An Experience Sampling Study on Self-Compassion and Loneliness in Daily Life

Master Thesis

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Abstract

Introduction: Loneliness is an increasing problem in society nowadays. Especially university students are a vulnerable group. The concept of self-compassion may play an important role in the experience of loneliness, as it has been associated with many benefits for well-being. The association of these concepts on a state level has not been explored before. This study aims to investigate the relationship of state self-compassion and state loneliness, while also testing for an interaction effect of trait self-compassion. Moreover, the association between trait self-compassion and state self-compassion will also be tested in order to assess how trait levels are related to the actual experience of state self-compassion throughout the study.

Methods: The experience sampling method (ESM) was used for data collection. 34 university students self-reported daily items three times a day for a total of 7 days. Furthermore, trait questionnaires were sent out. The data was analysed using IBM SPSS Statistics 24 and Microsoft Excel. Descriptive statistics, as well as linear mixed models, Pearson correlation and visual analyses were executed.

Results: State self-compassion and state loneliness were negatively correlated ($\beta = -.38$, $SE = .04$, $p < .001$). There was a significant interaction effect of trait self-compassion on this association ($\beta = -.17$, $SE = .07$, $p = .02$). Participants in the low trait self-compassion group showed a moderate negative association ($\beta = -.46$, $SE = .05$, $p < .001$), while those in the high trait group showed a weak negative association ($\beta = -.29$, $SE = .05$, $p = <.001$). Trait self-compassion was positively correlated to average state self-compassion ($r = .56$, $p < .001$).

Conclusion: The results found in this study could be related to different theories. The emotion-regulation systems (Gilbert, 2014) might clarify how the soothing system, activated when being self-compassionate, has the potential to deactivate the threat and drive systems. This may explain the negative relation found between state self-compassion and state loneliness. The downward spiral of the Broaden-and-Build theory (Fredrickson, 2013) was related to the stronger negative correlation found in the low trait self-compassion group in this study. Less fluctuations in the variables and a more balanced out emotion-regulation system may account for the weaker negative association found in the high trait self-compassion group. However, more research is needed in order to confirm the results and explore possible mechanisms. Nevertheless, it can still be suggested that exercises improving state self-compassion might help university students to experience lower levels of loneliness in their daily life.

1. An Experience Sampling Study on Self-Compassion and Loneliness in Daily Life

During the last years, there has been a growing interest in self-compassion. It is said to be associated with positive psychological strengths such as optimism, curiosity about the world, and happiness (Neff, Rude & Kirkpatrick, 2007). Moreover, it has also been related to increased feelings of social connectedness. This means that self-compassionate people feel more connected to their social world, engage more in social groups and activities and more easily relate with others (Bloch, 2018). Therefore, self-compassion may also be important when it comes to feelings of loneliness since it is defined as experiencing a deficit, qualitatively or quantitatively, in one's social relationships (de Jong Gierveld, 1998). This might especially be of value nowadays, as feelings of loneliness are increasing (Holt-Lunstad, 2017). Demographic trends have shown that the number of single households worldwide is now greater than ever before. Furthermore, marriage rates have decreased, while childlessness has increased, which may result in less available supportive family structures (Holt-Lunstad, 2017).

Studies exploring the association between self-compassion and loneliness have found a negative correlation (Akin, 2010; Lyon, 2015). Although this research supports the assumption that self-compassion might be an important construct in relation with loneliness, these studies have been cross-sectional. Importantly, only measuring the stable, trait-like concepts of self-compassion and loneliness might not be sufficient, as it has been shown that self-compassion (Kelly & Stephen, 2016), as well as loneliness can vary on a daily basis (Van Roekel et al., 2015). Therefore, it is of interest to explore how these two constructs may fluctuate during everyday life of people and how they would be related on this state level. The experience sampling method (ESM) gathers data throughout the daily life of participants by triggering self-reported measurements at set time points during the day. Therefore, more insight can be gained into the course and fluctuations of a psychological construct (Van Berkel, Ferreira & Kostakos, 2017). The current study aims to explore the association between self-compassion and loneliness, taking into account state and trait levels, in daily life by using ESM.

1.1 Self-Compassion

According to Neff (2003a), self-compassion consists of three components. The first one is *self-kindness*. This involves being kind towards oneself, instead of engaging in self-criticism, when experiencing difficulties. When being confronted with one's own failures or inadequacies, self-compassionate people would turn inwards and give themselves understanding and comfort (Neff, 2011). The second component is *common humanity*. This means to recognize that everyone makes mistakes and nobody is perfect. A person engaged in self-compassion would see

their difficulties as shared by all human beings and then feels connected with others, rather than disconnected and isolated (Neff, 2011). The third component is *mindfulness*. Generally, mindfulness can be defined as a kind of awareness focused unjudgmentally on what is happening in the present moment. This consists of being mindful of one's painful thoughts and feelings and keeping them in balanced awareness (Kabat-Zinn, 2003). In order to be self-compassionate to oneself, it is firstly important to acknowledge that one is suffering and to then take this mindful meta-perspective of not getting caught up in one's pain but to take a more objective perspective instead (Neff, 2011).

