cognitive reappraisal influences self-compassion, which in turn influences stress responses, but also because there is research and theory on the direct association between the two. To increase the ecological validity and include daily fluctuations of cognitive reappraisal in an individual, this will also be done on a state basis.

Purpose of the Current Study

The first research question will investigate the association between average weekly state stress-response and self-compassion to better understand the between-person variability and predicting value for one another. This is important as different participants may display completely different associations and levels of fluctuations due to factors like the strength of the stressor or individual resilience. These fluctuations are therefore averaged out to get a better picture of the general association.

RQ1: *How are weekly average state stress-response and weekly average state self-compassion associated in-between university students?*

The second research question aims to investigate the association between state self-compassion and state stress-response within participants to get an understanding of the fluctuations and variability in the predictive value of the variables over time. This is as important to explore as there is a definite lack of research in this area, although providing higher ecological validity of the relationships.

RQ2: *How are state stress-response and state self-compassion associated in university students over time?*

Furthermore, the relationship between state cognitive reappraisal and stress response will be explored to examine whether the possible association between self-compassion and stress

response might also be influenced by it. This would agree with Lazarus stress-response theory (Lazarus, & Folkman, 1986), although there is not much research on it, especially concerning the daily state relationship.

RQ3: *How are state stress response and state cognitive reappraisal associated over time in university students?*

Finally, there is a lack of research on the ability of state and weekly average state self-compassion to predict state stress-response levels, although this would provide an excellent basis for evaluating the cross-sectional research on this matter. Therefore, the within-participant and between-participant levels of self-compassion will be disaggregated and compared in their predictive value on stress response level to see whether one is better fitted.

RQ4: *What predicting value has the weekly average state self-compassion score and the momentary state self-compassion score for state stress response in university students?*

Method

Design

This study utilised the experience sampling method (ESM), enabling a repeated daily state measurement (Appendix D), as well as a cross-sectional method, enabling a one-time measurement. Furthermore, the study was done in the mobile app Ethica which allows for the creation of personalised test batteries and triggering logistics with their own notifications on a daily basis.

Participants

The study sample consisted of 31 participants (M_{age}: 21.5, SD_{age}: 1.6), of which 16 were female and 12 were male. 23 participants were German, two were Dutch, and three were from other nationalities. Three Participants did not fill in the trait questionnaire, leading to missing demographic data points, but were still included due to the low participation number. 16 participants were excluded from the research because of response rates under 50 %. All participants were collected through convenient sampling by offering the study on the BMS faculty's SONA system in exchange for course credits. Before beginning the study, ethical approval was collected from the ethical committee of the University of Twente (220268), as well

as active online informed consent from all participants following the guidelines for research at the University of Twente.

Materials and measures

Trait Questionnaire

Perceived stress scale (PSS-10): The PSS-10 (PSS; Cohen et al., 1983) assesses the degree to which a stressor evokes a high-stress response by measuring 10 items using a 5-Point Likert scale from 0 (never) to 4 (very often). The response is reversed for the 4 positive stated items (Items 4, 5, 7, & 8). The result is obtained by then summing up all item points. The possible results range from a low stress response (0-13) over moderate stress response (14-26) to high a stress response (27-40). The PSS-10 has been shown to have robust psychometric properties with an excellent internal consistency (α= .75), adequate test-retest reliability ($r > .70$) and satisfactory construct validity (Du et al., 2020; Eun-Hyun, 2012). In this study, the PSS-10 showed an excellent internal consistency (α=.91).

State Self-Compassion Scale Long Form (SSCS-L): The SSCS-L (Davidson et al. 2021) assesses the self-compassion of an individual by measuring 18 items on a 5-point Likert scale ranging from not at all true for me (1) to very true for me (5). Items include all three dimensions of self-compassion: kindness, common humanity, and mindfulness, as well as their reversed effects: self-judgement, isolation and over-identification. The responses of the 9 reversed items (items 2, 4, 6, 8, 10, 12, 14, 16 & 18) are therefore also coded reversed. The total score is obtained by computing the mean of all sub-scales, adding them up and again taking the mean. The possible results range from low (1- 2.49), over moderate (2.5-3.5), to high (3.51-5.0). The SSCS-L has shown to have robust psychometric properties with excellent internal reliability (α= .94), and the total, as well as sub scores, were associated with the expected positive and negative effects (Davidson et al.,2021). In addition, this study showed an excellent internal consistency (α=.91).

Emotion regulation questionnaire (ERQ)- positive cognitive reappraisal subscale: The positive cognitive reappraisal subscale of the ERQ (Gross & John, 2003) entails 6 items measuring reappraisal on a 7-point Likert scale, ranging from strongly disagree (1) to strongly agree (7). The total score is obtained by taking the average. Greater scales indicate higher use of positive cognitive reappraisal as a coping strategy. The cognitive reappraisal scale proved to have

robust psychometric properties, excellent internal reliability (α= .82), and a good overall criterion validation (*r* = 0.17). (Becerra et al., 2020). In addition, this study found adequate internal reliability (α=.69).

Daily Questionnaire

Stress numeric rating scale- 11 (SNRS-11): The SNRS-11 (Davies et al. 2016) measures the state stress response level on a scale from not experiencing a stress response at all (0) to the worst stress response possible (10). The outcome is a one-dimensional measurement of the intensity of the state stress response level. Compared to well-validated stress response measures like the PSS, the SNRS-11 has proven good psychometric properties with moderate to good construct validity and concurrent validity (Davies et al., 2016). In addition, a split half reliability analysis has proven excellent internal reliability (α= .95) for this scale.

The daily hassles scale: The daily hassles scale was used to measure in which context the state stress-response level occurred. Participants were presented with eight categories: Inner concerns, financial concerns, Time pressures, work/study-related hassles, environmental hassles, family hassles, health issues, covid related hassles and none, from which the most prevalent needs to be selected. These categories were derived from a study by Holm and Holroyd (1992), which proved this scale to be effective for grouping daily hassles into categories.

State Self-compassion short form (SSC-S): The SSC-S (Davidson et al., 2021) measures the state self-compassion level on a 5-Point Likert scale, ranging from not at all true for me (1) to very true for me (5). Items 2, 4 & 6 are reversed coded. To calculate the total score, the mean of all questions is taken. (1- 2.49), over moderate (2.5-3.5) to high (3.51-5.0). The SSC-S has shown excellent internal reliability (α = .86) and a nearly perfect correlation (r = .96) with the SSC-F (Davidson et al., 2021). The original scale was, however, designed to be applied in combination with the instruction to imagine a stressful event and then answer the items. Therefore, the sentence: "Given that you have indicated that you experienced a stressful event, would you say" was added before the items, as well as a "right now" after the item to ensure that the participants answered the items in the context of the momentary stressful event experienced. In this study, the items showed a strong correlation with the original scale (r= .66). Through a split-half-reliability test, this study found good internal reliability (*r*=.91).

Emotion regulation questionnaire (ERQ)- cognitive reappraisal subscale: To measure the state cognitive reappraisal, the item: "When I am faced with a stressful situation, I make myself think about it in a way that helps me stay calm" from the ERQ (Gross & John, 2003) was used and reformulate to: “In this current stressful situation, I make myself think about it in a way that helps me stay calm.” to ensure the best understanding possible. This was done because the initial ERQ was designed to measure the trait level cognitive reappraisal, while this study tries to measure the momentary level of cognitive reappraisal in accordance with the stressor experience, which needs to be made clear to the participants. This study found a moderate to bad correlation with the ERQ (r=.32). A split-half reliability analysis also showed good internal consistency (α= .85).

