UNIVERSITY OF TWENTE.

Faculty of Behavioral, Management, and Social Sciences

HOW STATE AND TRAIT SELF-KINDNESS AND STRESS ARE ASSOCIATED – AN EXPERIENCE SAMPLING STUDY AMONG UNIVERSITY STUDENTS.

Mirjam Römer, s1794930

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Supervisors:

Dr. Matthijs L. Noordzij

Dr. Ed J. de Bruin

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Abstract

Objective. The association between perceived *stress* and self-compassion is increasingly being attended to. It was shown that people with a higher level of self-compassion show lower levels of perceived *stress* compared to people with a lower level of self-compassion. However, studies on self-compassion mostly focused on aspects of mindfulness and did not focus on *self-kindness* itself. Further, there is a lack of research assessing daily *self-kindness* and *stress* and the association between these variables. This study aims to fill this gap in research and assess the association between *self-kindness* and *stress* on a state and trait level.
Method. For seven days, a longitudinal experience sampling study with a sample size of 35 students (M_{age} = 21.29) was conducted. To measure trait self-compassion/kindness and *stress* the Self-Compassion Scale Short-Form, (SCS-SF) and the Perceived Stress Scale (PSS) were used. Participants had to answer single-item questions concerning state *self-kindness* and state *stress* three times a day. An Experience Sampling Method was used.
Results. The results showed a negative association between state *self-kindness* and trait and state *stress* as well as a negative association between state and trait *self-kindness* and state *stress*. The association differed slightly on trait and state levels. As expected, the associations were trait- as well as state-like.
Conclusion. This research has enhanced our understanding of the relationship between *stress* and *self-kindness*. The results of this study provide valuable information to develop intervention and prevention programs regarding *stress* in university students.

Keywords: Self-kindness, Self-compassion, Stress, Experience Sampling Method (ESM)

Introduction

Experiencing feelings of *stress* is part of being human. However, the experience of being stressed seems to be different between and within individuals. The skill of using *self-kindness* to regulate *stress* levels is not equally well developed in all people. For example, some students seem to be harder on themselves when failing a test, and thus show a higher *stress* response on this experience than others (Neely, Schallert, Mohammed, Roberts, & Chen, 2009). This study focuses on the investigation of the association between perceived *stress* levels and *self-kindness* during the course of the week within as well as between persons. Through gaining new insights into this association people could benefit to regulate their *stress* levels and useful interventions could be based on the newly researched theoretical framework.

Stress seems to be a construct of high interest to researchers. The need for further investigation of *stress* increased as more and more people seemed to suffer from the consequences of experiencing extremely high levels of *stress* (Falconier, Nussbeck, Bodenmann, Schneider, & Bradbury, 2015; O'Connor, Jones, Conner, McMillan, & Ferguson, 2008). The result of extreme exposure to *stress* could be burnout during study or in the workplace (Spickard Jr, Gabbe, & Christensen, 2002). Self-compassion is used as a construct in interventions regulating the individual's *stress* levels and improving coping with *stress*. Self-compassion consists of three elements: mindfulness, *self-kindness*, and the belief that suffering belongs to common humanity (Neff, 2003). The most widely researched element of self-compassion is mindfulness. Yet the other components were not researched solely just in combination with the other elements of self-compassion. Additionally, research on *stress* interventions mainly focused on the association between *stress* and mindfulness (Anheyer, Leach, Klose, Dobos, & Cramer, 2019; McClintock, Brown, Coe, Zgierska, & Barrett, 2019). However, research providing evidence for the connection between *stress* and self-compassion indicates that common humanity and especially *self-kindness* may also have a major role in regulating *stress* levels (Neely et al., 2009). As both constructs, *stress*, and *self-kindness*, can be present as traits and states it seems interesting to investigate whether the association between them is different on a state or trait level. This would enable interventions to be used more precisely in the future, as skills for either general or momentary application can be taught. *Stress* levels seem to be high among university students, therefore this study investigates the association between *stress* and *self-kindness* in the context of university students. The prospective outcomes could offer an opportunity for universities to support the

development of programs for prevention and reduction of student's *stress* levels which would contribute to the student's overall well-being and consequently their performance in their studies.

Stress

"*Stress* is a physiological response that serves as a mechanism of mediation linking any given stressor to its target-organ effect." (Everly & Lating, 2019, p. 7) This leads to a physical reaction which in turn results in a subjective cognitive interpretation of the physical symptoms, as *stress* is perceived differently among persons (Everly & Lating, 2019). The model of Lazarus and Folkman (1984) supports a similar theory. Their model proposes that *stress* is a complex interaction between the circumstances of a given situation and the reaction of the person involved. Further, Lazarus and Folkman (1984) provide argumentation towards the state-notion of *stress*, indicating that individuals show differences in their level of *stress* when being exposed to the same stressful situation. Therefore, their model supports the notion that *stress* is characterized by an evaluation that a person makes about the situation (Folkman & Lazarus, 1984). This reaction can differ each moment depending on the setting and internal interpretation of the situation.

One group that is frequently exposed to momentary, as well as continuous *stress*, is the population of university students. The *stress* that students are experiencing can stem from diverse challenges, such as the transition to university, academic demands, new living arrangements, finding new friends and meeting new people, changes in the relationship with family and friends, or financial difficulties (Hartley, 2011; Pidgeon, Rowe, Stapleton, Magyar, & Lo, 2014). The impact of high perceived *stress* levels can have substantial effects on academic performance can lead to university dropout or can increase the development of psychological disorders. Also, research conducted at the University of Twente has shown that the mean of perceived *stress* among students is relatively high, indicating high perceived *stress* (Reh, 2019). Thus, indicating that experienced *stress* is a highly prevalent factor for the students at this university.

Most research concentrates on trait levels of *stress* (Flouri & Mavroveli, 2013; Phillips, Carroll, & Der, 2015). For example, Flouri and Mevroveli (2013) conducted research on the associations between life *stress*, problem behavior, and emotion regulation. A positive association between life *stress* and problem behavior was found. Besides major stressors, most people experience minor stressful daily events, such as being late for an appointment,

missing a bus, or having an argument with a friend. These are events inducing feelings of *stress* that are embedded in our daily lives. These daily disruptions are frequent and different from major stressful life events that entail a major change in individuals' circumstances or status.

Research considering minor daily stressful events supports the notion that the impact of repeated daily stressors on psychological distress should not be ignored (Falconier et al., 2015; Larsson, Berglund, & Ohlsson, 2016; O'Connor et al., 2008; Stefanek, Strohmeier, Fandrem, & Spiel, 2012). Even small stressful incidents during the day can harm affect, behavior, and the mental health status of individuals (Falconier et al., 2015; O'Connor et al., 2008). This means that *stress*-inducing events during the day lead to the development of negative affective states, such as e.g. anger and sadness (Willroth, Flett, & Mauss, 2020). Carlson (2016) and Shi et al. (2015) report that there might be a negative influence on positive affective states, such as e.g. self-compassion.