In an ESM study by Leary, Tate, Adams, Allen and Hancock (2007), the issue of mostly assessing trait self-compassion in cross-sectional studies was mentioned and the need for experience sampling and experimental studies was highlighted. Cross-sectional studies explore between-person variances at a single time point (Curran & Bauer, 2011). Nevertheless, it has been shown that, although much variation during a set time period was due to between-person differences in self-compassion, one-third of the variation in self-compassion was on the within-person level (Kelly & Stephen, 2016). This can be referred to as the state level of a psychological construct. Therefore, on the within-person level, a psychological construct shows its variance due to intraindividual differences (Curran & Bauer, 2011). Hence, it seems like there is also variance of self-compassion within people, suggesting variance on a state level. Neff et al. (2021) have recognized this and recently developed a State Self-Compassion Scale, which focuses more on self-compassion in the context of interventions and experiments.

Research has shown that trait self-compassion has several effects on well-being (Neff & Dahm, 2015). A study by Raes (2010) found that repetitive thinking is a mediator of the relation between self-compassion and anxiety/depression, wherefore it was concluded that self-compassion may buffer against the development of these clinical disorders. Using experience sampling, Leary et al. (2007) have shown that participants higher on trait self-compassion kept everyday difficulties in perspective and felt less alone with their problems. Furthermore, self-compassionate people acknowledge negative emotions, instead of suppressing them, and bring about positive emotions by embodying these negative emotions. Being in a self-compassionate state of mind can also be associated with positive emotions such as creativity, optimism, curiosity, and inspiration (Neff & Dahm, 2015).

Two of the studies that focused on state self-compassion, did so in relation to body image and eating behaviours (Breines, Toole, Tu & Chen, 2014; Kelly & Stephen, 2016). They have found that state self-compassion was related with less disordered and more intuitive eating. Moreover, a study by Li, Deng, Lou, Wang and Wang (2020) has found that state self-

compassion was associated with less perceived stress and more health-promoting behaviours within people. This further supports the notion that self-compassion can vary in everyday life and that state self-compassion can bring about positive benefits as well.

1.2 Loneliness

Loneliness has often been defined as occurring when a person's social relationships are somehow insufficient, either quantitively (lacking number of relationships) or qualitatively (lacking meaningful relationships) (de Jong Giervald, 1998). Therefore, two types of loneliness can be defined. One would be emotional loneliness, which stems from a lack of close and intimate relationships, for example after a divorce. The other type is social loneliness, which relates to a lack of integration into a community with common interests. Both types of loneliness concern an imbalance between desired and actual relationships in one's life (Weiss, 1973).

Loneliness has been studied in different age groups, ranging from the young to the old. A study has found that, in the United Kingdom, loneliness was higher amongst adults under the age of 25 and amongst adults over the age of 65. Therefore, resembling a U-shape across age groups (Victor & Yang, 2012). Especially, moving from home to start University can also entail risks for young adults. They might start feeling lonely because they are living in a new city and do not know anyone (Diehl, Jansen, Ishchanova & Hilger-Kolb, 2018). In fact, a study by Diehl et al. (2018) showed that 32.4% of students felt moderately lonely and 3.2% felt severely lonely. Therefore, loneliness is an important topic for university students.

A meta-analysis by Mund, Freuding, Möbius, Horn and Neyer (2020) has found that interindividual differences in loneliness appear to be stable over 1 year. However, they may vary when looking at longer time periods. Nevertheless, this suggests trait-like elements of loneliness, meaning that some people might generally feel lonelier than others. Therefore, just as self-compassion, loneliness has often been studied as a trait in cross-sectional studies. These studies have found several negative consequences related to loneliness. For example, especially depression, generalized anxiety and panic attacks are associated with loneliness. Moreover, suicidal ideation has increased from 6% to 42% in lonely people (Beutel et al., 2017). In addition to that, trait loneliness has been associated with more incidents of chronic diseases, a lower self-rated health and more visits to a physician. Furthermore, it has been related to different unhealthy behaviours, like smoking or physical inactivity (Richard et al., 2017).

Although Mund et al. (2020) have found stable trait-feature of loneliness, they have also admitted that stability coefficients leave room for individual differences. It has been shown that loneliness depends on environmental factors, for example, the context that people are in (Van

Roekel, Scholte, Engels, Goossens & Verhagen, 2015). An ESM study by Van Roekel et al. (2015) has shown that adolescents feel lonelier when they are alone than when they are with others. Additionally, loneliness has been shown to be more prevalent during weekdays than on weekends (Van Roekel et al., 2018). Hence, loneliness can not only be seen as a psychological trait but it can also fluctuate within people, depending on different factors. State loneliness has been associated with negative evaluation of social contact and social withdraw (Van Winkel et al., 2017), as well as negative affect like hostility and fear (Meng, Wang, Wei & Diu, 2020).

