UNIVERSITY OF TWENTE.

Faculty of Behavioural, Management and Social Sciences

The Association between Self-Compassion and Perceived Stress on the Within-Person and Between-Person Level

Master Thesis

Max Böggemann

Supervisors:
Dr. Matthijs L. Noordzij
Dr. Ed de Bruin

19.07.2020

Abstract

Introduction. Past studies found that perceived stress is significantly negatively correlated to mental health and research increasingly tries to find possibilities which buffer against stress. Self-compassion is one construct which has been found to have a positive effect on reducing perceived stress. Although both constructs implicate within-person *or state* effects, most studies use cross-sectional data which is unsuited to display daily fluctuations. Therefore, this study examined self-compassion and perceived stress on a daily basis in order to examine how self-compassion and perceived stress are associated on the within-person and between-person level.

Objective. The association between state self-compassion and state perceived stress was examined on the between-person *or trait* level and furthermore, it was examined in detail on the within-person level, by investigating individual data patterns of six randomly selected participants and by using linear mixed model. Moreover, the expected negative association between trait self-compassion and trait perceived stress was examined as a repetition of past research.

Method. A longitudinal online study was conducted with a sample of 35 college students over a time span of seven days. Daily fluctuations of state self-compassion and state perceived stress were measured with three single-item questions at three time points per day. The Self-Compassion Scale Short-Form (SCS-SF) and the Perceived Stress Scale (PSS) were used to assess the general trait level once. Linear mixed model (LMM) and linear regression were used for the analysis.

Results. LMM showed a moderate negative association between state self-compassion and state perceived stress on the between-person level. On the within-person level the individual data patterns of the six randomly selected participants showed in general the same negative association. However, for some individuals and time points state self-compassion levels were stable while the perceived stress levels fluctuated. Trait self-compassion and trait perceived stress have shown to be strongly negatively correlated which is in line with past research.

Conclusion. The results show that the associations on the between-person level cannot necessarily be generalized to the within-person level, since the associations on the within-person level were dependent on the individuals' self-compassion level and varied accordingly. Hence, future research should investigate between-person and within-person associations further, which could lead to more insights and ultimately to more effective interventions aimed at reducing general trait perceived stress and in addition momentary state perceived stress, by taking differences on the within-person level into account.

Table of Contents

Introduction

The effects of stress and its impact on mental health gains increasing attention. According to Phillips (2013) perceived stress is the feelings or thoughts that an individual has about how much stress they are under at a given time point or period. It incorporates feelings about the uncontrollability and unpredictability of life, the frequency of hassles, and changes in one's life, and furthermore, how confident one is to properly deal with these issues (Phillips, 2013). Perceived stress is significantly negatively correlated to mental health (Chu, 2014; Elkins, et al., 2010; Smith et al., 2010). Evidence for the link between psychological stress and various health problems and illnesses are already examined, including depression, cardiovascular disease, and HIV/AIDS (Cohen, et al., 2007). Moreover, stress is being recognized as having a major impact on physical and mental well-being and looking into the interactive nature between stress and health is seen as leading to profound implications for treatment and intervention models (Cohen, 2000).

Thus, research is looking into relationships between perceived stress and different concepts in order to find factors which can buffer against the negative effects of stress. One concept which has been found to be a possible buffer against perceived stress is self-compassion. Self-compassion entails to forgive oneself in the face of failings while also respecting oneself as a fully human instead of self-criticizing. (Neff, 2003). Research has shown that self-compassion has a positive impact on perceived stress (Allen & Leary, 2010; Sirois, 2014).

However, recently research began to examine daily fluctuations and differences - *or states* - compared to general traits when examining various constructs and their relationships. In order to examine not only between-person *or interindividual* effects which is commonly done in cross-sectional studies, but also within-person *or intraindividual* effects, the data used should not be cross-sectional since data of one measurement is not well suited to examine within-person effects which fluctuate over time (Curran & Bauer, 2011). Instead, it should be based on measurements of several time points (representing states at that time) which provide the possibility to display fluctuations over the day.

Fridhandler (1986) defines the concept of states and traits and explains that these concepts are distinguished most frequently by temporal duration which entails that states are short-lived, and traits are defined as highly enduring and possibly lifelong. Moreover, the author explains that traits are manifested discontinuously in reaction to relevant circumstances which means that they are not manifested all the time, for example being a generally cheerful person who has a propensity

to that feeling but who is not cheerful permanently in each situation. Further, he explains that states are manifested continuously, which means that if you are cheerful in a certain situation you will be continuously cheerful in that situation until the state is over and you are not cheerful anymore (Fridhandler, 1986). Many studies have already shown the value of examining trait-state differences - including intervention development - for different constructs (e.g. Deffenbacher, et al., 1987; Kiken, et al., 2015; McWhirter, & Page, 1999). Eid, et al. (1999) argue that assessing self-perceived deviations of mood states and looking at differences to mood traits are advantageous for research, (i.e. personality scales) and further they have shown that such measurements are a valid and reliable method. Therefore, this study will use momentary assessments of self-perceived deviations of perceived stress and self-compassion to explore differences on the between-person and within-person level, which might bring insights leading to new intervention developments which then include state conceptions. Since research has shown that including such conceptions might be useful, these developments could lead to new effective interventions which focus on enhancing self-compassion and reducing stress on the state and trait level, which could lead to increased well-being.

Perceived Stress

Research has summarized the conceptualizations of stress into three main areas, environmental, psychological, and biological (Cohen, et al., 1997; Kopp, et al., 2010). However, recently more emphasis has been put into the development of the stress assessment which focuses primarily on the psychological stress component *or perceived stress* (Cohen, et al., 1983; Cohen, et al., 1995; Derogatis & Coons, 1993; DeLongis, et al., 1982; O'Keeffe & Baum, 1990; as cited in Kopp, et al., 2010).

The psychological stress perspective *or perceived stress perspective* puts emphasis on the evaluation and perception of the potential harm of the environmental factors, and when the demands of these environmental factors are perceived as high to an extent that the individual thinks that coping is no longer possible, the person will label him- or herself as being stressed which is accompanied by negative emotions (Cohen, et al., 1997). Therefore, perceived stress is a product of the interpretation of the meaning of an event and how the coping capability of oneself is evaluated (Cohen, et al., 1997).

Research about state perceived stress is scarce. Although many central theories in psychology either implicitly or explicitly incorporate within-person processes, they mostly involve the collection and analysis of strictly between-person data (Curran & Bauer, 2011). The definition of perceived stress also involves individuals and how they feel at a given time point but very few studies exist which measured daily fluctuations of perceived stress.

However, some studies already demonstrated the value of assessing momentary perceived stress levels. Klaperski, et al. (2019) used momentary measurements of perceived stress for examining the influence of exercise environments on wellbeing. These momentary measurements provided the ability to measure the fluctuations of state stress levels associated with the environment and they found that if the environment is perceived as calming, stress levels were lower. VanEck, et al. (1996) used momentary measurements of perceived stress and other constructs to examine the effects of different factors on cortisol levels.

Self-Compassion

The concept of self-compassion is defined by Neff (2003) as being open to one's own suffering instead of disconnecting from it and having the desire to alleviate this suffering and heal it with kindness, and moreover, that it includes a nonjudgmental stand to one's pain and failures, so that one's experiences are seen as part of the larger human experience. Self-compassion entails three main features. Firstly, self-kindness which refers to the capacity to treat oneself with kindness and compassion. Secondly, common humanity, which places emphasis on recognizing that painful and difficult experiences are part of human life instead of isolating this suffering to oneself. Thirdly, mindfulness refers to being able to take a balanced view of one's emotions (Neff, 2003). According to Neff and Dahm (2015) research increasingly shows that self-compassion enhances intrapersonal and interpersonal wellbeing, coping, and reduces psychopathology while also leading to joy and meaning in life. For instance, self-compassion has been found to enhance self-regulation through reducing negative states and negative self-evaluations which can interfere with adaptive regulation and well-being (Allen & Leary, 2010; Neff & McGehee, 2009; Neff, et al., 2007b).

Although the concept of self-compassion incorporates within-person effects (how individuals react to states or situations at a given time point), research about trait and state differences in self-compassion is not extensive. However, there are several studies which used momentary assessments of self-compassion for their purposes and thus demonstrated the value of

such data. For instance, Falconer, et al. (2015) found that an association between increased negative affect, increased state self-compassion, and decreased state self-criticism, and they point out that this is in contrast with results from literature about such associations on the trait level. Kirschner, et al. (2019) found that state self-compassion elicits similar positive effects as trait self-compassion like activating a physiological pattern of relaxation. Further, they point out that this association remains to be studied while feeling stressed.