Self-Compassion and Self-Kindness

Neff (2003) defined self-compassion as "being open to and moved by one's suffering, experiencing feelings of caring and kindness toward oneself, taking an understanding, non-judgmental attitude toward one's inadequacies and failures and recognizing that one's experience is part of the common human experience" (Neff, 2003). The central aspect of self-compassion is being kind towards the self. However, the construct of self-compassion entails three primary features, namely *self-kindness,* common humanity, and mindfulness. According to Neff (2003), *self-kindness* is characterized by being kind and understanding towards oneself, for example when feeling treated unfairly. Common humanity means that pain and suffering are understood as unavoidable aspects of shared human experience (Neff, 2003). The last aspect of balanced awareness of one's emotions (mindfulness) is the ability to face painful thoughts and events without exaggeration, drama, or self-pity.

Self-compassion seems to be a predictor for good mental health. For example, research has shown that self-compassion is negatively associated with depression, neurotic perfectionism, anxiety, rumination, and thought suppression (Anheyer et al., 2017; Bohlmeijer, Prenger, Taal, & Cuijpers, 2010; Huang, He, Wang, & Zhou, 2016). In contrast, positive associations were found between self-compassion and life satisfaction and social connectedness. Moreover, people with increased levels of self-compassion report higher life satisfaction (Gilbert & Procter, 2006; Neff, Kirkpatrick, & Rude, 2007) and less experienced

stress after participating in a widely applied *stress*-reduction program (Mindfulness-based *stress* reduction; (Shapiro, Astin, Bishop, & Cordova, 2005)).

Furthermore, Neely et al. (2009) report self-compassion as a reliable correlate to well-being. Additionally, it was found that the addition of stress, social support, and self-compassion increased the amount of variance in the well-being index (Neely et al., 2009). Here, particularly self-compassion seemed to be a reliable correlate of students' well-being. As self-compassionate individuals were less likely to ruminate about past feelings or become overwhelmed by feelings of inadequacy it may have contributed to a feeling of an increased feeling of optimism about the future (Neff, Rude, & Kirkpatrick, 2007). Thus, self-compassionate behavior seems to contribute to the individual's well-being.

Compassion directed towards the self can be present in an individual as a trait. This means individuals scoring high on self-compassion are generally more self-compassionate than people scoring low on self-compassion. Neff (2011) discussed the difference between self-compassion and self-esteem. Hereby it was pointed out that an advantage of self-compassion is that this trait is available when self-esteem remains low, for example, in moments of embarrassment or other situations that represent the imperfections of life (Neff, 2011). However, levels of self-compassion can fluctuate during the day (Kelly & Stephen, 2016). Variations in the level of self-compassion can be triggered through different events or stressors, such as having fun with a friend or failing an experiment (Breines & Chen, 2013). As self-compassion can be variable and context-dependent it can be also named a state. Furthermore, when looking at self-compassion as a state Neff, Rude, and Kirkpatrick (2007) argue that self-compassion may generate positive emotions more generally due to the states' associated underlying neural activity in connection to positive emotions. Additionally, happiness might be directly positively influenced by self-compassion through feelings of kindness, interrelatedness, and equilibrium.

Kindness is seen as kind behavior to or from others. Research supports that it can increase happiness, satisfaction, and gratefulness (Otake, Shimai, Tanaka-Matsumi, Otsui, & Fredrickson, 2006). Self-compassion includes kindness directed towards the self, *self-kindness*. Self-oriented acts of kindness could include small, simple treats that cost relatively little money or effort. Examples of such could be treating yourself to a nice cup of coffee or a piece of cake, buying a book, taking five minutes extra break from work, taking a bath, or complimenting yourself. Such kind activities, contribute to the level of individuals' self-

compassion and its advantages (Muris, Otgaar, Meesters, Heutz, & van den Hombergh, 2019; Neely et al., 2009). However, the impact of *self-kindness* detached from the concept of self-compassion is rather unexplored. Even though, *stress* seems to be a well-researched construct no studies investigated the association between *stress* and *self-kindness* yet.

Stress and Self-Kindness

Grounds for assuming an association between *stress* and self-compassion or *self-kindness* are provided by Gilbert (2005). The research of Gilbert (2005) provides arguments that self-soothing features, such as included in *self-kindness*, of self-compassionate thoughts, promote calmness by deactivating 'defensive threat systems'. *Stress* operates as a defense against unexpected stimuli (Ursin & Eriksen, 2004). When an unpredicted event is occurring individuals can experience a feeling of being stressed, and subsequently, defense is activated (Gilbert, 2005; Gilbert & Procter, 2006). Defense lies on one continuum with coping, which is a more sustainable alternative to defense (Cramer, 1998). Hereby, a more conscious way to handle negative affect is used and thus emotions can be controlled more sustainably. In order, to activate coping rather than defense, training certain skills, e.g. skills promoting an increase of the level of *self-kindness* or mindfulness, are shown to be effective (Bravo, Pearson, Wilson, & Witkiewitz, 2018). Self-compassion is considered an adaptive way of coping which helps individuals respond more effectively to challenges such as failure and errors (Leary, Tate, Adams, Batts Allen, & Hancock, 2007; Rashid, Guo, & Babenko, 2019). Generally, effective coping with *stress* might reduce or even prevent obtaining high levels of *stress*.

Besides the influence on coping strategies, a high level of self-compassion has an impact on the use of effective emotion regulation strategies. Rashid et al. (2019) showed that high levels of self-compassion are negatively associated with symptom levels of psychopathology, especially depression, anxiety, and *stress*. Additionally, Leary et al. (2007) report that trait as well as state self-compassion is positively associated with positive emotional and cognitive reactions towards unpleasant self-relevant events. Therefore, people with high levels of self-compassion can adaptively regulate their emotions and react with calmness and concern towards stressful events. The more frequently the individuals are confronted with stressful situations the stronger they have to regulate their *stress* response with self-compassion. Thus, the notion arises that there is a positive association between *stress* and self-compassion. However, so far, no research was conducted on the positive

association between these variables. This research project aims to fill this gap to create a better understanding of this association.

As previously stated, students experience a broad range of stressors such as academic failure, the transition to college, etc. Research of Rashid et al. (2019) focuses on the effect of self-compassion on these factors among college students in Canada. Their findings support the assumption that trait self-compassion is negatively associated with the student's *stress* levels. Furthermore, Rashid et al. (2019) reported that *self-kindness* enhances people's adaption to life adversity and general problems, mostly *stress*-inducing events. Therefore, the assumption that self-compassion, and especially *self-kindness*, is negatively associated with *stress* arises.

Even though previously conducted research provides a fundament for assuming that trait *stress* and *self-kindness* might be associated, there is no research existing investigating this relationship in more depth. To the researcher's knowledge, there is no research examining the association between *stress* and *self-kindness* on a momentary state level as well as a stable trait level. As trait and state levels are different from each other one can assume that also the association between states and traits is dissimilar (Bravo et al., 2018; Tanay & Bernstein, 2013). For example, Bravo et al. (2018) report that trait and state mindfulness are differently associated with the practice of mindfulness exercises and coping of *stress*. It seems interesting to investigate whether there is also a difference in the association between state and trait *stress* and state *self-kindness* as well as state *stress* and trait and state *self-kindness*.