Procedure

After having signed up for the study on SONA, participants were led to the app Ethica, where they needed to fill in the study code provided prior to this and accept the study's conditions. Then, the participants were led to the study's homepage, where they were presented with the trait questionnaire. This test battery was only presented once at the beginning of the study and started with the informed consent form, continued with the demographic questions and finished with the trait questionnaires. After having filled that in, the participants were led back to the homepage, where the daily questionnaire was presented to them at the fixed time points: 9 am, 12 noon, 3 pm, 6 pm, and 9 pm over the course of one week. At those time points, participants received one notification via the app. Questionnaires were open to being filled out until the next collection point. This sampling frequency and duration were chosen to balance the amount of data needed for the researcher to gain insights into the daily fluctuations and the burden for the participant coming with the risk of dropping out (Myin-Germeys, & Kuppens, 2022). In addition, the order of the state questions stayed similar over the course of the study to enable quick response and reduce the burden (Myin-Germeys, & Kuppens, 2022). Having finished the 7-day study, participants were granted the total course credits. Data was collected throughout April and the beginning of May.

Data Analysis

The data set obtained by Ethica was transferred and analysed in IBM SPSS Statistics (version 28). In ESM studies, the cut-off scores for response rates of participants vary but are mainly located between 50 % (Conner, & Lehman, 2012) and 69% (Van Berkel et al., 2017). Therefore, all participants below the value of 50 % were omitted. Additionally, answers of participants who indicated a stress level of 0 on the SNRS were disregarded to ensure only measuring the variables when a stress response was present. Descriptive statistics were calculated for demographic data, as well as the trait and state levels.

To answer the current research questions, this study utilised simple linear regression as well as Linear Mixed Modelling (LMM) with an autoregressive structure to account for missing values and the possible higher correlation between time points closer together. To answer the first research question, a simple linear regression was applied to measure the association between the weekly average state stress-response (DV) and the weekly average state self-compassion (IV) in-between participants. For the second research question, LMM was applied to measure the association between state stress-response (DV) and state self-compassion (IV), with time points (IV) as an additional variable to account for the correlation between the variables over time. To answer the third research question, LMM was applied to measure the association between state stress response (DV), state cognitive reappraisal (IV) and state self-compassion (IV). Again, the variable time point (IV) was added to account for the correlation between the variables over time. Finally, to answer the last research question, an LMM with state stress-response (DV), the disaggregated scores of state self-compassion (IV) and time point (IV) were utilised. For this, person mean (PM) and person mean centred (PMC) of state self-compassion were calculated (Bauer, & Curran, 2011). To make interpretation more accessible, all effects were standardised.

To check for the validity of the adjusted state questions from the SSCS-S, as well as the ERQ, Pearson's correlation was utilised for the relationship between a) trait SSCS-L and mean state SSCS-S b) trait ERQ and mean state ERQ. Cut-off points of $r > 0.50$ suggest a strong relation, $r > 0.30$ suggest a moderate relation, and $r > 0.10$ suggest a weak relation. Additionally, split half reliability was calculated for both adjusted questionnaires to check for internal consistency of the adjusted state questionnaires. Finally, Cronbach's alpha was calculated for all scales with more than one question to check for internal consistency.

Results

Descriptive Statistics

All participants below the threshold of 50 % completed questionaries were omitted. In total, 47 participants took part in this study, of which 16 were excluded due to a general response rate under 50 %. After this, response rates were, on average 75.36 %. Generally, the results of the PSS-10 revealed that the participants were moderately stressed, while the SNRS-11 showed a low amount of stress response over the 7-day daily measurement (See Table 1). For self-compassion, the SSCS-L generally showed a moderate level of self-compassion in participants, which the SSCS-S also showed over the 7 days measurement period. Finally, the results of the ERQ generally showed a moderate to high level of cognitive reappraisal. At the same time, the state score of the ERQ revealed a general moderate level of cognitive reappraisal.

Table 1

Minimum, Maximum, Means and Standard Deviations (SD) of State and Trait: Stress Response, Self-Compassion, Cognitive reappraisal

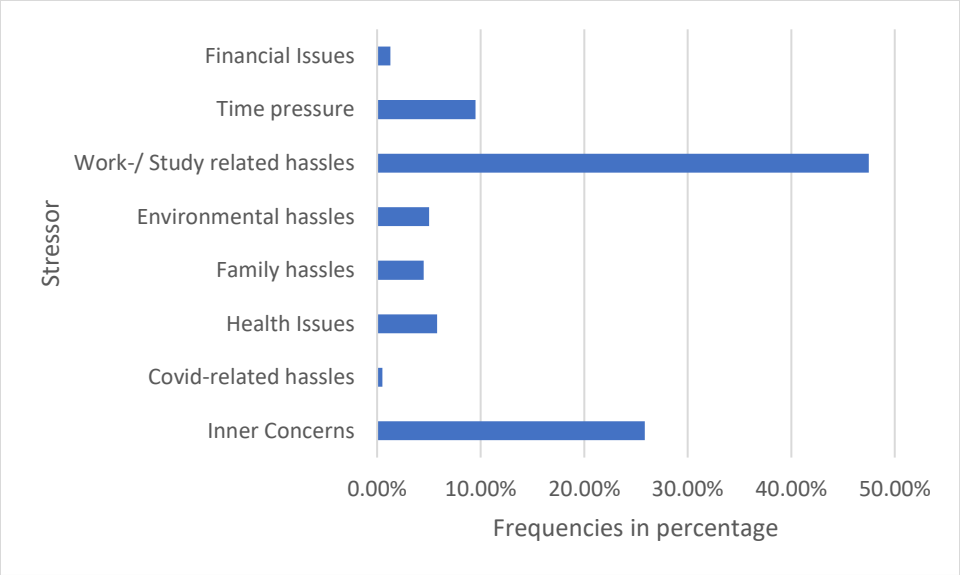
	Minimum (Scale minimum)	Maximum (Scale maximum)	Mean (SD)
State stress reponse (SNRS-11)	0 (0)	10 (10)	2.7 (2.33)
Trait stress response (PSS-10)	4 (0)	37 (40)	19 (7.12)
State self-compassion (SSCS-S)	1 (1)	5 (5)	3.46 (.71)
Trait self-compassion (SSCS-L)	2 (1)	5 (5)	3.4 (.62)
State cognitive reappraisal (ERQ)	1 (1)	7 (7)	4.4 (1.38)
Trait cognitive reappraisal (ERQ)	2 (1)	7 (7)	5.48 (1.21)

In order to obtain a general picture of the type of hassle causing participants a stress response, a frequency analysis was conducted (see Figure 1). The results showed that participants mostly experienced work-/study-related hassles (47.5 %). With quite a difference in percentage, people second most often experienced inner concerns (25.9 %), followed with a huge gap by time

pressure (9.5%), health issues (5.8 %), environmental hassles (5 %), family hassles (4.5 %), financial issues (1.3 %) and covid related hassles (0.5 %).