Self-Compassion and Perceived Stress

The association between self-compassion and perceived stress was examined by many studies. Self-compassion - with its three main features self-kindness, common humanity, and mindfulness - can help individuals to self-regulate negative emotions which can arise in uncontrollable or unexpected events (Neff, et al., 2007a). This is consistent with appraisal-based models of stress like the Transactional Model of Stress and Coping by Lazarus and Folkman (1984) which highlights the role of cognitive and behavioral responses in intensifying or weakening the stress response. Adaptive coping responses are those which successfully remove or reduce the stressor by cognitively changing its appraisal, or by making direct behavioral changes (Cohen, et al., 1997; Lazarus & Folkman, 1984). Self-compassionate people may appraise stressors in a less threatening and less negative way which allows them to elicit effective behavioral responses which potentially reduce the stressor since their self-regulation is not hindered by negative self-evaluations and mood which often arise in stressful events (Sirois, Kitner, et al., 2015; Sirois, Molnar, et al., 2015; Terry & Leary, 2011). Furthermore, Samaie and Farahani (2011) found that self-compassion is a mediator between stress and self-reflection and stress and rumination and Sirois (2014) found that self-compassion reduces procrastination-related stress (Sirois, 2014).

However, there are no studies about the relationship of self-compassion and stress concerning differences on the between-person and within-person level. Li, et al. (2019) found that daily self-compassion *or state self-compassion* leads to more health-promoting behavior by the reduction of perceived stress. However, they measured these constructs daily and not several times per day (momentary assessments) and further, they did not examine state and trait perceived stress and the direct relationship between perceived stress and self-compassion. Thus, there seems to be a knowledge gap in research about the relationship between self-compassion and perceived stress with possible differences on the between-person and within-person level.

Current Study

Although the concepts of self-compassion and perceived stress indicate within-person effects, which according to Curran and Bauer (2011) is common for psychological theories, most studies are based on cross-sectional data which cannot display daily fluctuations. Some studies already used momentary assessments for perceived stress (Klaperski, et al., 2019; VanEck, et al., 1996) and self-compassion (Falconer, et al., 2015; Kirschner, et al., 2019) to get new insights about state and trait differences with potential worth for future theoretical and practical applications. However, research lacks knowledge about the relationship between self-compassion and perceived stress on the within-person level. Thus, this study used the experience sampling method to measure stress and self-compassion several times per day which provided the possibility to examine state and trait differences.

Research showed that within-person *or state level* associations are not necessarily similar to the corresponding between-person *or trait level* associations. For instance, Falconer et al. (2015) found that the association between increased negative affect, increased state self-compassion, and decreased state self-criticism lies in contrast with the results found in literature about such between-person associations. Moreover, Fisher, et al. (2018) found that group data cannot necessarily be generalized to individual data patterns. Hence, between-person associations cannot necessarily be generalized to within-person associations. This results in the following exploratory research question:

1. How can *the association between state self-compassion and state perceived stress on the within-person level* be described?

Furthermore, research showed that self-compassion and perceived stress are negatively correlated on the between-person level (Neff, et al., 2007a; Samaie & Farahani, 2011; Sirois, 2014; Sirois, Kitner, et al., 2015; Sirois, Molnar, et al., 2015; Terry & Leary, 2011). In this context, this study will examine the between person *or trait level* association of trait self-compassion and trait perceived stress as a repetition. This results in the following research question:

2. It is expected that *individuals who score high in trait self-compassion feel lower levels of trait perceived stress.*

Method

This study includes a secondary data analysis using the data set of the longitudinal online study performed by Adam (2020) which was conducted over a period of one week and used the experience sampling method (ESM) to make daily measurements of state perceived stress and state self-compassion and furthermore, trait perceived stress and trait self-compassion were measured once in the end. The study by Adam (2020) obtained ethical approval by the Behavioral, Management, and Social Sciences (BMS) Ethics Committee of the University of Twente (Request-Nr: 191272). Participants who took part in that study gave their informed consent beforehand.

Participants

The participants were recruited by convenience sampling with the Test Subject Pool BMS (SONA) System of the University Twente and furthermore, the sharing-subscription link was shared by the researchers with personal contacts and Facebook. For the participants who subscribed via the SONA-System, 2.5 credit points were given as compensation for their participation. The participants who took part in the study were college students whose age ranged between 18 and 31 years (M=20.65; SD=3.15). 50% of Participants were German, 38.2% Dutch, 2.9% Indian, 2.9% Bulgarian, 2.9% Vietnamese, and 2.9% Indonesian. The participants consisted of different gender identities (85.3% women, 8.2% men, 2.9% transgender women, 2.9% gender variant/non-conforming). Inclusion criteria for the participants were to be enrolled as a student, to be proficient in the English language, to be over 18 years old, and to own a smartphone which is able to download and use The Incredible Intervention Machine (TiiM) application (The BMS Lab, n.d.). Since only participants with a 100% response rate of all questionnaires were included in the analysis, the final sample consisted of 35 participants.

Materials

The survey by Adam (2020) was created with The Incredible Intervention Machine (TIIM) developed by the University of Twente (The BMS Lab, n.d.) and consisted of six daily ESM questions and four trait questionnaires. However, in the current study the data of the daily questions about self-compassion and perceived stress and furthermore, the data of the trait questionnaires Self-Compassion Scale Short Form (SCS-SF) by Raes, et al. (2011) and Perceived Stress Scale (PSS) by Cohen, et al. (1983), was used.

The Incredible Intervention Machine (TIIM)

The survey tool TIIM, developed by the University of Twente (The BMS Lab, n.d.), can be operated on iOS and Android operating systems. In order to remind participants about required answers, push notifications were used (see Appendix A). The study was conducted over a period of one week with three daily ESM measurements per day, the first one between 8 o'clock and 10 o'clock, the second one between 12 o'clock and 14 o'clock, and the last one between 19 o'clock and 21 o'clock. These times were chosen to ensure that the data is measured in various social contexts and situations. The time span of one week was chosen because many students might be at different places on the weekends and measuring over a whole week might lead to more valid data since it approximates the daily life. To ensure decent usability of the survey, individual modules were tested and corrected in the creation phase and furthermore, the survey was tested in a pilot-test over one day by two participants. The pilot-test checked the surface, the timing, and the response function.

After the first four participants were instructed to set alarm clocks at 8 o'clock, 12 o'clock, and 19 o'clock which led to a reduction of the response rate, the strategy was changed to manual push notifications through the "BMS Lab Dashboard". This led to an increase of the response rate and this strategy was used further. Moreover, when participants did not respond until 30 minutes before the end of the time span, the researcher sent a reminder again (see Appendix A).

Daily Questionnaire

All daily ESM questions were randomly sorted in each time range to ensure that there is no habituation effect (see Appendix B).

State Perceived Stress. To access state perceived stress on a daily basis, it was measured on three different time points per day. In order to measure state perceived stress - and considering the reduction of effort and increasing the response rate - one single item ("On a scale from 0 to 7 and seven being the worst stress possible, what number best describes your level of stress right now?") was chosen. This item is called the Stress Numerical Rating Scale - 11 (SNRS-11) and was developed to assess perceived stress in the moment. Karvounides et al. (2016) state that three different studies validated the SNRS-11. The common effect size suggestion of Cohen (1988) states that $r > .10$ can be considered a weak correlation, $r > .30$ a moderate correlation, and $r > .50$ a strong correlation. Therefore, Bivariate Pearson analysis showed that the state perceived stress question and the trait perceived stress questionnaire (Perceived Stress Scale) by Cohen, et al.

(1983), are moderately positively correlated (r = .382, p <.000, N= 35) in the current study, which shows that the state perceived stress measure might be a valid instrument to assess perceived stress in the moment.

State Self-Compassion. In order to measure state self-compassion, one single item was phrased in the same way as the SNRS-11 ("On a scale from 0 to 7, how kind do you feel towards yourself right now?"). Bivariate Pearson analysis showed that the state self-compassion question and the trait self-compassion questionnaire (Self-Compassion Scale Short Form) by Raes, et al. (2011) are moderately positively correlated (r = .337, P < .000, N = 35) - based on the common effect size suggestion of Cohen (1988) - in the current study. This shows that these two scales are related, and this item might be a valid instrument to measure self-compassion in the moment.

Trait Questionnaires

Perceived Stress Scale (PSS). In order to examine the level of the participants' trait perceived stress level, the PSS (Cohen, et al., 1983) was used (see Appendix C). The scale includes ten items which ask about the participants' feelings and thoughts during the last month and are measured with a five-point Likert scale ranging from 0 (never) to 4 (very often). The total scale consists of four positively phrased items (i.e. "In the last month, how often have you been able to control irritations in your life?") and six negatively phrased items (i.e. "In the last month, how often have you felt nervous and "stressed"?). The total score is calculated by scoring the four positively phrased items reversed and then summing up all scores. The higher the total score, the higher the level of trait perceived stress. In the current study the reliability analysis has shown a Cronbach's α of .889. According to Blanz (2015) this can be described as good validity. Moreover, this study will validate this measure by using simple linear regression in order to examine the association between the mean of the state measurements (resulting in a calculated trait variable) and the results of the PSS.

Self-Compassion Scale Short Form (SCS-SF). For the examination of the participants' level of trait self-compassion, the SCS-SF (Raes, et al., 2011) was used (see Appendix D). The scale includes twelve items which ask the participants to indicate how often they behave in the stated manner and are measured with a five-point Likert scale ranging from 1 (almost never) to five (almost always). The total scale consists of three positive subscales (Self-Kindness; Common Humanity; Mindfulness) and three negative subscales (Self-Judgement; Isolation; Over-Identification). The items of the negative subscales must be scored reversed. The higher the total

score, the higher the level of trait self-compassion. Example items are “When I’m going through a very hard time, I give myself the caring and tenderness I need.” (positive) and “I’m intolerant and impatient towards those aspects of my personality I don’t like.” (negative). Reliability analysis in this study has shown a Cronbach’s α of .813 which according to Blanz (2015), can be described as good validity. Moreover, the SCS-SF will be validated by examining the association between the SCS-SF and the mean of the state measurements, which represents a calculated trait variable, with simple linear regression.