Aim of the study

This study aims to fill the gap of research on the association between trait and state *stress* and *self-kindness*. Most research regarding this topic used a cross-sectional study design, however, this research investigates the daily fluctuations of *stress* and *self-kindness* in a longitudinal design to gain a more detailed insight into state and trait levels of *stress* and *self-kindness* and how these fluctuate. By using the Experience Sampling Method (ESM) the association between perceived *stress* and self-compassion can be analyzed more thoroughly on a state and trait level. Based on the outlined facts the following research question was derived: How are daily levels of *stress* and *self-kindness* associated with each other among students?

In order to test the research, question the following hypotheses are created: Levels of *stress* as well as *self-kindness* fluctuate over the course of one week (1). There is a positive

association between state *stress* and state *self-kindness* (2), There is a negative daily association between state *self-kindness* and trait and momentary *stress* (3).

Method

This study operated as a post-hoc analysis of a study conducted by students of the University of Twente in the context of their Bachelor thesis in 2019. The Behavioral, Management, and Social Sciences (BMS) ethics committee of the University of Twente (Request-Nr. 191272) approved the longitudinal online study. Before their voluntary participation, the participants gave their informed consent online.

Design

This study was conceptualized as a longitudinal online study, assessing real-life experiences of *stress* and *self-kindness* in university students three times a day over the period of one week. A seven-day experience sampling method (ESM) was used for the measurement of the daily experiences of perceived *stress* and *self-kindness*. ESM seemed to be a useful option to assess immediate data of different constructs and psychological mechanisms from the participants' everyday lives. Therefore, the results did not rely on retrospective memory, and thus ecological validity was increased (Verhagen, Hasmi, Drukker, van Os, & Delespaul, 2016).

Participant characteristics and inclusion criteria

This study included a convenience sample of 35 students from the University of Twente. The participants were approached through the medium of the Test Subject Pool BMS (SONA) System of the University of Twente and by sharing the survey-subscription link through personal contact and Facebook. Participants that subscribed via the SONA-System received 2.5 credit points as compensation for their effort; participants who subscribed differently did not receive compensation. Criteria for including participant data were being a registered student, being above the age of 18, speaking and understanding English sufficiently, and owning an Apple or Android smartphone to download and use The Incredible Intervention Machine (TIIM) application. Also, trait, as well as state questionnaires, had to be completed, thus only participants with a 100% response rate were included.

Materials and measures

The study was part of a larger research project including more variables than this study concerns. For this study, in total, the test battery consisted of six daily ESM questions and four trait questionnaires, namely the Multi-Component Gratitude Measure (MCGM) ((Morgan, Gulliford, & Kristjánsson, 2017), the UCLA Loneliness Scale (third version) (Russell, 1996), the Perceived Stress Scale (PSS) (Cohen, Kamarck, & Mermelstein, 1983), and the Self-Compassion Short Form (SCS-SF) (Raes, Pommier, Neff, & Van Gucht, 2011). Relevant for this study are the PSS and the SCS-SF, which will be described in more detail.

The Incredible Intervention Machine (TIIM)

TIIM is an application operating as an intervention and survey tool that was created by the BMS Lab of the University of Twente (The BMS lab, n.d.). It can be used on iOS and Android operating systems. Questions can be packed into a module that is presented to the participant at specific times. When new questions need to be answered the participant gets a short push notification as a reminder. Additionally, it can be timed how long a participant can react to a module.

Trait Questionnaires

The Perceived Stress Scale (PSS). In order to assess trait *stress*, the PSS was used (see Appendix A). The PSS is the most widely used instrument for assessing the perception of *stress* through self-reports (Cohen, Kamarck, & Mermelstein, 1994). The PSS is a tool for measuring the degree to which situations in one's life are seen as stressful. The questionnaire is designed in a way that the items and response alternatives are easy to understand. Furthermore, the items are designed to be as general as possible and thus relatively free of content specification to any subpopulation group. The items refer to feelings and thoughts during the last month. The scale includes ten items to be answered on a 5-point Likert Scale (0=never to 4=very often). Example items are*: "In the last month, how often have you felt that things were going your way?"*, "*In the last month, how often have you been upset because of something that happened unexpectedly?"*, or "*In the last month, how often have you felt nervous and "stressed"?*. Four items were reversed-coded. A high score on the PSS indicated a higher level of perceived *stress*. In the current study, Cronbach's alpha (α=.889) indicated good reliability of the scale.

Self-Compassion Scale – Short Form (SCS-SF). To examine the participant's trait self-compassion the SCS-SF was used (Appendix B). The SCS-SF is the shorter version of the Self-Compassion Scale (SCS) (Raes et al., 2011). However, the correlation with the long scale is near perfect when comparing total scores (Raes et al., 2011). Additionally, Raes et al. (2011) report good internal consistency of the scale. The short form consists of twelve items measuring how compassionate an individual is towards him/herself. The items can be answered with the help of a 5 Point Likert Scale (1=almost never to 5=almost always). The items of the SCS-SF belong to either positive (mindfulness, *self-kindness*, or common humanity) or negative (Isolation, self-judgment, or over-identification) subscales. Example items for the three positive subscales are*: "I try to see my failings as part of the human condition*" (Common humanity)*, "I try to be understanding and patient towards those aspects of my personality I don't like."* and *"When I am going through a very hard time, I give myself the caring and tenderness I need."* (Self-kindness). Example questions for negative subscales (Self-Judgement, Isolation, and Over-Identification) items are: *"When I fail at something important to me I become consumed by feelings of inadequacy"*(Over-identification), or *"When I fail at something that's important to me, I tend to feel alone in my failure"*(Isolation). In order to estimate the total score of self-compassion negative subscale items needed to be reversed. A high score on the SCS-SF indicated a high level of self-compassion. In this study, the SCS-SF showed good reliability with a Cronbach's alpha of .813.

Daily questionnaires

In order to avoid habituation, the daily questions were randomly ordered within each time frame.

State Stress. To reduce the effort of the participants and increase response rates the single item: "On a scale from 0 to 7 and even being the worst stress possible what number best describes your level of stress right now?" was chosen for the momentary assessment of perceived stress levels. The name of this item is Stress Numerical Rating Scale – 11 (Stress NRS – 11). The internal validity of the Stress NRS-11 is confirmed (Karvounides et al., 2016).

State Self-Kindness. Based on the structure of the item assessing momentary *stress* a single item measuring state *self-kindness* was formulated: "On a scale from 0 to 7, how kind do you feel towards yourself right now?". This item was taken from the SCS-SF. Bivariate

Pearson correlation between the SCS-SF and the single item showed a significant moderate correlation ($r=.337$, $n=35$, $p < .00$), thus indicating good criterion validity.