Figure 1

Frequencies of relative numbers of times a type of hassles experienced in the sample



Regarding the general level of stress response, participants showed a generally fluctuating level of stress, which, in the beginning, was slightly heightened and decreased over time (Appendix A). As shown in Figure 2, there was a large within-person variance of state self-compassion, with some having a higher variance (e.g., Participant 6) and some having a lower variance (e.g., Participant 10) but also a lot of between-person variances. The same can be seen in Figure 3, showing the variance in cognitive reappraisal; there are again a lot of within-person variance, some larger (e.g., Participant 14), some smaller (e.g., Participant 3) but also a lot of variances between the participants.

Figure 2

Boxplots displaying the levels of state self-compassion displayed by each participant over their 7-day participation

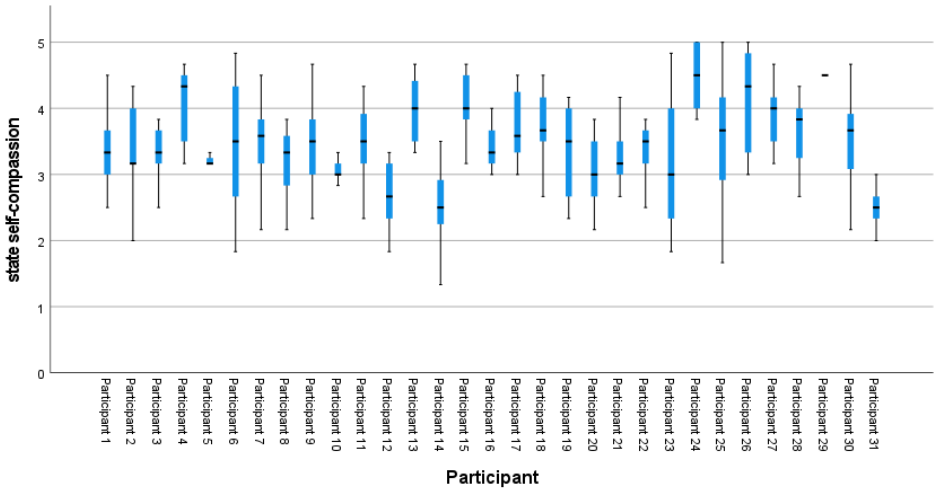
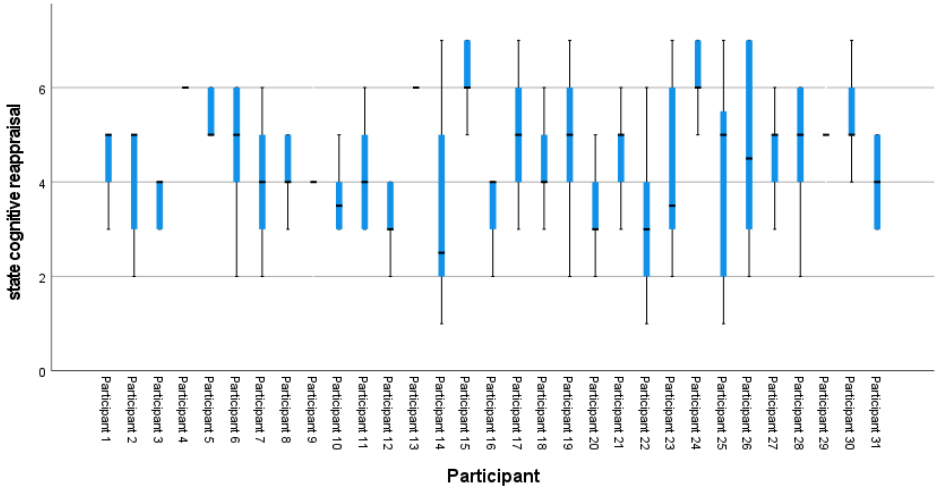


Figure 3

Boxplots displaying the levels of state cognitive-reappraisal displayed by each individual over their 7-day participation



Inferential statistics

There was a moderate significant negative association between person mean (PM) state stress response and person mean (PM) state self-compassion, β=-.54, F (1, 945) = 480.63, p<0.001.

There was a weak to moderate significant negative association between state stress response and self-compassion, β= -.44, F (1, 495) = 140,72, p <0.001. There was a very weak, insignificant negative association between state stress response and cognitive reappraisal, β=-.02, F (1,495) = 0.323, p=0.057.

There was a weak to moderate significant association between state stress response and person mean (PM) self-compassion, β= -.25, F (1, 495) = 23.65, p<0.001. There was a weak to moderate significant association between state stress response and person mean centred (PMC) self-compassion, β=-.35, F (1, 495) = 185,31, p< 0.001. See table 2 for the (standardised) parameter estimates.

Table 2

Coefficients slope (b), z-score (β), standard error (SE), T-Value and 95 % Confidence Interval (95 % Cl) of inferential statistics

Coefficient	b	β	SE	t	95 % Cl
PM state stress response					
PM state self-compassion	-2.12	-.54	.63	-3.37	-3.42, -.83
State stress response					
State self-compassion	-1.43	-.44	.12	-11.86	-1.67, -1.19
State cognitive reappraisal	-.03	-.02	.06	-.57	-.15, .08
State PM self-compassion	-1.28	-.25	.26	-4.86	-1.78, -.75
State PMC self-compassion	-1.5	-.35	.11	-13.61	-1.72, -1.29

Note: PM state stress response and state stress response are set as the dependent variables

Individual Cases

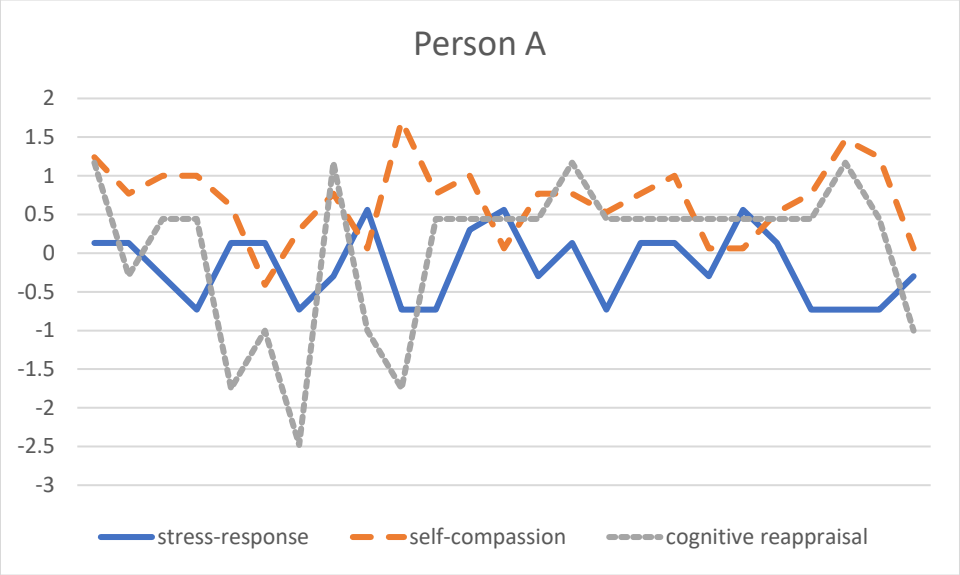
To obtain a better picture of participants' daily fluctuations of state stress response and self-compassion within participants and educationally check for possible expiations in the association between state stress response, self-compassion and cognitive reappraisal, three representative participants were chosen, from which one displayed high, one medium and one low score of self-compassion and cognitive reappraisal in comparison to the sample.