Procedure

The study was conducted over nine days. The first day was meant exclusively for informing the participants about the study and to ensure that the participants could prepare for the actual study period. Subscription to the study was possible through the SONA-System of the University of Twente or directly via the subscription link offered by TIIM. Both paths led to the subscription page which required them to fill in a valid email address, a password, their age, nationality, their gender identity, and confirm that they are enrolled as a student. Afterwards, the participants were instructed to download and install the TIIM application on their smartphone with either an Android or iOS operating system (see Appendix B). The information that all tasks for that day were completed and that more information would follow on the next morning in the application was provided on the next page.

On day one (the next morning) participants were informed about the study background, more information about the schedule and the setup of the study over the next week and about their rights and contact information. Informed consent had to be given by all participants afterwards. The next seven days (day two until day eight) the participants were asked to answer the same six questions three times per day, including the two items about state self-compassion and state perceived stress which are used in this study. They had to answer all questions subsequently (to give no answer and continue to the next question was not possible). On day nine the study ended with the trait questionnaires (including the PSS and the SCS-SF). The questionnaires were available from 8 o’clock in the morning while the next one was only available after completing the previous one.

Data Analysis

All analyses were performed using SPSS (version 25). To get standardized coefficients which can be used for the LMM analysis, Z-scores were computed for state and trait self-compassion and state and trait perceived stress. Furthermore, for their person mean scores (PM) and person-centered mean scores (PC-M) and were used for all following analyses. Linear Mixed Model analysis (LMM) was used with an autoregressive repeated measurement structure which enables to control for the dependency of the data measurements. In order to properly analyze the data, person mean scores (PM) of all measurement points and person-centered mean scores (PC-M), which are the raw scores minus the PM, were calculated in order to do between-person and within-person analysis (Curran & Bauer, 2011). The PM scores can be considered as being the calculated trait variable of the state scores since it represents the average level of perceived stress and self-compassion over the period of one week which approximates their trait level. In order to validate this, simple linear regression was done with the PM scores as the dependent variable and the trait questionnaire scores (SCS-SF and PSS) as the fixed independent variable for perceived stress and self-compassion separately. For the purpose of interpretation, the effect size suggested by Cohen (1988) was used which states that $R^2 > .02$ can be considered a weak variance prediction, $R^2 > .13$ a moderate variance prediction, and $R^2 > .26$ a strong variance prediction. The PM scores can be used to examine between-person associations. The PC-M scores represent the better state variable since they show how much each person deviates from their PM at each measurement. According to Eid, et al. (1999) measuring the momentary deviation from how individuals feel normally is most valuable since it represents the pure situational and/or interactional influences that are free of stable aspects. The PC-M scores can therefore be used to analyze within-person associations.

Furthermore, the expected negative or positive association between state self-compassion and state perceived stress on the between-person level of all participants across all time points was examined by using LMM with the PC-M scores of state self-compassion as the dependent variable and the PC-M scores of state perceived stress as the fixed independent variable. Moreover, in order to properly examine state associations on the within-person level, the sample was divided into three groups based on their scores of the trait self-compassion questionnaire. This resulted in three groups with low, moderate, and high levels of trait self-compassion, respectively. Then, the *select cases* command of SPSS was used to randomly select two participants from each group. The selected participants were then used as examples to examine within-person associations of state

self-compassion and state perceived stress by looking at the individual measurements (visually on graphs) which show the fluctuations over the time span of one week. Moreover, LMM was done with the PC-M scores of state self-compassion and state perceived stress for each of the six participants in order to examine intraindividual *or within-person associations*.

Lastly, simple linear regression analysis was used to examine the expected negative association between trait self-compassion and trait perceived stress with the participants' mean of trait self-compassion as the dependent variable and the participants' mean of trait perceived stress as the fixed independent variable.

Results

Descriptive Statistics

An overview of the data, including minimum and maximum scores, means and standard deviations for the state questions of self-compassion and perceived stress (SNRS-11) and the trait questionnaires PSS and SCS-SF, can be seen in Table 1.

Table 1

Minimum and Maximum Scores, Means and Standard Deviations (SD) of Trait/State Self-Compassion and Trait/State Stress

Scales	Mean	SD	Minimum (Min. of Scale)	Maximum (Max. of Scale)
Trait Perceived Stress (PSS)	15.51	6.64	5 (0)	36 (40)
State Perceived Stress (SNRS-11)	3.61	1.73	1 (1)	7 (7)
Trait Self-Compassion (SCS-SF)	36.57	8.30	20 (12)	52 (60)
State Self-Compassion ("On a scale from 0 to 7, how kind do you feel towards yourself right now?")	5.00	1.46	1 (1)	7 (7)

Note. N=35

Validation of State Variables (PM)

Simple linear regression was conducted with the average state variable (PM) of self-compassion as the dependent variable and the trait questionnaire scores (SCS-SF) as the independent variable. A significant regression equation was found ($F(1, 33) = 12.212$, $p < .001$) with an R^2 of .27. This means that the trait questionnaire results (SCS-SF) accounted for 27 % of the variance of the average variable (PM) of state self-compassion, which can be considered a strong variance prediction of the model. Moreover, simple linear regression was conducted with the average state variable (PM) of perceived stress as the dependent variable and the trait questionnaire scores (PSS) as the independent variable. A significant regression equation was found ($F(1, 33) = 17.790$, $p < .000$) with an R^2 of .35. This means that the trait questionnaire results (PSS) accounted for 35 % of the variance of the average state variable (PM) of perceived stress, which can be considered a strong variance prediction of the model. This means that the PM scores derived from the repeated state questions can be considered a valid representation of the participants' general level of self-compassion and perceived stress and therefore, the calculated trait variable of the period of one week. Furthermore, this validates further analysis since the PC-M scores are based on the scores of the repeated state questions.

State Self-Compassion and State Perceived Stress

LMM analysis showed a moderate negative association between the PC-M scores of state self-compassion and PC-M scores of state perceived stress for the participants (ß = -.35; SE = .04; CI 95% [-0.42, -0.28]; p <.000). This means that participants who scored high in state self-compassion tended to score lower in state perceived stress at different time points and vice versa. Furthermore, the associations of the PC-M scores of the six randomly selected participants, two for each group of different trait self-compassion levels, can be seen in Table 2. All associations found were negative which means that the individual participants showed a pattern which displays higher state self-compassion levels with simultaneously lower levels of state perceived stress and vice versa in general across all time points. The relationship between state self-compassion and state perceived stress for participant 23 and 15 can be considered strong and those of participant 18 and 4 were moderate. However, a weak relationship was found for participant 22 and 1, although they cannot be considered statistically significant due to a p-value >.05.

Moreover, the fluctuating state levels of two participants with low and high levels of trait self-compassion (23 and 22, respectively) can be seen visually as an example across all 21 time points in Figures 1 and 2. Furthermore, for the results of the other four participants (1, 18, 4, and 15) used in the analysis, the individual data patterns can be seen visually in the Appendix E, since they are similar to a significant extent. For the participants 1, 18, 4, and 22, which are in the groups of moderate and high levels of trait self-compassion, there is a pattern visible which deviates from the in general negative association found. State self-compassion levels showed a stable level while state perceived stress fluctuated simultaneously for some individuals and time points.

Table 2

Standardized ß Scores of the Relationships between the PM-C Scores of State Self-Compassion and State Perceived Stress of the six randomly chosen Participants

Trait Self-Compassion Level	Participant	ß	SE	Confidence Interval [CI] 95%	p
Low	23	-.86	.35	[-1.61, -0.12]	<.025
	15	-.51	.16	[-0.85, -0.16]	<.006
Moderate	1	-.18	.21	[-0.62, 0.27]	<.418
	18	-.43	.15	[-0.74, -0.11]	<.012
High	4	-.45	.16	[-0.76, -0.15]	<.006
	22	-.26	.15	[-0.58, 0.54]	<.098

Figure 1

PC-M Scores across all Time Points for Participant 23 (Low Level of Trait Self-Compassion)