Procedure

During the process of creating the survey, individual modules were repeatedly tested and adjusted to make responding to the questions as easy as possible. In order to test the surface of the survey, the timing and the response function a one-day pilot study was conducted including two participants.

In order to assure that the participants answer the questions in time, the first four participants were asked to set an alarm at 8 am, 12 pm, and 7 pm. The use of different time frames enabled a deeper insight into how and when levels of *stress* and self-compassion change. The strategy of setting an individual alarm was intended to make up for the reminder that should have been sent by the TIIM application itself. However, the researcher noticed that the response rates remained low and assumed that the strategy did not work. Consequently, the research team started to send each participant a reminder manually via the BMS Lab Dashboard in the form of push notification which resulted in immediate responses of the participants (Appendix C). As the response rates increased through this strategy this approach was used on all the following participants. When the researchers noticed that the participant did not answer 30 minutes before the time frame ends, an additional reminder was sent.

The study took place over a course of nine days. Day one included preparation for the following eight days of the study and information on the procedure. All participants had to register with a valid email address and password, indicate their age, gender identity, nationality, and confirm that they are registered students (see Appendix D). Consequently, the participants were asked to download and install the TIIM application on their smartphone (a link was provided for the Apple and Google Play Store). A notification indicated that this was everything to do for this day and that more information will be available in the next morning.

On the following day, the application provided further information about the study's background, its set up, and about rights and content information. Finally, the participants are asked to give active online consent to participate in the study. During the next seven days, the participants were asked to fill out the same six questions three times per day. In order to get to the next question, the previous item had to be answered. On the last day (day 9) the trait

questionnaires had to be answered. At 8 am the first questionnaire was made available to the participants (MCGM) followed by the remaining questionnaires (SCS-SF, PSS, and UCLA). When one questionnaire was completed the next one was made accessible.

Statistical analysis

The data analysis was carried out by using the 26th Version of the Statistical Package for Social Sciences (IBM SPSS Statistics 26). Data descriptive statistics for age, gender identity, and nationality as well as distributions and mean scores of trait *stress* and trait self-compassion within the sample were calculated. Furthermore, descriptive statistics were used in order to check for distributions and mean scores for *stress* and self-compassion. For state *stress* and state *self-kindness* person means (PM) were calculated. PM were necessary in order to reflect on the average *stress* and self-compassion level for seven days per participant and to authorize between-person analysis. Additionally, the person mean-centered scores (PM-centered) were calculated for all measurement points of *stress* and *self-kindness*. This score helped to check the difference between each single measurement point and the person mean, thus allowed within-person analysis (Curran & Bauer, 2011).

Moreover, two Linear Mixed Model (LMM) analyses were conducted using an autoregressive structure. This analysis was chosen because it accounts for missing data in the momentary assessments and controls for dependency between data. To obtain standardized coefficients, Z-scores were calculated for trait and state *self-kindness* and trait and state *stress* and were used for the analysis. In order to assess the association between state *stress* and state and trait *self-kindness, stress* was set as dependent variable and PM *self-kindness* (between-person association) and PM-centered *self-kindness* (within-person association) as fixed independent variables. Next, the association between state *self-kindness* and trait and state *stress* was calculated by setting *self-kindness* as dependent variable and PM *stress* and PM-centered *stress* as fixed independent factors. In order to support and visualize findings, figures and tables and graphical representations have been created with Microsoft Excel 2019.

Results

Participant Characteristics and Descriptive Statistics

A total of 59 students signed up for this study. Generally, 12 % of the participants possessed an Apple device and therefore, could not participate in the study due to technical issues that blocked the compatibility of the TIIM application with the iOS operating system. Additionally, five participants were excluded as they did not fill in the trait questionnaires. In total, the data of 35 participants were analyzed. The age of the participants ranged between 18 and 31 years (M_{age}=20.65; SD_{age}=3.15). Most participants identified themselves as females (85.3%), 8.8% of the participants identified themselves as men, 2.9% as a transgender woman, and 2.9% as gender variant conforming. Six nationalities were prevalent among the participants, namely German (50%), Dutch (38.3%), Indian (2.9%), Bulgarian (2.9%), Vietnamese (2.9%) and Indonesian (2.9%).

An overview of minimum and maximum scores, as well as mean scores of trait self-compassion, trait *stress*, state *self-kindness,* and state *stress,* is provided in Table 1. Skewness and kurtosis values[1] were between ± 1, indicating a normal distribution of the data within the sample (Field, 2009). Simple correlational analysis showed that there is a moderate negative linear relationship between trait self-compassion and trait perceived *stress* (r=-.573, p < .01). Furthermore, there was a moderate negative correlation between trait perceived *stress* and state kindness (r=-.455, p < .01). A weak positive relationship was found between state *stress* and trait perceived *stress* (r=.382, p < .001). The analysis detected a weak positive relationship between trait self-compassion and state *self-kindness* (r=.337, p <.01). Further, the strong correlations of state *self-kindness* (PM) and the SCS-SF, and state *stress* (PM) and the PSS, indicated acceptable validity of the single used items assessing the variables on a state level.

[1] Trait Self-Compassion: Skewness: .07, Kurtosis: -1.0; Trait Stress: Skewness: .73, Kurtosis: .86; State Self-Kindness: Skewness: -.74, Kurtosis: -.23; State Stress: Skewness: .16, Kurtosis: -1.00

Table 1

Minimum and Maximum Scores, Means (M) and Standard deviations (SD) of Trait Self-Compassion and Trait Stress

Variables	Minimum (scale min.)	Maximum (scale max.)	M	SD
SCS-SF	20 (12)	52 (60)	36.57	8.19
PSS	5 (0)	36 (40)	15.51	6.55

N = 35

State Stress and State Self-kindness

In order to get an overview of the data and the occurrence of *stress* and *self-kindness* as state and trait, marginal means across participants and timepoints were estimated. Figure 1 is intended to show a general trend over the course of one week. The levels of both constructs increase slightly. In contrast, in figure 2 it can be detected that the levels of *stress* tend to increase as the level of *self-kindness* decreases. Also visible in Figure 2 is the negative association between trait self-compassion and trait *stress.* As scores of self-compassions were decreasing, scores of *stress* were increasing. Additionally, Figure 3 illustrates the negative association as high levels of state *self-kindness* are correlated with a lower level of state *stress*.

Figure 1

Mean state stress and mean state self-kindness per measurement over time.