Participant A indicated an average level of self-compassion, cognitive reappraisal, and low stress-response levels. On the SNRS, the participant showed low levels of stress-response with a mean score of 2, a minimum score of 1 and a maximum score of 4. On the SCSS-S, Participant A showed a moderate level of self-compassion with a mean score of 3.49 (SE=0.13),

with a minimum score of 4 and a maximum score of 5. The participant displayed heightened levels of state self-compassion when experiencing a lower stress response and vice versa (see figure 4), which can also be seen by the medium negative association of β=0.44 between the standardised scores of state stress response and self-compassion (Appendix B). On the ERQ, Participant A displayed a moderate level of cognitive reappraisal, with a mean score of 4.47 (SE= 0.26), a minimum score of 1 and a maximum score of 6. The participant did not show any observable association between state stress response and cognitive reappraisal (see Figure 4), which can also be seen by the very weak positive association of β=0.01 between the standardised scores of state stress response and state cognitive reappraisal (Appendix C).

Figure 4

Standardised scores for state stress, state self-compassion and state cognitive reappraisal over time

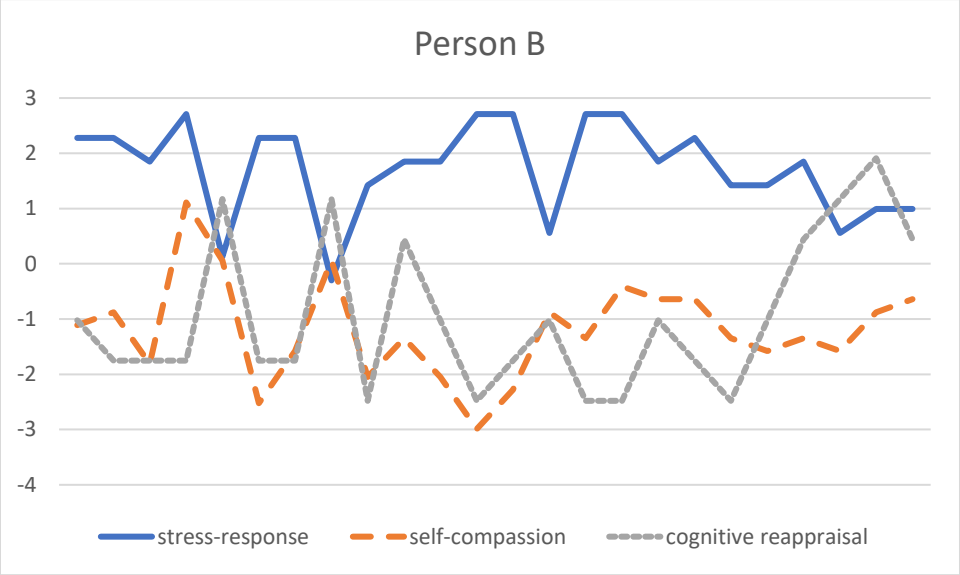


The second example, Participant B, showed low levels of self-compassion and cognitive reappraisal and high levels of stress response in comparison to the sample. On the SNRS, the participant displayed a high level of stress response with a mean score of 6.72, a minimum score of 2 and a maximum of 9. On the SCSS-S, Participant B displayed a low level of self-compassion with a mean of 2.45 (SE=0.12), a minimum score of 1 and a maximum score of 4. The participant predominantly displayed higher levels of self-compassion when experiencing

lower levels of stress-response (see Figure 5). This was also shown by the medium negative association of -0.59 between the standardised scores of state stress response and state self-compassion (Appendix B). On the ERQ, this Participant B showed a low level of cognitive reappraisal, with a mean score of 3.16 (SE= 0.26), a minimum score of 1 and a maximum score of 7. This participant seemed to have a positive association between the two variables at the beginning, while at the end of the measurement period, it changed to the opposite (see figure 5). Participant B displayed a medium negative association of β=-0.45 between the standardised scores of state stress-response and state cognitive reappraisal (Appendix C).

Figure 5

Standardised scores for state stress, state self-compassion and state cognitive reappraisal

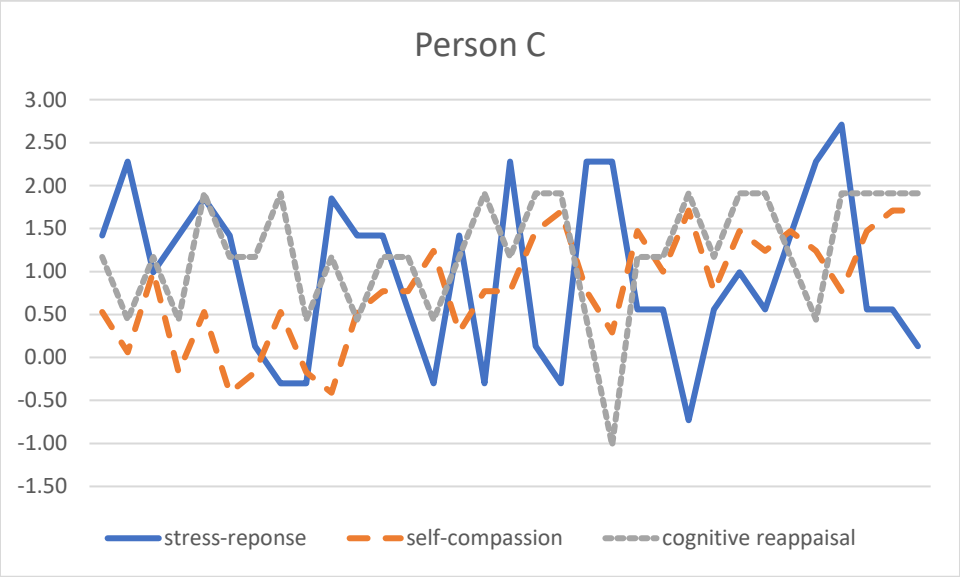


The third participant displayed high self-compassion scores compared to the sample and a relatively low number of stress-response. On the SNRS, Participant C displayed a medium stress response level with a mean score of 4.94, a minimum score of 1 and a maximum score of 9. On the SSCS-S, Participant C showed a high level of self-compassion, with a mean score of 4.04 (SE=0.12), a minimum score of 3, and a maximum score of 5. The participant generally displayed heightened levels of state self-compassion when experiencing a lower stress response and vice versa (see figure 6), which was also shown by the average medium negative association of – 0.52 between the standardised scores of state stress response and state self-compassion

(Appendix B). On the ERQ, this participant scored a high level of cognitive reappraisal, with a mean score of 6.07 (SE=0.23), a minimum score of 5 and a maximum score of 7. The participant generally displayed low levels of state stress-response when experiencing higher levels of cognitive reappraisal (see figure 6) and vice versa, which was also shown by the moderate association of β=0.59 between the standardised scores of state stress response and state cognitive reappraisal (Appendix C).

Figure 6

Standardised scores for state stress, state self-compassion and state cognitive reappraisal



Discussion

This study aimed to investigate the relationship between an individual's daily stress-response level and self-compassion- as well as cognitive reappraisal level. For this, it was examined how state self-compassion and state cognitive reappraisal relate to state stress response in individuals throughout a 7-day ESM study. Additionally, it was looked at the between-subject association by comparing person mean (PM) state stress response and self-compassion levels. Generally, the current results align with previous research on stress response and self-compassion, indicating a negative relationship, meaning high stress response is associated with low self-compassion and vice versa. It was found that both weekly average state self-compassion levels, as well as the momentary self-compassion levels, are indicative of the current level of stress-response

experienced by participants, although the latter showed off to have a higher predicting value than the average score. Other than the result on self-compassion, state cognitive reappraisal did not show any significant association with the state stress-response level, meaning momentary stress responses could not be predicted from the level of momentary cognitive reappraisal level in an individual.