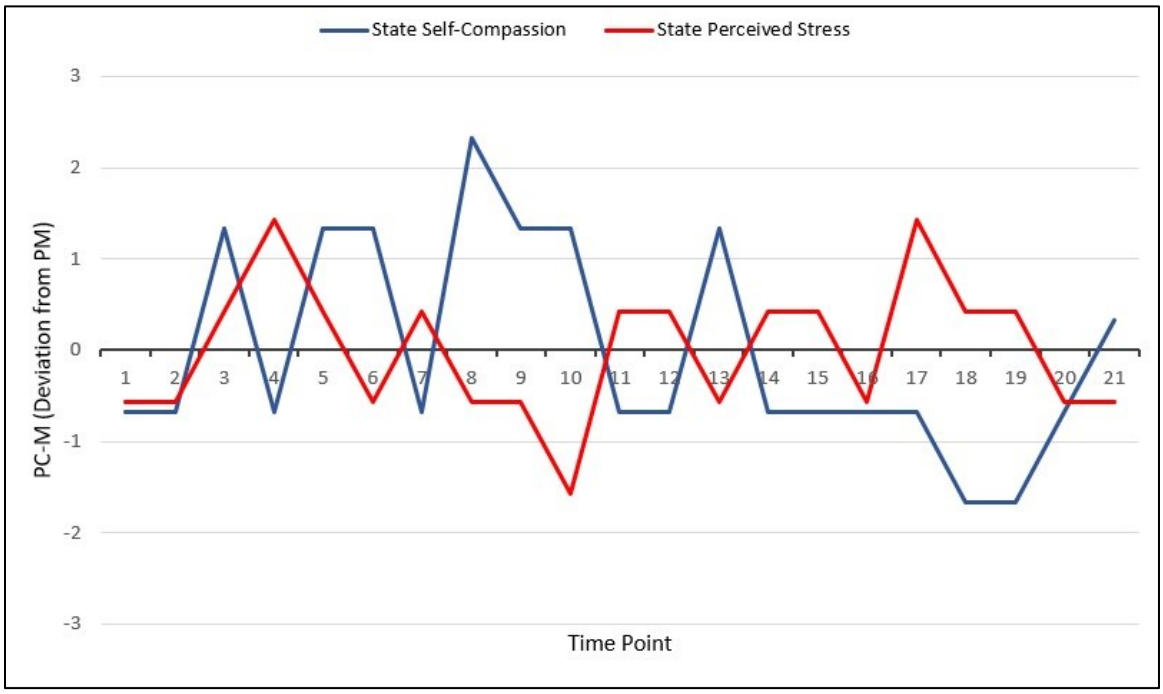


Figure 2

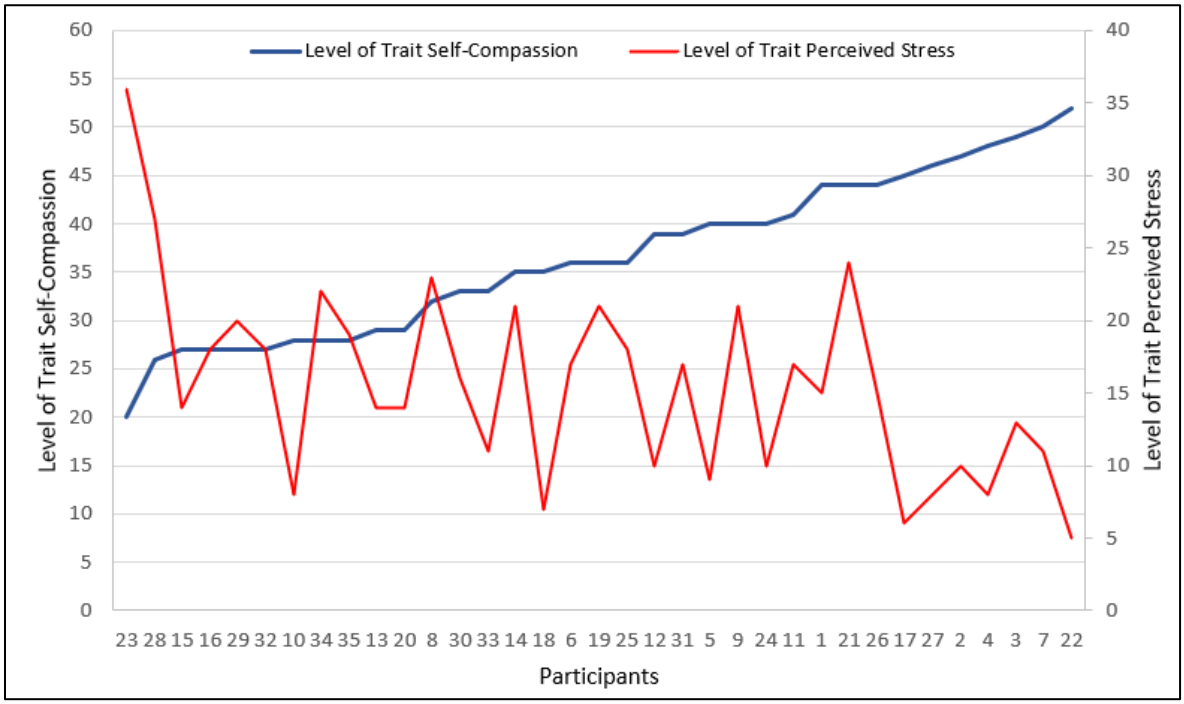
PC-M Scores across all Time Points for Participant 22 (High Level of Trait Self-Compassion)

Trait Self-Compassion and Trait Perceived Stress

Simple linear regression analysis showed a significant regression equation ($F(1, 33) = 16.107$, $p < .000$) with an R^2 of .328. This means that the results of the PSS accounted for 32.8 % of the variance of the results of the SCS-SF, which can be considered a strong variance prediction of the model. Moreover, the simple linear regression showed a standardized ß of -.57, which means that the results of the SCS-SF and PSS are strongly negatively associated. This means that people who scored high in trait self-compassion tend to score low in trait perceived stress and vice versa. Moreover, this association can be seen visually in Figure 3.

Figure 3

Association between Trait Self-Compassion and Trait Perceived Stress for each Participant



Note. The x-axis was sorted by the ascending trait self-compassion level.

Discussion

This study examined the relationship between momentary feelings of state self-compassion and state perceived stress. This represents a measurement of these constructs on the within-person *or state* level. Moreover, on the between-person *or trait* level the participants` average level of state self-compassion and state perceived stress across all time points was examined. Furthermore, the between-person association of trait self-compassion and trait perceived stress was measured as a repetition of past research and ultimately the trait and state associations were compared. The results suggest a moderate negative association between the participants` average state self-compassion and state perceived stress level across all time points representing the between-person association of these constructs. This approximates the strong negative association between trait self-compassion and trait perceived stress found in this study, which is in line with past research (Allen & Leary, 2010; Sirois, 2014; Sirois, Kitner, et al., 2015; Sirois, Molnar, et al., 2015; Terry & Leary, 2011). However, when the within-person level was examined, there were ambivalent patterns visible. Besides the overall found negative association, several randomly selected participants with moderate to high levels of trait self-compassion showed a pattern of stable state self-compassion levels with simultaneously fluctuating state perceived stress levels while also being negatively associated in general. This means that there is a visible difference between the data patterns found within persons and between persons. When the results were examined on the within-person level, a negative association was not naturally expected since research showed that group data *or between-person data* cannot necessarily be generalized to data patterns of individuals *or within-person data* (Fisher, et al., 2018). This was for instance confirmed when Falconer et al. (2015) found an association between increased momentary negative affect, increased state self-compassion, and decreased state self-criticism which lies in contrast with the results found in literature about associations on the trait level of these constructs.

Interpretation of Results

State Self-Compassion and State Perceived Stress

This study examined the association between state self-compassion and state perceived stress on the within-person and between-person level. The negative association found on the between-person level approximates the – to the most part - found negative association on the within-person level. The Transactional Model of Stress and Coping by Lazarus and Folkman (1984) highlights

the role of cognitive and behavioral responses in intensifying or weakening stress responses. Adaptive coping responses might be able to successfully remove or reduce stressors by cognitively changing its appraisal or leading to direct behavioral changes (Cohen, et al., 1997; Lazarus & Folkman, 1984). According to Neff, et al. (2007a), self-compassion seems to help individuals to self-regulate negative emotions which possibly arise in uncontrollable or unexpected events and therefore improve adaptive psychological functioning. They found that individuals who experienced an increase in self-compassion also experienced decreased self-criticism, depression, rumination, thought suppression, and anxiety, which is in line with the expectation of the Transactional Model of Stress and Coping by Lazarus and Folkman (1984), which highlights the role of such adaptive responses. This explanation is in line with the findings of this study on the between-person level, since overall self-compassion and perceived stress seem to be negatively correlated, which means that individuals tend to feel lower levels of perceived stress when feeling simultaneously higher levels of self-compassion.