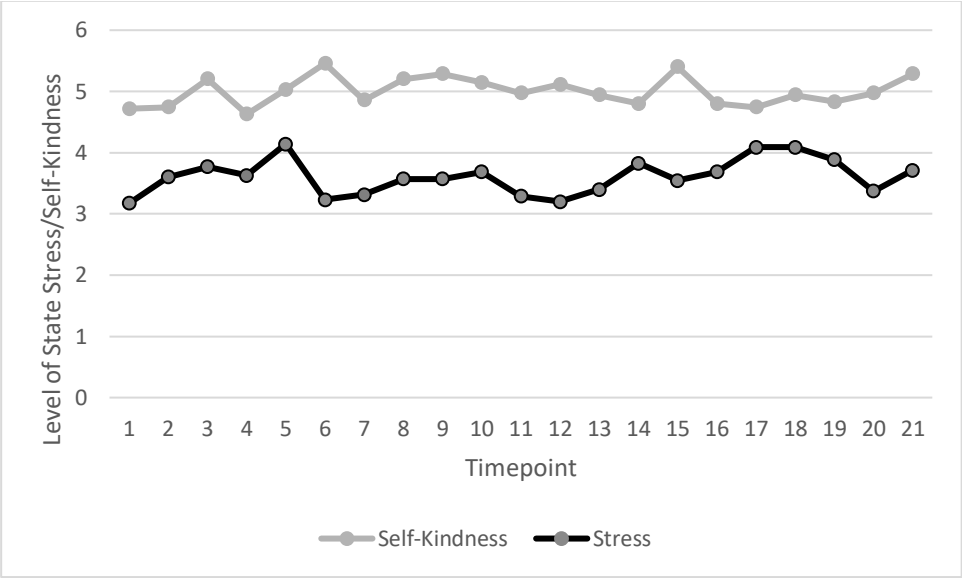
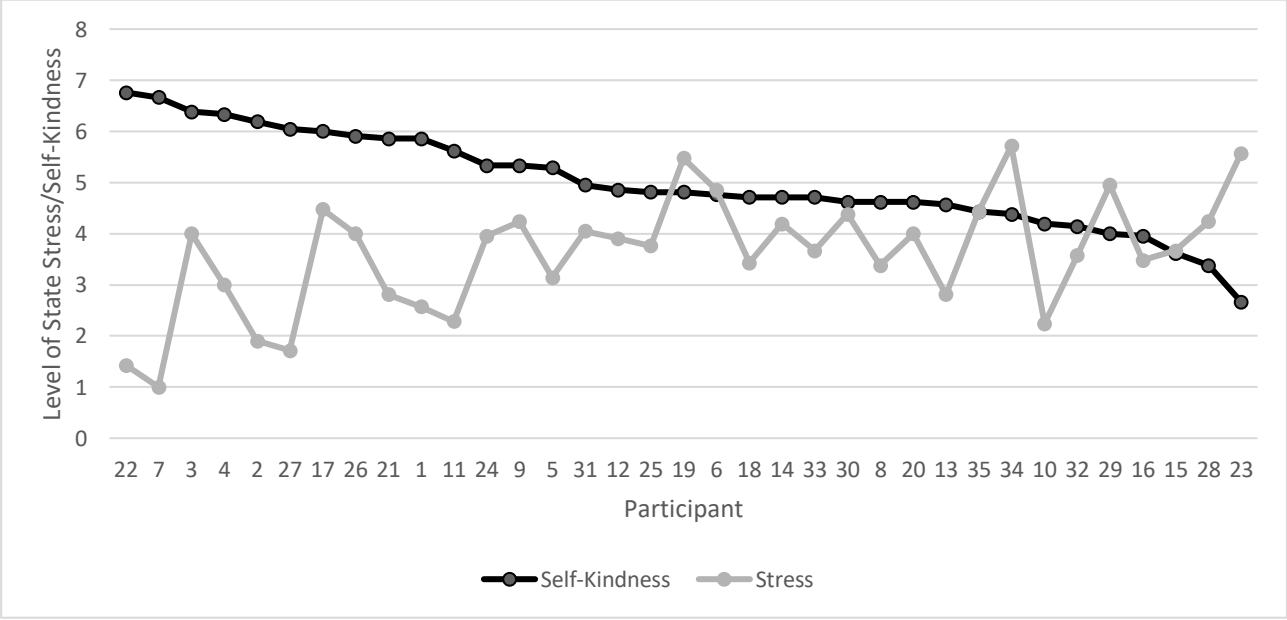


Figure 2

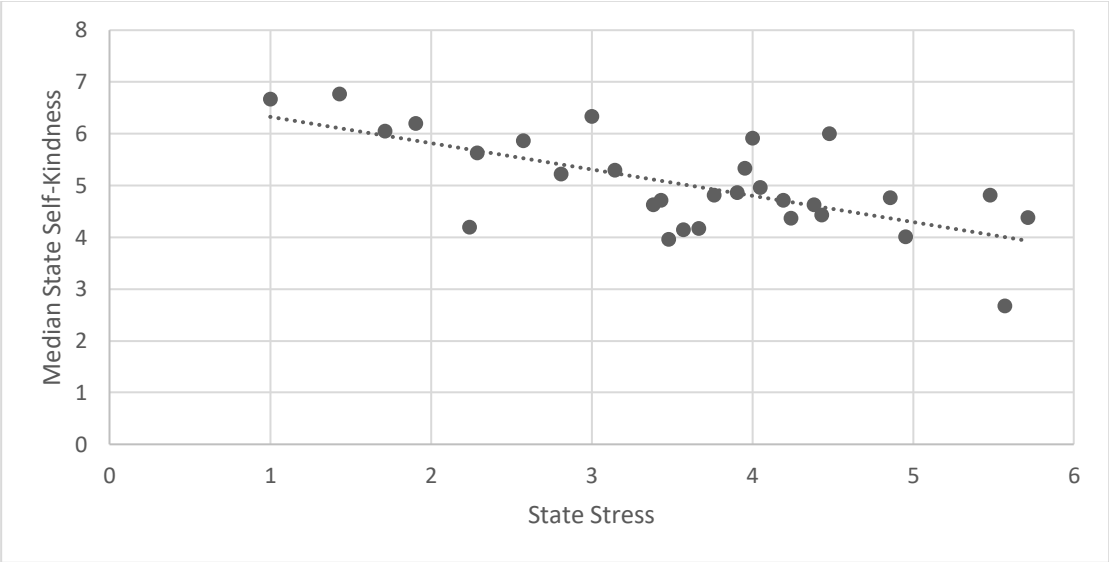
Mean state stress and mean state self-kindness per participant.



Note. The participants (x-axis) were sorted in descending order by their *self-kindness* scores, thus the level of self-compassion decreases from left to right.

Figure 3

Simple Scatter with Fit Line Median of state self-kindness by state stress



Inferential analysis for between and within-person associations

Association between state stress and state and trait self-kindness

In order to explore the association between state *stress* and state and trait *self-kindness*, an LMM was calculated. When looking at the results the association between *stress* and *self-kindness* appears to be mainly trait-like and partly state like (Table 2). This means that there is a negative association between within-person (PM-centered) *stress* and between-person (PM) *self-kindness*. When an individual has a higher score of *stress* on a state level than his or her average, there is also a negative association with lower state *self-kindness*. However, there was a stronger negative association for participants with higher trait *stress* levels on average than others, with lower *self-kindness* scores at different time points.