Interpretation Results Stress-Response and Self-Compassion

The fact that participants with high levels of self-compassion indicated low levels of stress-response can be interpreted in two ways. The first interpretation would be that these results are in line with the expectation and self-compassion had a buffering effect on stress-response, implying that participants already experienced the lowering effect of high self-compassion levels on stress-response levels when reporting and therefore displayed the negative association between the two. This is in line with previous research from Astin et al. (2005) and Biegel et al. (2007), who found that mindfulness-based exercises decrease stress responses in health care workers. The current study, however, also extends these findings methodically as the variables were measured in real life and on a momentary daily basis, whereas the earlier study only included a one-time measurement of trait self-compassion. Therefore, the current study allowed for a higher ecologically valid measurement of self-compassion and stress response (Myin-Germeys, & Kuppens, 2022). Additionally, constructs were measured in an unobtrusive way, while the study by Astin et al. (2005) was conducted in an interventional manner. The current study also added new knowledge on the theoretical bases, as it focused on all three dimensions of self-compassion (Neff, 2003a), while the study by Astin et al. (2005) only focused on mindfulness, which does not allow for a complete picture. The current study, however, shows that it is not only the mindfulness dimension of self-compassion which has a stress-reducing effect but the whole construct. The result also corroborates with the study from Hirsch et al. (2015), who measured a significant correlation between stress-response and self-compassion in chronically ill patients. Similar to the other studies and in contrast to the current study, however, this study also obtained results through a cross-sectional design with only two measurements and therefore only measuring the trait level of all variables. Additionally, the sample of the study by Hisch et al. (2015) only included people diagnosed with arthritis or IBS, which could have affected the participant's responses. The current study, on the other hand, did not restrict the sample to a

certain nationality, gender, or illness, though it was restricted to being a student at the University of Twente, which could also have influenced the types and levels of stress-response as well as the perception of self-compassion levels. Deng et al. (2019) found the same buffering effect of self-compassion on stress-response not only on a trait but also on a state level. That study, however, only indirectly measured the pathway between state stress response and self-compassion with healthy eating behaviour as a mediator. The current study adds to that by measuring the direct association between state self-compassion on state stress response instead of using a mediator.

The other way to interpret the results would be to assume that individuals who used self-compassion as a buffer should experience high levels of self-compassion co-occurring with high levels of stress responses, which would indicate that the individual is coping with the stress response by heightening the self-compassion level. Rather than assuming that the buffering effect already took place while measuring like the first interpretation, this interpretation would assume that individuals should have been in the active buffering process when being measured. This would be in line with Neff (2003a, b), who initially developed self-compassion as a construct co-occurring with stress responses in individuals. When expecting this kind of relation, however, the results of the current study do not fulfil the expectations of self-compassion functions as a buffer, but rather the opposite, considering high levels of stress-response were measured with low levels of stress. Furthermore, the individual case analysis revealed that even people generally high in self-compassion did not use it in stressful situations. As no causal measurement was included in this study, it is hard to tell which interpretation holds true and whether self-compassion administers a buffering effect.

Apart from analysing the association between stress response and self-compassion, this study also further extended the existing theoretical framework by showing that both the state self-compassion as well as the weekly average state self-compassion levels are able to predict stress response levels, although momentary self-compassion levels were more predictive than the latter. Additionally, the current study and the research by Deng et al. (2019) indicated great variance of self-compassion not only between but also within participants over time. This gives a first indication that self-compassion should not only be regarded as a trait like it was initially intended by Neff (2003a, b) but also as a state construct. Past research (Astin et al., 2005; Biegel et al., 2007; Hirsch et al., 2015), however, mostly disregarded the state level of self-compassion and should therefore be used and interpreted with caution. This is because it only regards part of

what self-compassion entails and ignores momentary fluctuations within individuals, making the studies prone to bias. Although this research is still useful as the current study shows that weekly average state self-compassion is also associated with stress-response levels between participants, it suggests that past research ignored an important facet of self-compassion.

Interpretation Results Stress-Response and Cognitive Reappraisal

As suggested in the Lazarus stress response theory (Lazarus, & Folkman, 1986), this study predicted a negative association between momentary state cognitive reappraisal on state stress, meaning more cognitive reappraisal would result in less stress. However, results showed a non-significant positive association, which contradicts the earlier assumption and, therefore, findings from Lazarus & Folkman (1986). Newer research has, however, already criticised this theory as too simplified and overly broad (Dubow, 2011; Allen & Leary, 2010), which could be one reason for this difference. The association between those two variables was, however, also found in other research, as Mollenholt et al. (2008) showed in their study about how emotional regulation and specifically cognitive reappraisal significantly influences the appearance of stress-related symptoms. Similar to Mollenholt et al. (2008), the current study used the ERQ to measure cognitive reappraisal. As the current study however attempted to measure cognitive reappraisal on a momentary level, the test battery only included one adjusted item from the ERQ, which, although showing off good internal reliability, displayed only moderate to bad correlation to the original questionnaire. This could hint at a measurement error due to possible misinterpretation of the items and could therefore account for the difference in results. Additionally, as already discussed above, the study by Mollenholt et al. (2008) only measured cognitive reappraisal on a trait level, while the current study assessed momentary levels. Until now, literature mostly disregarded this level of cognitive reappraisal and, therefore, any comparable study design, though the current study shows a great variance of cognitive reappraisal within participants over time. These results suggest the inclusion of a state variable for cognitive reappraisal for future research and interventions, as well as being cautious with past research results only regarding trait cognitive reappraisal. Lastly, the study by Mollenholt et al. (2008) only included women to erase possible gender differences, something not done in this sample, which could also partly account for the differences in results. As there are many differences in study design and measurement choices, the current study cannot be regarded as completely contradicting past

research. Further research needs to be done in order to obtain a clear picture of the association between momentary stress response and cognitive reappraisal.

Strengths, Limitations and Recommendations

The first strength of the current study is the ESM study design which, in contrast to ordinary cross-sectional study designs, allows for repeated daily measurement and therefore reduces the amount of recall bias and ensures high ecological validity (Delespaul et al., 2016). Additionally, this study made it possible to measure self-compassion, stress-response, and cognitive reappraisal directly in the context they were experienced and documented fluctuations over time. This highly increased the external validity. Another strength of this study is that by only taking into account measurement points when a stress response was present in participants, self-compassion was regarded as initially developed by Neff (2003a, b), that is, as a construct only co-occurring with stress. Although the current study did not find this association, it still considered the initial theoretical suggestion. By measuring five times a day, the probability of a participant experiencing a stress response was significantly increased, and, by ultimately only taking into account the measurement-point where a participant indicated a stress response over 0, self-compassion was only measured in cooccurrence with stress. Another strength of this study is its innovative character. To the author's knowledge, there was no comparable study done investing the relationship between state stress response and state self-compassion, which makes the study fill a hole in the literature and give a first impression on the connection between state self-compassion and stress, which could be taken on by future research. Finally, all questionnaires used to measure the constructs showed good to excellent reliability and validity, and except for the daily measurement of state cognitive reappraisal, a good correlation to their trait measurement.