However, the results on the within-person level and the overall found negative association on the between-person level are partly ambivalent, since this negative association also implies that individuals felt lower levels of state self-compassion while feeling simultaneously higher perceived stress levels. Theories about stress (Lazarus & Folkman, 1984) and self-compassion (Neff, et al., 2007a) could lead to the assumption that when individuals feel high levels of self-compassion they are more likely to have better adaptive psychological functioning providing them with the ability to self-regulate negative emotions arising in stressful situations and thereby, reducing stressors. Moreover, past studies explain this relationship by assuming that self-compassionate people could appraise stressors less threatening and less negative which provides them with the ability to elicit more effective stress-reducing behavioral responses while their self-regulation is less hindered by negative emotions (Sirois, Kitner, et al., 2015; Sirois, Molnar, et al., 2015; Terry & Leary, 2011). This assumption is in line with the data patterns of the individuals with moderate to high levels of trait self-compassion in this study, which showed stable state self-compassion levels with simultaneously fluctuating state perceived stress levels, since these individuals might be more capable of self-regulating negative emotions. This self-regulation of negative emotions might result in fluctuating state perceived stress levels while having stable state self-compassion levels. However, on the within-person level the individuals in this study with lower levels of trait self-compassion showed data patterns with high state self-compassion levels

and simultaneously lower levels of state perceived stress and vice versa. This means that the state self-compassion levels also fluctuated, which could mean that individuals with lower levels of trait self-compassion might be less capable of self-regulating these negative emotions and therefore, perceived stress might be experienced as more dominant since these individuals are more hindered by negative emotions (Sirois, Kitner, et al., 2015; Sirois, Molnar, et al., 2015; Terry & Leary, 2011), which might explain simultaneously lower levels of state self-compassion. This is in line with the model of self-compassion by Neff (2003) which highlights that higher self-compassion means to be less self-critical and harsh judging. Moreover, this is in line with the argumentation of Cohen, et al. (1997) which says that when the environmental factors are perceived as high to an extent that individuals think that coping is no longer possible, they will perceive themselves as being stressed accompanied by negative emotions. Therefore, when individuals with low levels of trait self-compassion who are more self-critical and harsh judging find themselves in situations which make them feel stressed, they might feel less able to cope which might be experienced as feeling less self-compassionate. This could explain the data patterns of individuals with lower trait self-compassion levels showing high state perceived stress levels with simultaneously lower state self-compassion levels and vice versa.

Overall, the association between state self-compassion and state perceived stress on the within-person level can be described as being overall negatively associated but also dependent on the level of trait self-compassion of each individual, which is in line with the theoretical background of self-compassion (Neff, 2003, Neff, et al., 2007a; Sirois, Kitner, et al., 2015; Sirois, Molnar, et al., 2015; Terry & Leary, 2011), which highlights that individuals with high levels of self-compassion are more able to self-regulate their emotions which might lead to more stable self-compassion levels. Furthermore, it highlights that individuals with low levels of self-compassion are less capable of self-regulating their emotions and therefore, might be more vulnerable to perceived stress resulting in fluctuating self-compassion and perceived stress levels.

Trait Self-Compassion and Trait Perceived Stress

This study examined the relationship between self-compassion and perceived stress on the between-person or *trait level* as a repetition and therefore as a measure to control whether the data approximates the findings of other studies. A strong negative association between trait self-compassion and trait perceived stress was found. This was expected since research showed this negative association on the between-person *or trait level* in many studies (Allen & Leary, 2010;

Sirois, 2014; Sirois, Kitner, et al., 2015; Sirois, Molnar, et al., 2015; Terry & Leary, 2011). Overall, the strong negative association found in this study is in line with the findings of past research about trait self-compassion and trait perceived stress on the between-person level. Moreover, the found moderate negative association between state self-compassion and state perceived stress for all participants across all timepoints on the between-person level, approximates the strong negative association between trait self-compassion and trait perceived stress found in this study.

Strengths and Limitations

Several strengths can be considered additions to the value of this study. Firstly, this study used the Experience Sampling Method (ESM) which describes the method of measuring momentary or daily experiences. This has the advantage that moment-to-moment changes in daily life including measurements of experiences, mental states, and behaviors can be assessed (Verhagen, et al., 2016). Moreover, Myin-Germeys et al., (2018) states that ESM has shown to be a suitable method to capture emotional variability. Therefore, by using the ESM method this study was able to capture daily fluctuations of self-compassion and perceived stress in a valid way. Moreover, this method allows for between-person and within-person comparisons. Secondly, the trait questionnaires used in this study (PSS and SCS-SF) have shown to be highly valid instruments. The state questionnaire included the SNRS-11 to measure state stress and has shown to be a valid measure for momentary stress levels (Karvounides et al., 2016). The question used to measure state self-compassion was formulated in the same way. Since the participants' general level of self-compassion measured with this question approximates the results of the SCS-SF strongly, the state self-compassion question can also be considered valid. Moreover, it can be considered a strength of this study that the results of past studies about the between-person *or trait level* association were investigated as a repetition. The examined relationship between trait self-compassion and trait perceived stress allowed for direct comparison of the trait and state associations based on the same data.

However, there are several limitations which could affect the validity and generalizability of the results. Firstly, the question used to measure state self-compassion can only be considered to measure an approximation of self-compassion since it only measures self-kindness. According to Neff (2003) self-compassion entails three facets, next to self-kindness, it includes common humanity which means to see one`s experiences as part of the larger human experience and

mindfulness, which means to deal with painful thoughts and feelings in a balanced way. The state self-compassion question ("On a scale from 0 to 7, how kind do you feel towards yourself right now?") focused self-kindness, which means to be understanding to oneself instead of being judgmental and self-critical. According to Winders, et al. (2020) the Self-Compassion Scale - Short Form (SCS-SF) is the most prevalent standardized measure of self-compassion. In the SCS-SF, self-kindness is for instance measured with the question ("When I'm going through a very hard time, I give myself the caring and tenderness I need.") which asks about "a very hard time" in general. The question used in this study asks a similar question about the present moment. Therefore, the question might represent an approximation of measuring the whole concept of self-compassion at the moment of measurement. Since it might be an approximation, it could reduce the validity of the results. In order to validate the degree to which this could be problematic, this study compared the general state level measured over the period of one week with the scores of the trait questionnaire SCS-SF. The SCS-SF includes all three facets of self-compassion and the strong correlation found indicates that the state self-compassion question approximates the whole concept of self-compassion to a significant degree.

Secondly, since technical challenges led to the circumstance that the questions did not disappear in the TIIM application after two hours, participants could answer the questions later which means that the possibly retrospective answers could have affected the validity of the results, since participants had to remember how they felt a certain time ago which might deviate from what they would have answered immediately after the question was asked. Hence, the answer could then not represent the state of that moment which could have affected the validity of the study.

Thirdly, this study used the convenience sampling method, resulting in a sample including only college students, which could reduce the generalizability of results since such samples are often biased and do not represent the general population (Jager, et al., 2017). Since psychology students could be represented in the sample to a certain degree, the self-compassion levels could be higher in this sample compared to the general population since these students might be more familiar with the concept and its advantages and might also know certain techniques to increase their self-compassion levels. Moreover, students might feel higher or lower levels of perceived stress over certain periods of time compared to the normal population. This could for instance be caused by a period of exams or a period of longer holidays compared to the general population. Moreover, students might have a certain level of intelligence and higher education compared to

the normal population, which might be associated with self-compassion and perceived stress levels which could be different to those of the normal population.

Implications for Future Research

Firstly, the measurement of state self-compassion could be improved in regard to measuring the whole concept of self-compassion. This would entail three questions, one for common humanity, one for mindfulness, and one for self-kindness. Since the question to measure self-kindness is formulated as "On a scale from 0 to 7, how kind do you feel towards yourself right now?", the question to measure common humanity and mindfulness could be formulated in the same way. However, since these questions would then include for instance the word *mindfulness* which requires some understanding about its concept, the questions could also be based on items used to measure these concepts in the SCS-SF (Raes, et al., 2011). For measuring common humanity it could be phrased as "On a scale from 0 to 7, to what degree do you see your feelings as part of the human condition right now?" and for mindfulness as "On a scale from 0 to 7, to what degree do you keep your emotions in balance right now?". When all three facets of self-compassion are measured, the validity of results might be increased.

Secondly, since the sample was collected by convenience sampling and consisted only of students which could have affected the validity and generalizability of results due to deviating self-compassion and perceived stress levels compared to the normal population, it would be possible to do a repetition with another sampling method (e.g. probability sampling) which would ensure more generalizability of the results. For example, the study could be done with adults independent from income, education, and gender. Furthermore, the sample size could be increased, and the sampling could be done via several paths. For instance, via internet (social media), printed media, and telephone. To ensure a higher response rate, a certain compensation could be given.

Thirdly, future research should continue to study within-person *or state level* associations, since many central theories in psychology either implicitly or explicitly incorporate within-person processes but mostly involve the collection and analysis of strictly between-person data (Curran & Bauer, 2011). This study showed that on the within-person level, the negative association between self-compassion and perceived stress does not hold up for each individual and all time points. For example, people with higher trait self-compassion levels often showed stable state self-compassion levels with simultaneously fluctuating levels of state perceived stress. Hence, future

research should incorporate these differences on the within-person level in order develop more effective and stress reducing interventions.

Many studies and interventions already incorporate daily fluctuations *or states* to monitor behavior in order to get new insights or to achieve behavioral change. For instance, Spangenberg, et al. (2019) measured the capability for suicide with three items once a day of psychiatric patients with a unipolar depressive disorder and found that the capability for suicide includes a dynamic short-term component. Moreover, Spring, et al. (2013) explain how important new developed mobile devices and apps, which include continuous monitoring of behavior *or states,* can be and how they can be actively used as interventions to modify behavior in a way which leads to a healthier lifestyle. They point out that today's technological improvements and processing power can modify intervention algorithms in real time which provides great possibilities for e-health interventions. Furthermore, Snippe, et al. (2016) assessed within-person associations of people with depression every day and found out that physical, sedentary, and social behaviors have affective implications for the daily mental health of these individuals. They conclude that self-monitoring using the Experience Sampling Method (ESM) may be a useful tool to gain personalized insight in behaviors and achieve behavioral change which improves daily depressive symptoms. Moreover, the STEADY-Project already actively uses wearables to monitor biological feedback and self-monitoring data which is used for patients with depression or other disorders in order to track their symptoms and possible changes and ultimately, achieve improvements (STEADY-Projekt, n.d.).