Table 2

LMM for state Stress and state Self-Kindness (PM) and trait Self-Kindness (PM-centered)

	Estimate (95% CI)	Standardized ß (95% CI)	t (df)	P
Self-Kindness PM (between-person)	-0.69 (-0.86 - -0.51)	-0.38 (-0.47- -0.28)	-7.81 (145.31)	<0.0001
Self-Kindness PM-centered (within-person)	-0.37 (-0.46 - -0.29)	-0.24 (-0.30 - -0.18)	-8.34 (628.86)	<0.0001

Association between state Self-Kindness and trait and state Stress

When looking at the association between state *self-kindness* and within- and between-person *stress*, similar results were obtained (table 3). *Self-kindness* was negatively associated with *stress*, mostly on a trait level and on the state level. The negative association was slightly stronger on a trait level. Meaning, that participants with higher scores on average than others, obtain lower *stress* scores at different time points.

Table 3

LMM between Self-Kindness and state Stress (PM) and trait Stress (PM-centered)

	Estimate (95% CI)	Standardized ß (95% CI)	t (df)	P
Stress PM (between-person)	-0.51 (-0.63 - -0.39)	-0.34 (-0.48- -0.30)	-8.365 (153.656)	<0.0001
Stress PM-centered (within-person)	-0.27 (-0.33 - -0.21)	-0.25 (-0.30 - -0.19)	-8.259 (660.532)	<0.0001

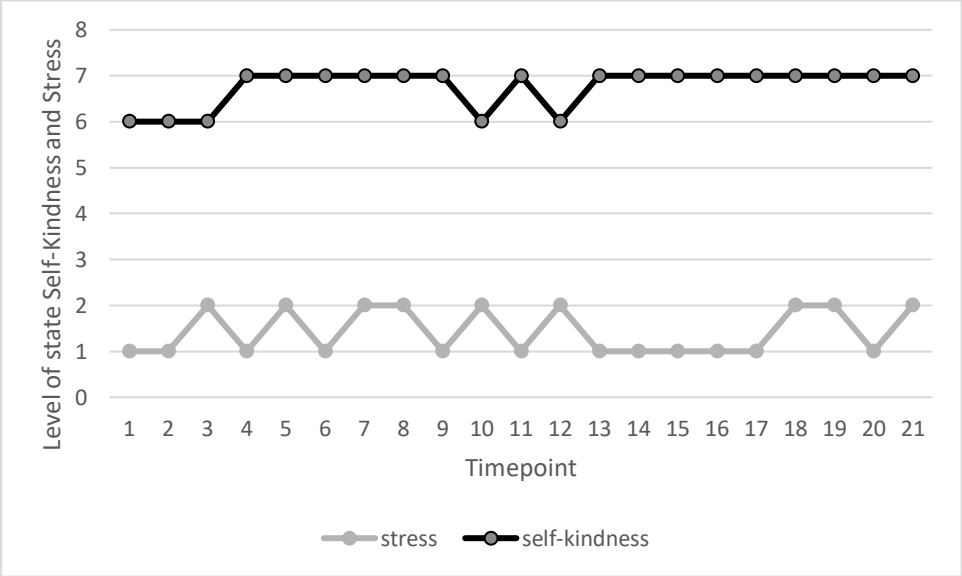
Visual Analysis of Individual Cases

The data of three participants have been illustrated in individual figures to capture the naturally occurring *stress* and *self-kindness* experiences for one week. Herby, cases with high levels of perceived *stress* and *self-kindness* and low levels of perceived *stress* and *self-kindness* were chosen.

Participant 22. The first case showed a high level of *self-kindness*. Figure 4 shows that if the level of *self-kindness* is high the level of *stress* remains low. Thus, it seems as if there is a positive association apparent between state *self-kindness* and state *stress*. However, this case shows relative consistency of the levels of *stress* and *self-kindness* during the course of a week.

Figure 4

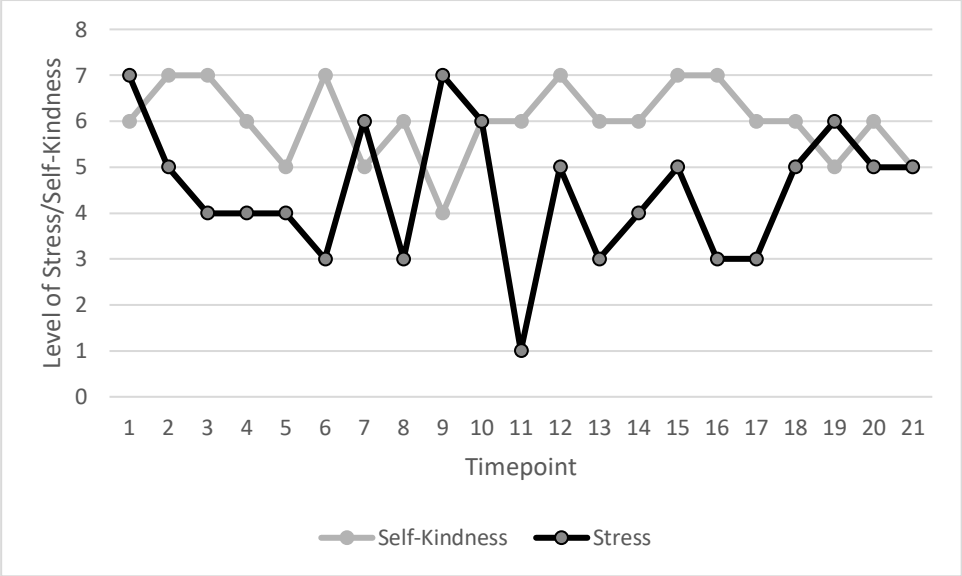
Levels of State Stress and State Self-Kindness of Participant 22 per measurement point over time.



Participant 12. The second case shows strong daily fluctuations in the level of *stress* during one week. Additionally, variations in the level of *self-kindness* can be seen in Figure 5. Further, it seems as if there is a positive association between *stress* and *self-kindness*. Which is contrary to the average, negative parameter estimates.

Figure 5

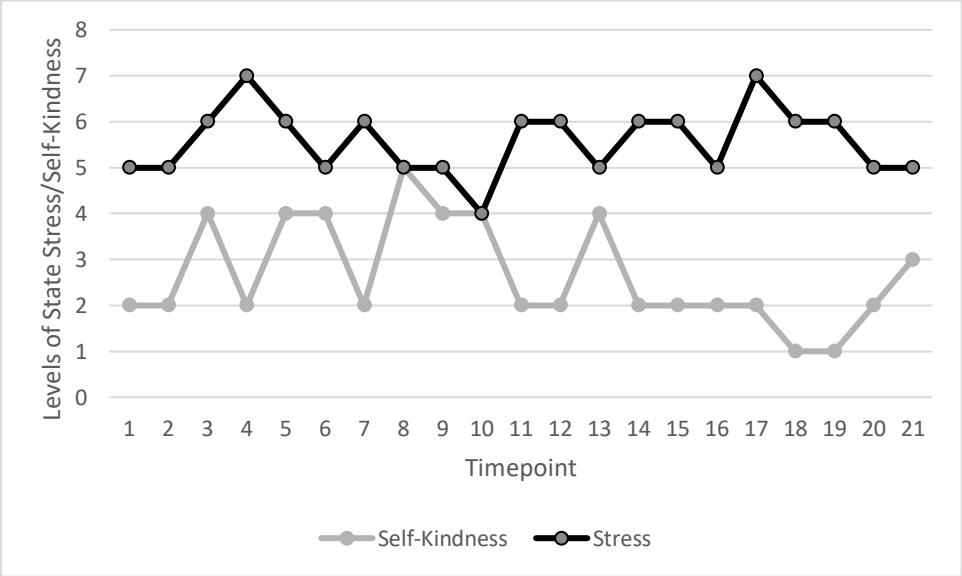
Levels of State Stress and State Self-Kindness of Participant 12 per measurement point over time.