Nevertheless, there are, of course, also some limitations in this study, among which one is the small sample size. Unfortunately, a lot of participants had to be excluded because of low response rates, which could not be increased, as the study environment did not allow to contact the participants. This could be solved by doing a pilot study beforehand to see and eliminate possible technical shortcomings. Another way to fix this problem would have been to lower the response rate requirement. As the current study however already chose quite a low boundary value, lowering it even more, would have risked nonresponse bias and ultimately a lower validity

and reliability of the data. Next to that, the measurement of state variables is very new in research, meaning there are seldomly any complementary measurements of state level and trait level, which also goes for stress, self-compassion, and cognitive reappraisal. For self-compassion, it was, therefore, decided to take the state questionnaire in long (trait) and altered short (state) form. For cognitive reappraisal, one item from the ERQ was taken and altered. Stress response was measured with two completely different questionnaires. Although most questionnaires showed high reliability and validity, there is no guarantee that the results hold true with other questionnaires measuring the same construct, making the correct interpretation of results difficult. Thirdly, typical ESM studies include measurements 10 times a day (Myin-Germeys, & Kuppens, 2022), which was not visible in the current study due to practical reasons like burdening of the participants, possible resulting in lower participation and response rates. This would have, however, significantly increased the amount of measurement points, also resulting in a clearer picture of the daily fluctuations of the variables. Another problem which was discovered while analysing the data was that some participants clearly did not take the questionnaires seriously, shown in the repeated measurement of one score for all questions. Apart from this, there also might have been participants who just randomly selected scores without paying attention, which is not detected as easily. This problem could be solved by including a control question that, e.g., asks the participants to select number 5 if they are paying attention and by that test whether the participant pays attention without disrupting the question flow. Right now, all data points were included, which could have led to possible misinterpretations. Although a strength, the ESM nature of this study also causes a limitation, as it does not allow to draw interferences due to possible confounding variables (Myin-Germeys, & Kuppens, 2022). Another problem was that two people did not receive the trait questionnaire due to technical problems, as well as the number of prompts initially planned per day. This did not only result in a lower response rate but also in missing demographic data, ultimately interfering with drawing conclusions about the nature of the sample. Finally, one could argue about the generalizability of the study, as all participants were students taking part in a BMS-study program with a very limited age range.

Practical Implications and Future Research

First of all, this study gave some insights into the nature of stressors university students experience. By far, the most experienced were study and work-related hassles, followed by inner concerns, which gives first insights into the types of stressors interventions tackling stress response reduction in students should focus on. Besides this practical implication, there is also the theoretical implication concerning the best predictor for an individual's level state stress response level. In the past, research has mostly been done on cross-sectional studies, which focus on the between-subject associations and average out possible within-subject associations. This study, however, revealed that the within-person level of self-compassion is very relevant as the results showed a lot of variances, which is why future research, as well as interventions, should include both state and trait level self-compassion in their measurement. Furthermore, current theoretical frameworks should be adjusted to the point where they acknowledge self-compassion not only as a trait but also as a state variable.

One possibility for future research would be to change the fixed time interval scheme into an event-contingent sampling scheme (Myin-Germeys, & Kuppens, 2022). This would increase the usable data, as only measurements with stress response levels higher than zero would be generated and also erases the risk of missing a stress response in a participant. Of course, this study design also has its disadvantages, the biggest being that it requires active participation, as there is no notification or triggering logistic present that would remind the participant to go back into the app and fill in the questionnaire. Additionally, stress responses themselves burden an individual and could take away the motivation to fill in the questionnaire directly after being triggered. Therefore, combining this sampling scheme with a fixed one would be recommended to ensure high response rates (Myin-Germeys, & Kuppens, 2022). Another interesting path for future research would be to see which interpretation of the results regarding self-compassion and stress-response holds true. This could be reached by including a measurement option to see whether the participants are currently buffering against stress response, which would help get a clearer picture of the association between self-compassion and stress response.

Conclusion

Although the current study showed some limitations, it provided a first look at the significant negative association between momentary stress response and self-compassion and its two possible interpretations. In order to decide which of them holds true, further research should

include a measurement option asking whether the individual thinks it is currently engaging in a buffering activity is suggested. Additionally, this study showed that there is no significant association between stress response and cognitive reappraisal, suggesting that the Lazarus stress response theory should be further tested to see if the results of the current study are replicable, and it, therefore, needs to be adapted.

References

Adler, N, & Matthews, K. (1994). Health Psychology: Why do Some People Get Sick and Some Stay Well?. *Annual Review of Psychology, 45*(1), 229–259. https://doi.org/10.1146/annurev.ps.45.020194.001305

Allen, A. B., & Leary, M. R. (2010). Self-Compassion, stress, and coping. *Social and Personality Psychology Compass*, *4*(2), 107–118. https://doi.org/10.1111/j.1751-9004.2009.00246.x

Astin, J. A., Bishop, S. R., Cordova, M., & Shapiro, S. L. (2005). Mindfulness-based stress reduction for health care professionals: Results from a randomised trial. *International Journal of Stress Management, 12*(2), 164–176. https://doi.org/0.1037/1072-5245.12.2.164.

Bauer, D. J., & Curran, P. 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

Becerra, R., Gross, J. J., Preece, D. A, & Robinson, K. (2019). The Emotion Regulation Questionnaire: Psychometric Properties in General Community Samples. *Journal of Personality Assessment, 15*(4), 1–9. https://doi.org/10.1080/00223891.2018.1564319

Biegel, G. M., Brown, K. W., & Shapiro, S. L. (2007). Teaching self-care to caregivers: Effects of mindfulness-based stress reduction on the mental health of therapists in training. *Training and Education in Professional Psychology, 1*(2), 105–115. https://doi.org/10.1037/1931-3918.1.2.105

Chrousos, G.P. (2009). Stress and disorders of the stress system. *Nat Rev Endocrinol, 5*(7), 374-381. https://doi.org/10.1038/nrendo.2009.106

Cohen, S., Kamarack, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior*, *24*(4), 386-396. https://doi.org/10.2307/2136404

Conner, T. S., & Lehman, B. J. (2012). Getting started: Launching a study in daily life. In M. R. Mehl & T. S. Conner (Eds.), *Handbook of research methods for studying daily life*. (pp. 89–107). The Guilford Press.

Davidson, O., Knox, M., Kuchar, A , Neff, K. D., & Tóth-Király, I. (2021). The Development and Validation of the State Self-Compassion Scale (Long-and Short Form). *Mindfulness, 12*(1), 121-140. https://doi.org/10.1007/s12671-020-01505-4

Davies, W. H., Hainsworth, K. R., Kahn, K. A., Karvounides D., Simpson, P., & Weisman, S. J.

(2016). Three studies supporting the initial validation of the stress numerical rating scale-11 (Stress NRS-11): *A single item measure of momentary stress for adolescents and adults.* https://doi.org/10.15761/PD.1000124

Delespaul, P.A., Drukker, M., Hasmin, L., Verhagen S. J.,& Van Os, J. (2016). Use of the experience sampling method in the context of clinical trials. *Evid Based Mental Health, 19*(3).86-9. https://doi.org/10.1136/ebmental-2016-102418.