Therefore, future research could incorporate differences between within-person and between-person associations and moreover, daily fluctuations of self-compassion and perceived stress. Further, they could focus on enforcing state self-compassion which could lead to more stable self-compassion levels at moments with increased state perceived stress levels and therefore, help to overall reduce perceived stress. Interventions could therefore focus on increasing trait self-compassion together with state self-compassion in order to develop most effective interventions which reduce the general perceived stress level as well as regulating momentary perceived stress levels.

Conclusion

The findings of this study showed that the expected between-person *or trait* associations cannot necessarily be generalized to the within-person *or state* associations, since the expectations based on past research could explain the between-person associations found in this study better than the within-person associations. The within-person associations were dependent on the individuals' self-compassion levels and varied accordingly. Hence, it could be advantageous for future research to investigate between-person and within-person associations in order to develop more effective interventions aimed at monitoring and achieving behavioral change in the context of self-compassion and perceived stress, and other constructs. In order to achieve this goal, some improvements in form of a better state self-compassion measurement and an improved sample would increase the validity and generalizability of results. Future studies and interventions could therefore aim at enhancing self-compassion and reducing perceived stress, by taking the differences on the within-person level into account.

References

Adam, J. T. (2020). *How the Company of Others and Being Alone Affect Feelings of Loneliness and Gratitude –An Experience Sampling Study* [Master's thesis, University of Twente]. Retrieved from http://essay.utwente.nl/80442/17/Adam%2C%20BA%2C%20BMS.pdf

Allen, A. B., & Leary, M. R. (2010). Self-compassion, stress, and coping. *Social and Personality Psychology Compass*, *4*(2), 107–118.

Blanz, M. (2015). *Forschungsmethoden und Statistik für die Soziale Arbeit: Grundlagen und Anwendungen*. Stuttgart: Kohlhammer.

The BMS Lab (n.d.). *TIIM (The Incredible Intervention Machine)*. bmslab. https://bmslab.utwente.nl/knowledgebase/tiim/

Chu, L. (2014). The Influence of Perceived Stress on Work-Family Conflict and Mental Health: The Moderating Effect of Person-Environment Fit. *Journal of Nursing Management*, *22*(5), 613–620.

Cohen, J. (1988). Statistical Power Analysis for the Behavioral Sciences (2nd ed.). Hillsdale, N.J.: Lawrence Erlbaum.

Cohen, J. (2000). Stress and mental health: A biobehavioral perspective. *Issues in Mental Health Nursing, 21*(2), 185-202.

Cohen, S., Janicki-Deverts, D., & Miller, G. E. (2007). Psychological stress and disease. *Jama*, *298*(14), 1685-1687.

Cohen, S., Kamarck, T., & Mermelstein, R. (1983). A global measure of perceived stress. *Journal of Health and Social Behavior, 24*, 386-396.

Cohen, S., Kessler, R. C., & Gordon, L. U. (Eds.). (1997). *Measuring stress: A guide for health and social scientists*. Oxford University Press on Demand.

Curran, P. J., & Bauer, D. J. (2011). The Disaggregation of Within-Person and Between-Person Effects in Longitudinal Models of Change. *Annual Review of Psychology*, *62*(1), 583–619. https://doi.org/10.1146/annurev.psych.093008.100356

Deffenbacher, J. L., Story, D. A., Stark, R. S., Hogg, J. A., & Brandon, A. D. (1987). Cognitive-relaxation and social skills interventions in the treatment of general anger. *Journal of Counseling Psychology*, *34*(2), 171.

Eid, M., Schneider, C., & Schwenkmezger, P. (1999). Do you feel better or worse? the validity of perceived deviations of mood states from mood traits. *European Journal of Personality, 13*(4), 283-306. https://doi.org/10.1002/(SICI)1099-0984(199907/08)13:43.0.CO;2-0

Elkins, G., Cook, T., Dove, J., Markova, D., Marcus, J., Meyer, T., Rajab, M. H., & Perfect, M. (2010). Perceived stress among nursing and administration staff related to accreditation. *Clinical Nursing Research, 19*(4), 376-86. https://doi.org/10.1177/1054773810373078

Falconer, C. J., King, J. A., & Brewin, C. R. (2015). Demonstrating mood repair with a situation-based measure of self- compassion and self- criticism. *Psychology and Psychotherapy: Theory, Research and Practice*, *88*(4), 351-365.

Fisher, A., Medaglia, J., & Jeronimus, B. (2018). Lack of group-to-individual generalizability is a threat to human subjects research. *Proceedings of the National Academy of Sciences of the United States of America, 115*(27), 6106.

Fridhandler, B. (1986). Conceptual note on state, trait, and the statetrait distinction. *Journal of Personality and Social Psychology, 50*(1), 169-174. https://doi.org/10.1037/0022-3514.50.1.169

Jager, J., Putnick, D. L., & Bornstein, M. H. (2017). II. More than just convenient: The scientific merits of homogeneous convenience samples. *Monographs of the Society for Research in Child Development*, *82*(2), 13-30.

Karvounides, D., Simpson, P. M., Davies, W. H., Khan, K. A., Weisman, S. J., & Hainsworth, K. R. (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. *Pediatric Dimensions*, *1*, 105-109.

Kiken, L., Garland, E., Bluth, K., Palsson, O., & Gaylord, S. (2015). From a state to a trait: Trajectories of state mindfulness in meditation during intervention predict changes in trait mindfulness. *Personality and Individual Differences, 81*, 41-46.

Kirschner, H., Kuyken, W., Wright, K., Roberts, H., Brejcha, C., & Karl, A. (2019). Soothing Your Heart and Feeling Connected: A New Experimental Paradigm to Study the Benefits of Self-Compassion. *Clinical Psychological Science*, *7*(3), 545–565. https://doi.org/10.1177/2167702618812438

Klaperski, S., Koch, E., Hewel, D., Schempp, A., & Müller, J. (2019). Optimizing mental health benefits of exercise: The influence of the exercise environment on acute stress levels and wellbeing. *Mental Health & Prevention*, *15*, 200173.

Kopp, M., Thege, B., Balog, P., Stauder, A., Salavecz, G., Rózsa, S., Purebl, G., & Ádám, S. (2010). Measures of stress in epidemiological research. *Journal of Psychosomatic Research, 69*(2), 211-225. https://doi.org/10.1016/j.jpsychores.2009.09.006

Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer publishing company.

Li, Y., Deng, J., 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 : Journal International De Psychologie, 2019 Jul 31. https://doi.org/10.1002/ijop.12610

McWhirter, B. T., & Page, G. L. (1999). Effects of anger management and goal setting group interventions on state-trait anger and self-efficacy beliefs among high risk adolescents. *Current Psychology*, *18*(2), 223-237.

Myin- Germeys, I., Kasanova, Z., Vaessen, T., Vachon, H., Kirtley, O., Viechtbauer, W., & Reininghaus, U. (2018). Experience sampling methodology in mental health research: new insights and technical developments. *World Psychiatry*, *17*(2), 123-132.

Neff, K. (2003). Self-compassion: An alternative conceptualization of a healthy attitude toward oneself. *Self and Identity, 2*(2), 85-101.

Neff, K. D., & Dahm, K. A. (2015). Self-compassion: What it is, what it does, and how it relates to mindfulness. In B. Ostafin, M. Robinson, & B. Meier (Eds.), *Handbook of mindfulness and self-regulation* (pp. 121-137). Springer, New York, NY.

Neff, K. D., & McGehee, P. (2009). Self-compassion and psychological resilience among adolescents and young adults. *Self and Identity, 9*(3), 225–240.

Neff, K. D., Rude, S. S., & Kirkpatrick, K. L. (2007b). An examination of self-compassion in relation to positive psychological functioning and personality traits. *Journal of Research in Personality, 41*(4), 908–916.

Neff, K., Kirkpatrick, K., & Rude, S. (2007a). Self-compassion and adaptive psychological functioning. *Journal of Research in Personality, 41*(1), 139-154. https://doi.org/10.1016/j.jrp.2006.03.004

Phillips, A. C. (2013). Perceived Stress. In: Gellman M.D., Turner J.R. (eds) Encyclopedia of Behavioral Medicine. Springer, New York, NY

Raes, F., Pommier, E., Neff, K. D., & Van Gucht, D. (2011). Construction and factorial validation of a short form of the Self-Compassion Scale. *Clinical Psychology & Psychotherapy, 18*, 250-255.

Samaie, G., & Farahani, H. (2011). Self-compassion as a moderator of the relationship between rumination, self-reflection and stress. *Procedia - Social and Behavioral Sciences, 30*, 978-982. https://doi.org/10.1016/j.sbspro.2011.10.190

Sirois, F. (2014). Procrastination and stress: Exploring the role of self-compassion. *Self and Identity, 13*(2), 128-145.