Participant 8. This case showed a high average *stress* level and a rather low level of *self-kindness*. Figure 6 represents a negative association between *stress* and *self-kindness*. In contrast to participant 12, this participant reported less *stress* when the level of *self-kindness* increases.

Figure 6

Levels of State Stress and State Self-Kindness of Participant 8 per measurement point over time.



All three individual cases showed fluctuations in the levels of *stress* and *self-kindness*. The apparent fluctuations indicated that *Stress* and *Self-Kindness* are variable constructs. Further, in most cases, a negative association could be detected. However, the associations seemed rather weak when looking at the calculated LMMs.

Discussion

The objective of this study was to test whether there is an association between perceived *stress* and *self-kindness* among students. To the researcher's knowledge, this is the first study assessing the association between these variables on a trait and state level within an ESM study. The results have shown that there are fluctuations in the levels of *stress* and *self-kindness* over the course of one week (1). No positive association between *stress* and *self-kindness* on a state level was found (2). Further, the results confirmed the assumption that there is a negative daily association between state *stress* and momentary *self-kindness* as well as trait *self-kindness* (3). Comparable results were found for the negative association between state *self-kindness* and trait *stress* and state *stress*. Lastly, the results show differences in the

associations between state and trait measures. Elaboration on the findings as well as the importance of acquiring a more thorough comprehension of the daily association between *stress* and *self-kindness* and how the findings of this study contribute to this will be provided.

The results of the present study support the hypothesis that there is a negative association between state *stress* and trait and state *self-kindness*. This supports the notion, that the more *stress* an individual is experiencing the less self-kind he or she is. Also, the results have shown that the kinder an individual acts towards the self, the lower their *stress* level. One explanation for this finding could be that *self-kindness* operates as a *stress* regulator. Gilbert (2005) argues that self-soothing features of self-compassion, particularly *self-kindness* have a calming effect on threatening experiences. Further, it was reported that defensive threat systems, and coping lie on one continuum. Engaging in defensive threat systems can even increase feelings of being stressed while being kind towards the self-promotes engagement in healthy coping strategies, such as positive cognitive restructuring, e.g. acceptance and positive reinterpretation (Aspinwall, 2005). These forms of coping can be seen as proactive coping, which includes understanding psychological variables that guide individuals to take care of themselves before problems arise and thus, increasing resilience (Aspinwall, 2011). As *self-kindness* involves a motivation to do what is best for oneself it might be that these people show higher resilience when being exposed to stressful events which could explain the negative association between those two variables.

Further explanation of the results of the present studies can be found in the research of Bravo et al. (2018). It was reported that trait and state mindfulness are associated differently with the practice of mindfulness exercises and coping with *stress*. They focused on two positive subcategories of self-compassion, namely mindfulness and non-judgment. Their research excluded *self-kindness*. The results of Bravo et al. (2018) suggested that the stronger the manifestation of non-judgment and mindfulness as a trait the lower the individual's state *stress* level. Our results, similarly, suggest that the negative association between *stress* and *self-kindness* is stronger on a trait level. This study not only adds to the existing research in the association between self-compassion and *stress* on a trait level but also on a state level, as there was also an association found on a state level. Thus, this research significantly adds to the findings of Bravo et al. (2018) and enriches the research on self-compassion by adding insights on *self-kindness* and *stress*.

The findings of this study strongly imply that levels in both variables fluctuate over one week. This supports the assumption both variables can be apparent as states. The results highlight that there is a negative association between them on a state level. Previous research usually viewed *stress* and *self-kindness* as traits (Homan & Sirois, 2017). The results of research on emotion regulation support the assumption and support the results of this study that *self-kindness* can occur as a trait as well as a state as *self-kindness* serves as emotion regulation (Leary et al., 2007; McMahon & Naragon-Gainey, 2019). The current study has shown that *self-kindness* is present within and between persons. This goes along with recent research by Li et al. (2020). Their study focused on the moderating effect of *stress* on self-compassion and health-promoting behaviors. They investigated the levels of perceived *stress* and self-compassion within as well as between persons. Finally, their findings suggested that there is a negative association between perceived *stress* and self-compassion on a state level (Li, Deng, Lou, Wang, & Wang, 2020). The current study significantly adds more detail to the research of Li et al. (2020) as the component of *self-kindness* was explored outside of the construct of self-compassion. However, the association between state *stress* and state *self-kindness* seems rather low. Li et al. (2020) found a stronger association between *stress* and self-compassion than the one that was found between *stress* and *self-kindness* in the present study. This information could be interpreted in that way that all components of self-compassion influence that association with *stress*, thus the whole construct of self-compassion has a stronger influence on that level of perceived *stress*.

It was expected that there is a positive association between state *stress* and state *self-kindness*. However, the results were not in line with this assumption. This means, that on a specific time point on which a person shows a higher (or lower) score of *self-kindness* than their average, they tend to show a lower (or higher) level of *stress* at the same timepoint. This finding might be explained by the idea that people showing a high level of *self-kindness* also react with greater emotional resilience and stability towards stressful situations (Neff, 2011). Thus, the assumption arises that the level of *self-kindness* remains stable due to their emotional resilience for people showing a higher level of *self-kindness*. Further, it could be explained by the assumption that people high on *self-kindness* rather avoid stressful situations, as *stress* is seen as a threat to their *self-kindness* (Neff, Kirkpatrick, et al., 2007). Additionally, when Neff (2011) compared self-compassion to self-esteem it was found that self-compassion does not depend on positive self-judgment in contrast to self-esteem. Thus, feelings of self-compassion seem to be more consistent, more easily accessible, and more trait-like.

In this study, the results have shown that the students experience a moderate level of *stress*. In comparison, an earlier study at the University of Twente indicated the student's having a high level of *stress* (Reh, 2019). However, this study was conducted outside the exam period whereas the earlier study was conducted within the exam period. Based on this study's finding that there is a negative association between *stress* and *self-kindness* (on a state and trait level) the assumption arises that *self-kindness* serves as an emotion regulator. This pattern of results is consistent with the previous research by Neely and Colleagues (2009) outlining the importance of self-compassion as a predictor for student`s well-being. Their research indicated that the way students managed their negative emotions in the face of disappointment was a significant contributor to their well-being. Echoing their results Leary et al. (2007) reported that undergraduate students' self-compassion scores predicted their self-evaluations and reactions to real-life events. Taken together, it seems both constructs, *stress,* and *self-kindness,* are highly prevalent constructs among students and that self-compassion takes an important role in decreasing the students' *stress* level. This study specifically outlined the role of *self-kindness* in association with *stress,* thus providing more detailed insights into their relationship.