Dejitterat, K., Hsieh, Y. P., & Neff, K. D. (2004). Self-compassion, achievement goals, and coping with academic failure. *Self and Identity 4*(3), 263-287. https://doi.org/10.1080/13576500444000317

DeLongis, A., & Lazarus, R. S. (*1983).* Psychological stress and coping in aging. *American Psychologist*, *38*(3), 245–254. https://doi.org/10.1037/0003-066X.38.3.245

Deng, J., Li, Y., Lou, X., Wang, H., & Wang, Y. (2019). A daily diary study of the relationships among daily self-compassion, perceived stress and health-promoting behaviours. *International Journal of Psychology, 55*(3), 364-372. https://doi.org/10.1002/ijop.12610

Du W., Huang F., Jia X., Jiang H., Li L., Ouyang Y.,Su C., Wang W., Wang Y., Wang Z., Zhang J., & Zhang B. (2020). Psychometric properties of the perceived stress scale in a community sample of Chinese. *BMC Psychiatry*, *20*(1), 497-513. https://doi.org/10.1186/s12888-020-02520-4

Dubow, E.F. (2011). Coping with violence: A comprehensive framework and implications for understanding resilience. *Encyclopedia of Adolescence: Coping, 14*(3), 109–118. https://doi.org/10.1016/b978-0-12-373951-3.00107-1

Ensel, W. M., & Lin, N. (1991). The life stress paradigm and psychological distress. *Journal of Health and Social Behavior, 32*(4), 321–341. https://doi.org/10.2307/2137101

Eun-Hyun, L. (2012). Review of the Psychometric Evidence of the Perceived Stress Scale. *Asian Nursing Research*, *6*(4), 121–127. https://doi.org/10.1016/j.anr.2012.08.004

Fink, G. (2016). Stress: concepts, cognition, emotion, and behavior. *Handbook of Stress*, *1*(1), 3-11.
https://doi.org/ 10.1016/C2013-0-12842-5

Glanz, K., & Schwartz, M. D. (2008). Stress, coping, and health behavior. In K. Glanz, B. K. Rimer, & K. Viswanath (Eds.), *Health behavior and health education: Theory, research, and practice* (pp. 211–236). Jossey-Bass.

Gross, J. J., & John, O. P. (2003). Individual differences in two emotion regulation processes: Implications for affect, relationships, and wellbeing. *Journal of Personality and Social Psychology, 85*(2), 348–362. https://doi.org/10.1037/0022-3514.85.2.348

Harkness, K. L., & Hayden, E. P. (2020). *The Oxford handbook of stress and mental health.* Oxford University Press. https://doi.org/10.1093/oxfordhb/9780190681777.001.0001

Hirsch, J. K., Molnar, D. S., & Sirois, F.M., (2015). Self-Compassion, Stress, and Coping in the Context of Chronic Illness. *Self and Identity*, *14*(3). 334 - 347. https://doi.org.10.1080/15298868.2014.996249

Holm, J. E., & Holroyd, K. A. (1992). The Daily Hassles Scale (Revised): Does it measure stress or symptoms? *Behavioral Assessment, 14*(3-4), 465–482.

Kirkpatrick, K., Neff, K. D., & Rude, S. S. (2006) Self-compassion and its link to adaptive psychological functioning. *Journal of Research in Personality, 41*(4), 139–154. https://doi.org/ 10.1016/j.jrp.2006.03.004

Krohne, H.W. (2001). Stress and Coping Theories*. International Encyclopedia of the Social & Behavioral Sciences, 7*(1)*,* 15163–15170*.* https://doi.org/10.1016/B0-08-043076-7/03817-1

Lazarus, R. S., & Folkman, S. (1986). Cognitive theories of stress and the issue of circularity. In M. H. Appley & R. Trumbull (Eds.), *Dynamics of stress: Physiological, psychological, and social perspectives* (pp. 63–80). Plenum Press.

Mollenholt, N., Moore, S. A., Zoellner, L. A. (2008). Are expressive suppression and cognitive reappraisal associated with stress-related symptoms? *Behaviour research and therapy*, *46*(9), 993–1000. https://doi.org/10.1016/j.brat.2008.05.001

Myin-Germeys, I., & Kuppens, P. (Eds.). (2022) The open handbook of experience sampling methodology: A step-by-step guide to designing, conducting, and analysing ESM studies (2nd ed.). Leuven: Center for Research on Experience Sampling and Ambulatory Methods Leuven.

Neff, K. D. (2003a). The Development and Validation of a Scale to Measure Self-Compassion. *Self and Identity, 2*(3), 223–250. https://doi.org/10.1080/15298860309027

Neff, K. (2003b). Self-Compassion: An Alternative Conceptualisation of a Healthy Attitude Toward Oneself*. Self and Identity, 2*(2), 85–101. https://doi.org.10.1080/15298860309032

Selye, H. (1956). *The stress of life.* McGraw-Hill. Retrieved from: https://psycnet.apa.org/record/1957-08247-000

Solem, R. C. (2015). Limitation of a cross-sectional study. *American Journal of Orthodontics*

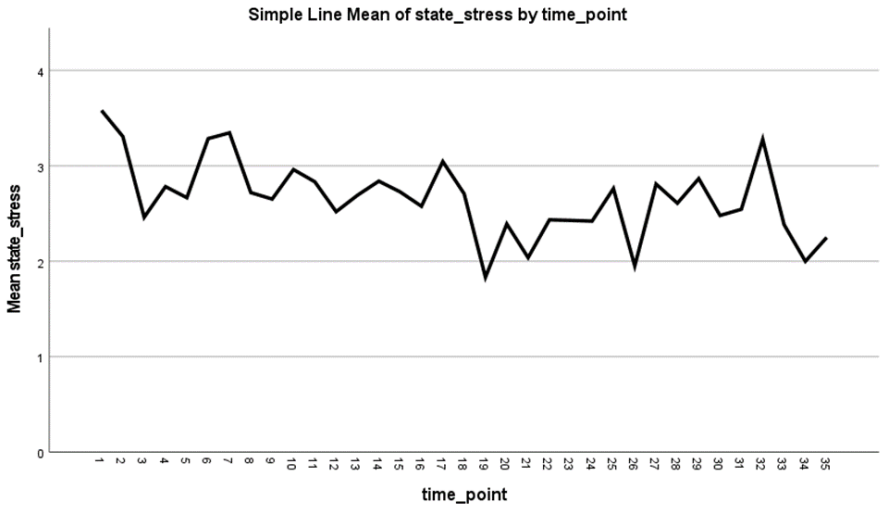
and Dentofacial Orthopedics, 148(2). https://doi.org/10.1016/j.ajodo.2015.05.006

Van Berkel, N., Ferreira, D., & Kostakos, V. (2017). The Experience Sampling Method on Mobile Devices. *ACM Computing Surveys*, *50*(6), 1-40. https://doi.org/10.1145/3123988