Sirois, F., Kitner, R., & Hirsch, J. (2015). Self-compassion, affect, and health-promoting behaviors. *Health Psychology: Official Journal of the Division of Health Psychology, American Psychological Association, 34*(6), 661-9. https://doi.org/10.1037/hea0000158

Sirois, F., Molnar, D., & Hirsch, J. (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

Smith, B., Papp, Z., Tooley, E., Montague, E., Robinson, A., & Cosper, C. (2010). Traumatic events, perceived stress and health in women with fibromyalgia and healthy controls. *Stress and Health, 26*(1), 83-93. https://doi.org/10.1002/smi.1269

Snippe, E., Simons, C. J. P., Hartmann, J. A., Menne-Lothmann, C., Kramer, I., Booij, S. H., Viechtbauer, W., Delespaul, P., Myin-Germeys, I., & Wichers, M. (2016). Change in daily life behaviors and depression: within-person and between-person associations. *Health Psychology*, *35*(5), 433–441.

Spangenberg, L., Glaesmer, H., Hallensleben, N., Rath, D., & Forkmann, T. (2019). (in)stability of capability for suicide in psychiatric inpatients: longitudinal assessment using ecological momentary assessments. *Suicide & Life-Threatening Behavior*, *49*(6), 1560–1572. https://doi.org/10.1111/sltb.12547

Spring, B., Gotsis, M., Paiva, A., & Spruijt-Metz, D. (2013). Healthy apps: mobile devices for continuous monitoring and intervention. *Ieee Pulse*, *4*(6). https://doi.org/10.1109/MPUL.2013.2279620

STEADY-Projekt (n.d.). deutsche-depressionshilfe.de. https://www.deutsche-depressionshilfe.de/forschungszentrum/aktuellestudien/steady-studie

Terry, M. L., & Leary, M. R. (2011). Self-compassion, self-regulation, and health. *Self and Identity, 10*, 352–362.

VanEck, M., Berkhof, H., Nicolson, N., & Sulon, J. (1996). The effects of perceived stress, traits, mood states, and stressful daily events on salivary cortisol. *Psychosomatic Medicine, 58*(5), 447-458.

Verhagen, S. J., Hasmi, L., Drukker, M., van Os, J., & Delespaul, P. A. (2016). Use of the experience sampling method in the context of clinical trials. *Evidence-based mental health*, *19*(3), 86-89.

Winders, S.-J., Murphy, O., Looney, K., & O'Reilly, G. (2020). Self-compassion, trauma, and posttraumatic stress disorder: a systematic review. *Clinical Psychology & Psychotherapy*, *27*(3), 300–329. https://doi.org/10.1002/cpp.2429

Appendix A

Table 1

Push Notifications

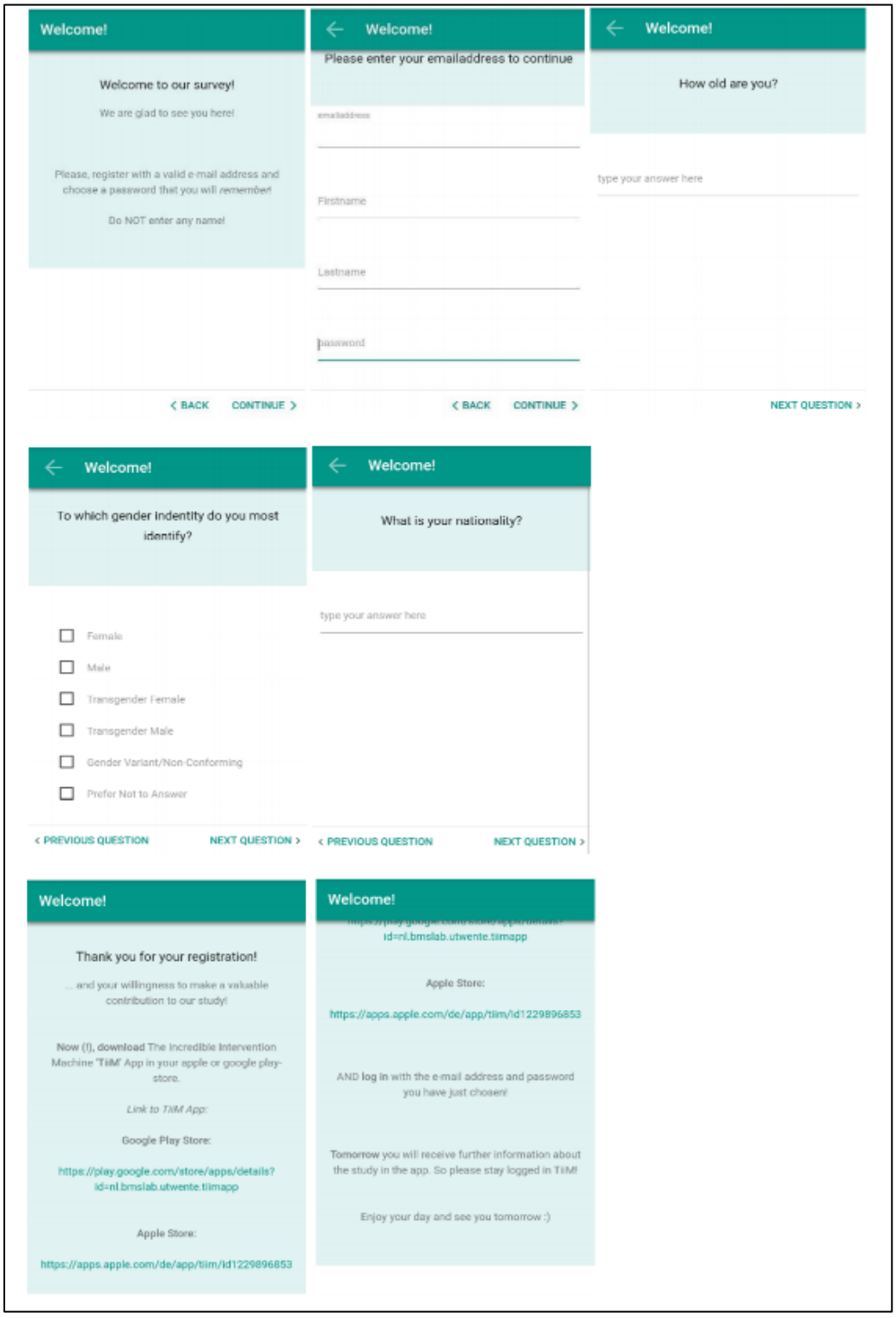
Time	Push Notification
After assigning participants to study:	Welcome! Further information will follow tomorrow! :)
Day 1: 08:00: 19:00 (if not done yet):	Thank you for your patience; New information are available! Have you read all information? We'll start tomorrow morning :)
Day 2 - 8: 08:00: 12:00: 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 2 more days. You're doing great! A few missed answers are no problem! Keep doing!
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! :)

Note. Adam (2020)

Appendix B

Figure 1

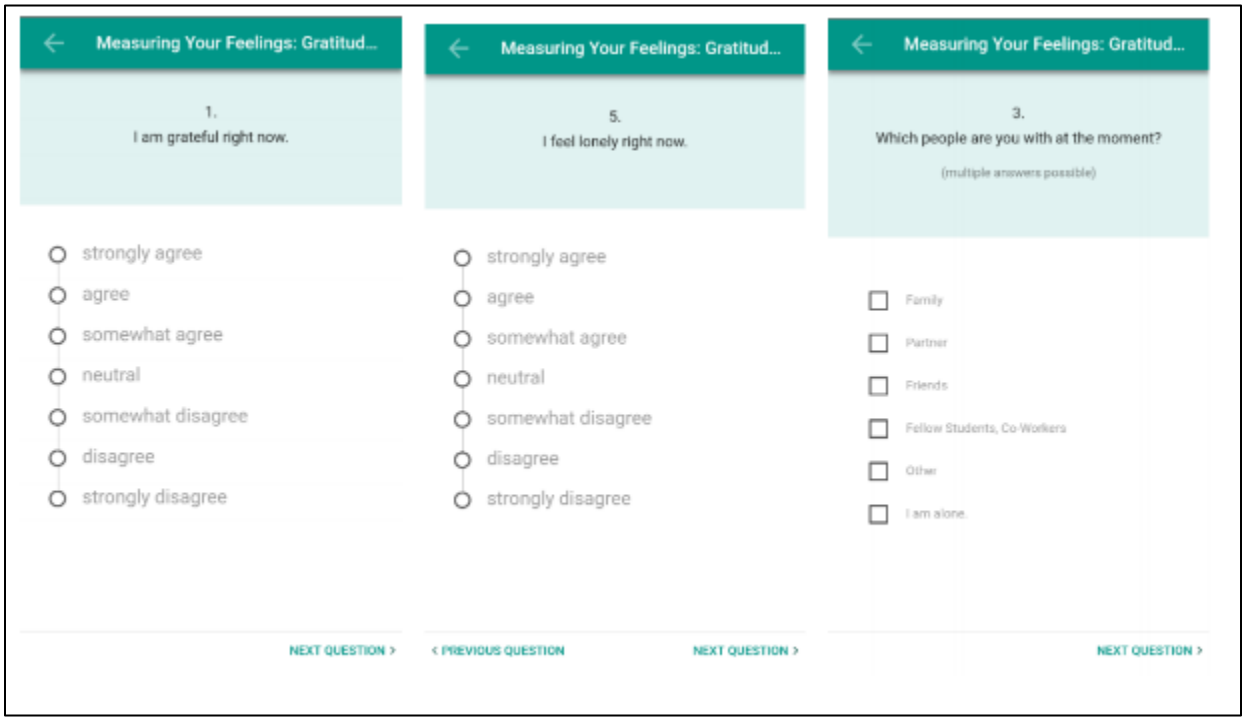
Subscription page



Note. Adam (2020)