Strengths and Limitations

In order to evaluate the generalizability of this study strengths, as well as limitations, should be mentioned. Firstly, the biggest strength is that the experience sampling method (ESM) was used, and thus, ecological validity has been increased. Through using this method, it was possible to assess the participant's levels of *stress* and *self-kindness* multiple times a day. Therefore, the levels of *stress* and *self-kindness* could be assessed within daily circumstances and fluctuations of these variables can be grasped more accurately. Further, by using ESM assessment of within- and between-person associations have been made possible which would have been impossible with a cross-sectional survey.

Secondly, a strength of this study are the used trait questionnaires. The SCS-SF as well as the PSS show high reliability. However, one potential limitation can be found in the use of the SCS-SF. The focus of this study lies on one specific component of self-compassion it would have been practical to assess the participant's level of trait *self-kindness* with the SCS. This study used the SCS-SF which includes twelve items only. It is suggested to use the longer form when assessing the subscales in detail (Raes et al., 2011). However, trait levels of the participants were assessed through analyzing between participant means. Nonetheless, it

can be recommended to use the long-form in future research to get a more detailed insight into the scores of the subscales, specifically *self-kindness*.

A second potential limitation is that due to technical problems only students with an android mobile phone could participate in this study, as the TIIM application did not work on phones with iOS. Research indicates that there are differences between android and apple users regarding their personality, habits, and usage (Shaw, Ellis, Kendrick, Ziegler, & Wiseman, 2016; Ubhi, Kotz, Michie, van Schayck, & West, 2017). Based on these findings the idea arises that the results might have been different if both user groups would have been included in the research. For further research, it would be interesting to enable both users to take part in the study. However, it seems to be rather common for psychological app-based studies to conduct the study solely with Android or iOS users (Götz, Stieger, & Reips, 2017). Another technical problem limiting the results of this study is that the questionnaires did not disappear after the timeframe of two hours. Therefore, participants could indicate their *stress* and *self-kindness* level later during the day instead of in the moment. Therefore, the response was rather based on their memory of the feeling during that moment instead of the actual feeling. This might have impaired the ecological validity of this study.

Conclusion and recommendations for further research

As a few limitations were outlined, there are some indications for future research. Firstly, it is recommended to use the long form of the SCS to assess the trait level of *self-kindness* more detailed. Secondly, in order to increase ecological validity, a strict timeframe for filling out the questionnaires should be set. Thus, the results have not to be based on the participant's memory but on their current state of emotion. Further, it can be recommended for future research to include students from other universities. This study only considered students of the University of Twente. It might be that students at other universities indicate a different level of perceived *stress* and *self-kindness*.

Despite the mentioned limitations, this research can be seen as a first step towards integrating two lines of research, *stress*, and *self-kindness* on a trait as well as on a state level, that, to our knowledge, have not been directly researched. The association between them is shown to be negative and stronger on a trait level. Now that there is support for the assumption that *self-kindness* and *stress* are negatively associated with each other among students, interventions helping students to cope with *stress* levels and alleviate their feelings of being stressed can be developed according to these findings. Taking this one step further,

findings could be used to integrate this knowledge into treatment with patients suffering from disorder including high-*stress* levels. For example, in CBT treatment the patient could be taught how to apply *stress* coping skills with the help of *self-kindness*. Furthermore, as this study has shown that levels of *stress* tend to decrease when the level of *self-kindness* is increasing *self-kindness* exercises could be assigned as homework to keep *stress* levels low or decrease them (Riley, 2015). Further, as follow up of this study focus groups could be created to discuss the results of this study and how this could be implemented into and applied to the university life.

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Appendix A

Perceived Stress Scale (PSS) by Sheldon Cohen

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling how often you felt or thought a certain way.

0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2. In the last month, how often have you felt that you were unable to control the important things in your life?	0	1	2	3	4
3. In the last month, how often have you felt nervous and "stressed"?	0	1	2	3	4
4. In the last month, how often have you felt confident about your ability to handle your personal problems?	0	1	2	3	4
5. In the last month, how often have you felt that things were going your way?	0	1	2	3	4
6. In the last month, how often have you found that you could not cope with all the things that you had to do?	0	1	2	3	4
7. In the last month, how often have you been able to control irritations in your life?	0	1	2	3	4
8. In the last month, how often have you felt that you were on top of things?	0	1	2	3	4
9. In the last month, how often have you been angered because of things that were outside of your control?	0	1	2	3	4
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	0	1	2	3	4

Appendix B

Self-Compassion Scale Short-Form (SCS-SF) by Kristin Neff, Ph.D.

Please read each statement carefully before answering. To the left of each item, indicate how often you behave in the stated manner, using the following scale:

Almost never **Almost always**

1 **2** **3** **4** **5**

_ 1. When I fail at something important to me, I become consumed by feelings of inadequacy.

_ 2. I try to be understanding and patient towards those aspects of my personality I don't like.

_ 3. When something painful happens, I try to take a balanced view of the situation.

_ 4. When I'm feelings down, I tend to feel like most other people are probably happier than am.

_ 5. I try to see my failing as part of the human condition.

_ 6. When I'm going through a very hard time, I give myself the caring and tenderness I need.

_ 7. When something upsets me, I try to keep my emotions in balance.

_ 8. When I fail at something that's important to me, I tend to feel alone in my failure.

_ 9. When I'm feeling down, I tend to obsess and fixate on everything that's wrong.

_ 10. When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people.

_ 11. I'm disapproving and judgmental about my own flaws and inadequacies.

_ 12. I'm intolerant and impatient towards those aspects of my personality I don't like.

Appendix C

Push Notifications

Time	Push Notification
After assigning participants to study	Welcome! Further information will follow tomorrow! 😊
Day 1: 8:00: 19:00 (if not done yet)	Thank you for your patience; New information are available! Have you rread all information? We'll start tomorrow morning 😊
Day 2 -8: 08:00 12:00 19:00 09.:30, 13:30, 20:30 (if not done yet) To encourage	Good morning 😊 Tell me how you are feeling! Lunch time 😊 Tell me how you are feeling! Tell me how you are feeling! And enjoy your evening 😊 Don't forget to tell me how you are feeling 😊 You are doing great! 4 more days to go! Good morning 😊 Only two more days. You are doing great! A few missed answers are no problem! Keep going!
Day 8: 21:00	You've made a great job this week! 😊 Tomorrow you'll receive the ending questionnaires.
Day 9:08:00 14:00 (If not done yet) 19:00 (If not done yet)	Today is your last day! Please fill in the 4 questionnaires. Great job so far! Don't forget to fill in the last questionnaires! 😊 Great job so far! Don't forget to fill in the last questionnaires! 😊

Appendix D

Subscription to the study