Appendix

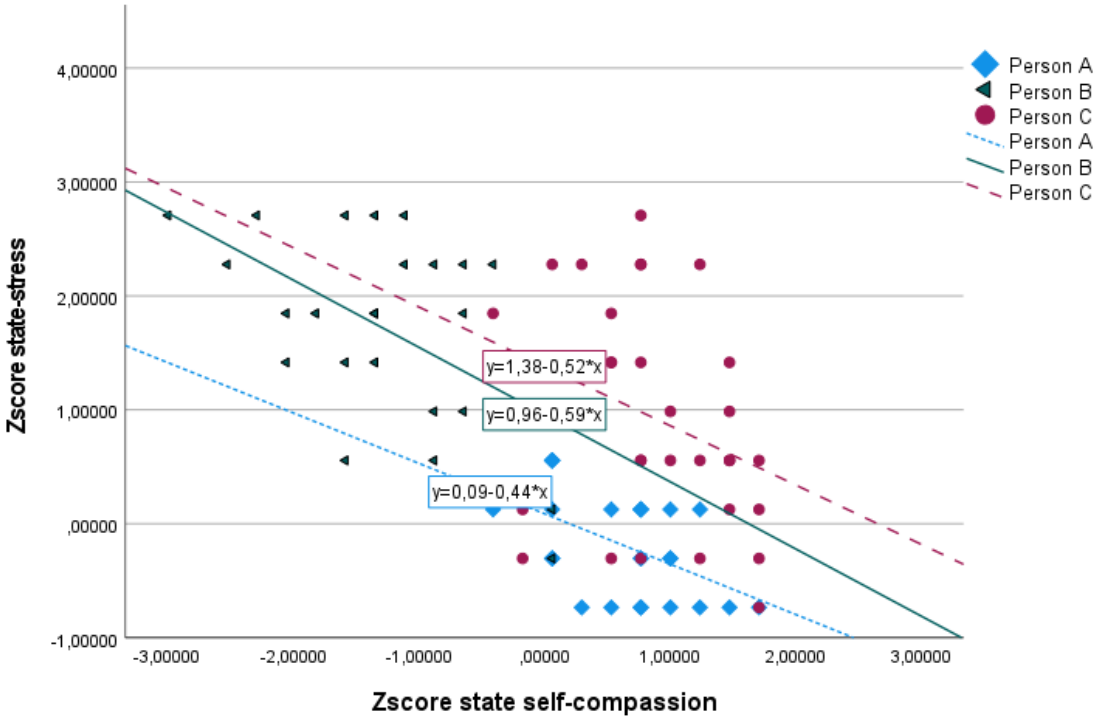
Appendix A

Mean state stress response levels of participants per measurement point



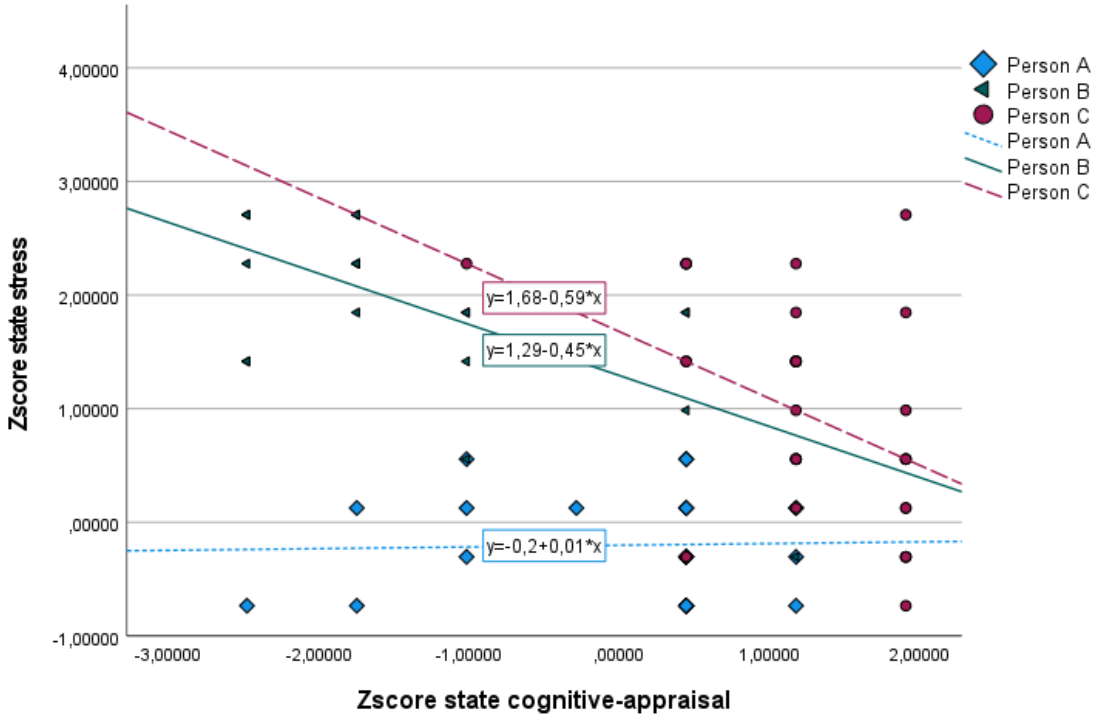
Appendix B

Standardised scores of state stress response by state self-compassion, filtered by participants, with a fit line for each participant



Appendix C

State stress response by state cognitive reappraisal, filtered by participants, with a fit line for each participant



Appendix D

Daily Questionnaire

1. From 0 (not stressed at all) to 10 (extremely stressed), how do you perceive your current level of stress?

   1, 2, 3, 4, 5, 6, 7, 8, 9, 10

2. How would you describe the stressful event causing you stress at the moment? If more than one event happened, please pick the most significant event:
   1. Inner concerns
   2. Covid-related hassles
   3. Health issues
   4. Family hassles

5. Environmental hassles
6. Work-/Study related hassles
7. Time pressure
8. Financial issues
9. None

Information

Please proceed to answer the items below (1 = not at all true for me, 5 = very true for me).

Given that I have indicated that I experienced a stressful event, would I say ...

3. I'm giving myself the caring and tenderness I need right now.

   1, 2, 3, 4, 5

4. I'm obsessing and fixating on everything that's wrong right now.

   1, 2, 3, 4, 5

5. I'm remembering that there are lots of others in the world feeling like I am right now.

   1, 2, 3, 4, 5

6. I feel intolerant and impatient toward myself right now.

   1, 2, 3, 4, 5

7. I'm keeping things in perspective right now.

   1, 2, 3, 4, 5

8. I feel like I'm struggling more than others right now.

   1, 2, 3, 4, 5

9. In this current stressful situation, I make myself think about it in a way that helps me stay calm.

1, 2, 3, 4, 5, 6, 7

[10. Right now, / the past few hours, I try / tried to lower my experienced stress by being kind to myself.

1, 2, 3, 4, 5

11. Right now / the past few hours, through being kind to myself I protected myself from feeling distressed.

1, 2, 3, 4, 5]

Appendix E

Informed consent form

Thank you for taking part in the research about self-compassion and stress in university students. The study will last 7 days in which you will be asked to fill in a short questionnaire five times a day (taking approx. 3 minutes per session) to determine your stress level, your self-compassion level and your coping strategy.

This research project has been reviewed and approved by the BMS Ethics Committee.

Your data will be collected and processed. Your data may be shared with the research team (in form of email after the experiment). Your names will be anonymised after the experiment by using a random number instead of your name for the further course of the research project and a potential publication. At any point you have the right to request access to and rectification or erasure of your data. The anonymised data will be processed by research project members of the University of Twente. Your data will not be used commercially and is for research and teaching purposes only. You retain full rights over your ideas. 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 of the Faculty of Behavioural, Management and Social Sciences at the University of Twente via ethicscommittee-bms@utwente.nl.

If you want to withdraw from the study or have any other questions about the study or the research project, do not hesitate to contact …