Figure 2

Daily Questionnaire



Note. Adam (2020)

Appendix C

Figure 3

Perceived Stress Scale Page 1

PERCEIVED STRESS SCALE

Sheldon Cohen

The *Perceived Stress Scale* (PSS) is the most widely used psychological instrument for measuring the perception of stress. It is a measure of the degree to which situations in one's life are appraised as stressful. Items were designed to tap how unpredictable, uncontrollable, and overloaded respondents find their lives. The scale also includes a number of direct queries about current levels of experienced stress. The PSS was designed for use in community samples with at least a junior high school education. The items are easy to understand, and the response alternatives are simple to grasp. Moreover, the questions are of a general nature and hence are relatively free of content specific to any subpopulation group. The questions in the PSS ask about feelings and thoughts during the last month. In each case, respondents are asked how often they felt a certain way.

Evidence for Validity: Higher PSS scores were associated with (for example):

- failure to quit smoking
- failure among diabetics to control blood sugar levels
- greater vulnerability to stressful life-event-elicited depressive symptoms
- more colds

Health status relationship to PSS: Cohen et al. (1988) show correlations with PSS and: Stress Measures, Self-Reported Health and Health Services Measures, Health Behavior Measures, Smoking Status, Help Seeking Behavior.

Temporal Nature: Because levels of appraised stress should be influenced by daily hassles, major events, and changes in coping resources, predictive validity of the PSS is expected to fall off rapidly after four to eight weeks.

Scoring: PSS scores are obtained by reversing responses (e.g., 0 = 4, 1 = 3, 2 = 2, 3 = 1 & 4 = 0) to the four positively stated items (items 4, 5, 7, & 8) and then summing across all scale items. A short 4 item scale can be made from questions 2, 4, 5 and 10 of the PSS 10 item scale.

Norm Groups: L. Harris Poll gathered information on 2,387 respondents in the U.S.

Norm Table for the PSS 10 item inventory

Category	N	Mean	S.D.
Gender			
Male	926	12.1	5.9
Female	1406	13.7	6.6
Age			
18-29	645	14.2	6.2
30-44	750	13.0	6.2
45-54	285	12.6	6.1
55-64	282	11.9	6.9
65 & older	296	12.0	6.3
Race			
white	1924	12.8	6.2
Hispanic	98	14.0	6.9
black	176	14.7	7.2
other minority	50	14.1	5.0

Note. Cohen, et al. (1983)

Figure 4

Perceived Stress Scale Page 2

Perceived Stress Scale

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.

Name _____ Date _____

Age _____ Gender (*Circle*): **M F** Other _____

	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

Please feel free to use the *Perceived Stress Scale* for your research.

Note. Cohen, et al. (1983)

Appendix D

Figure 5

Self-Compassion Scale - Short Form

HOW I TYPICALLY ACT TOWARDS MYSELF IN DIFFICULT TIMES

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 feeling down, I tend to feel like most other people are probably happier than I am.

_____5. I try to see my failings 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.

Note. Raes, et al. (2011)

Appendix E

Figure 6

PC-M Scores across all Time Points for Participant 15 (Low Level of Trait Self-Compassion)

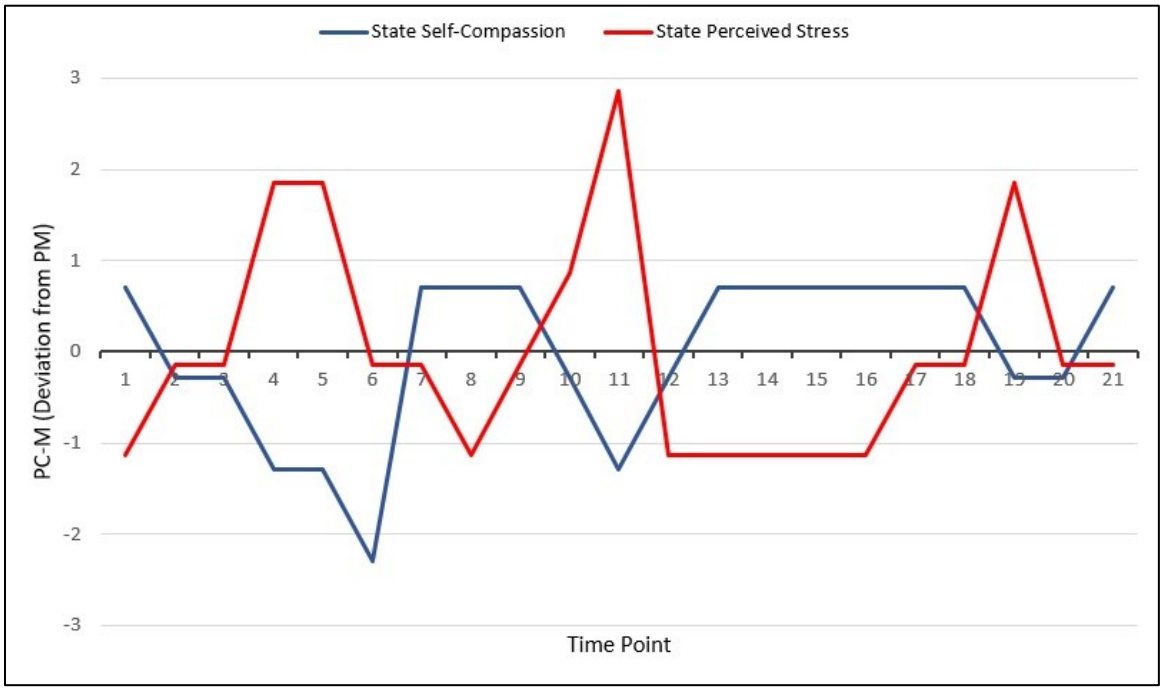


Figure 7

PC-M Scores across all Time Points for Participant 1 (Moderate Level of Trait Self-Compassion)

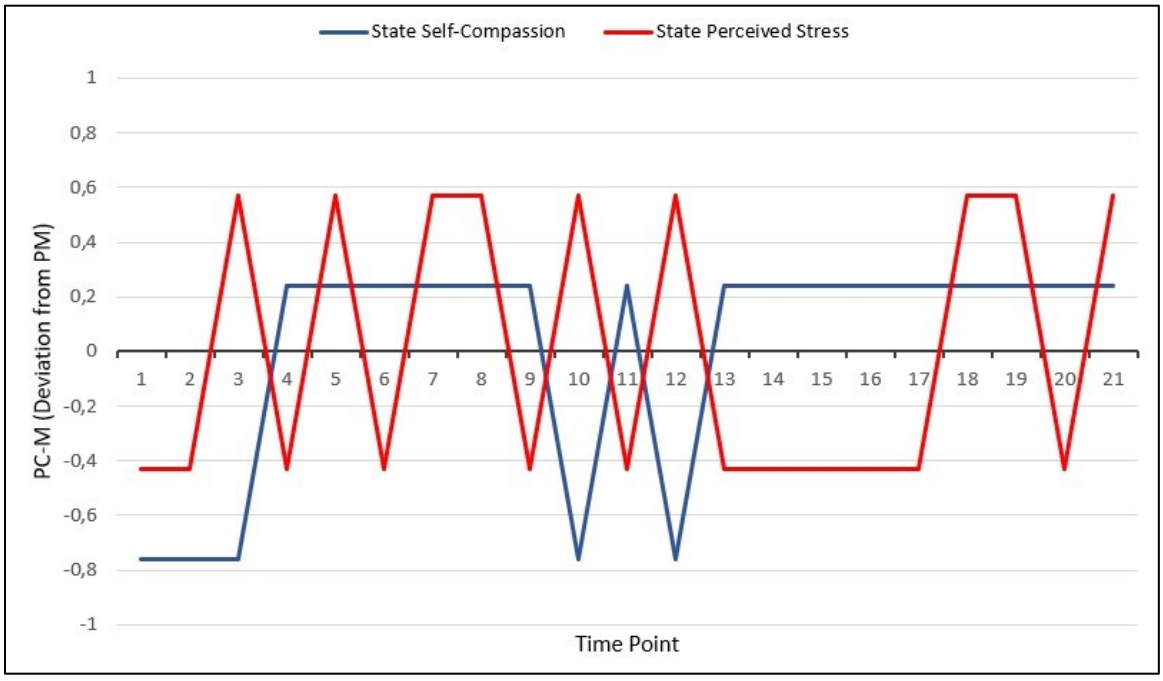


Figure 8

PC-M Scores across all Time Points for Participant 18 (Moderate Level of Trait Self-Compassion)

Figure 9

PC-M Scores across all Time Points for Participant 4 (High Level of Trait Self-Compassion)