1.3 Self-compassion and loneliness

A cross-sectional study by Akin (2010), has found that the three dimensions of self-compassion are negatively correlated with loneliness. He assumed that people who are more self-compassionate, are better at recognizing their suffering and giving themselves kindness. Thus, they would experience more positive and less negative emotions in that moment and this may also relate to feelings of loneliness (Akin, 2010). Another cross-sectional study conducted by Lyon (2015), has shown a moderate negative correlation between self-compassion and loneliness in students.

However, to the best knowledge of the researcher, these have been the only two studies so far to explore the relationship between self-compassion and loneliness. There appears to be a lack of studies that explore self-compassion and loneliness as states across time. There may be a positive correlation between state self-compassion and loneliness as self-compassion is especially generated in times of difficulties by acknowledging negative emotions, instead of suppressing them (Neff & Dahm, 2015). This may be supported by the three emotion regulation systems (Gilbert, 2014). According to this theory, there are three emotion regulation systems - the threat system, drive system and soothing system. The soothing system can be activated when being self-compassionate (Kirschner et al., 2019). It is related to the parasympathetic nervous system, oxytocin and feelings of peace and safety (Gilbert, 2014). Therefore, it is especially needed when the threat system is active, in order to soothe and engage in caring behaviours (Gilbert, 2009). Hence, a positive correlation between state self-compassion and loneliness may be found. However, the three-emotion regulation system might also predict a negative correlation as the soothing system could deactivate the threat system when it is activated and the other way around (Gilbert, 2014). As these are just assumptions, the current study will explore how this relationship actually varies over time.

Furthermore, it could be interesting to take into account how trait self-compassion might interact with the association between state self-compassion and loneliness. An ESM study by

Krieger, Hermann, Zimmermann and grosse Holtforth (2015) has found that high trait levels of self-compassion were associated with higher levels of positive affect in daily life. The Broaden-and-Build theory states that when experiencing more positive emotions, one's thought and action repertoire is broadened, leading to more psychological and social resources (Fredrickson, 2003). As someone with high trait self-compassion would experience positive emotions more frequently (Neff, 2003b; Krieger et al., 2015; Odou & Brinker, 2015), this may broaden their perspective and get them more easily into an upward spiral when feeling self-compassionate. Therefore, they may be more likely to experience higher levels of state self-compassion and lower levels of state loneliness. The opposite might apply when someone is low on trait self-compassion. They might experience more negative affect (Neff et al., 2007), thus having a more narrowed perspective and making them more vulnerable to experience higher states of loneliness and lower state self-compassion. Hence, it could be that a possibly negative relationship between state self-compassion and state loneliness would become stronger when adding trait self-compassion as an interaction. However, the interaction effect of trait self-compassion might show other patterns. People high on trait self-compassion might generate higher levels of state self-compassion when feeling lonely, as self-compassion is especially needed in difficult times (Neff & Dahm, 2015). This would result in a positive correlation for this group. For people low on trait self-compassion, this might not hold true, as they may not be self-compassionate towards themselves when feeling lonely. Hence, they may display a negative association between state self-compassion and loneliness.

1.4 Present study

The current study explores relationships between trait and state levels of self-compassion and loneliness. It firstly aims to explore a possible association between state self-compassion and state loneliness. As there is a lack of studies on the relationship between state self-compassion and state loneliness, it appears to be important to explore this in the current study.

RQ1: *How are state self-compassion and state loneliness associated over time in university students?*

Moreover, the interaction of trait self-compassion on the relation between state self-compassion and state loneliness will be explored. This has also not been explored before and may reveal whether the relationship between state self-compassion and loneliness changes when taking into account the trait levels of self-compassion. Different possibilities of data patterns have been discussed above and will be explored in the current study.

RQ2: *Do high or low levels of trait self-compassion change an association between state self-compassion and state loneliness in university students?*

An experiment by Waring & Kelly (2019) has shown that trait self-compassion is positively correlated with state self-compassion. However, it would be interesting to explore whether this finding can also be confirmed using ESM and thus, applies to everyday life. Moreover, investigating this relation might also be important in order to further explore the assumption of a possible downward or upward spiral effect (Fredrickson, 2013).

RQ3: *How does trait self-compassion correlate with average state self-compassion in university students as measured in daily life?*

2. Methods

2.1 Design

The chosen data collection method for this study is the Experience Sampling Method (ESM). This method can assess the thoughts, behaviours and emotions of participants during their everyday life. Participants receive daily notifications and reminders to self-report the phenomena that is being investigated in the ESM study. Generally, ESM is becoming easier to implement nowadays as more and more people possess a smartphone on which these daily questionnaires could be retrieved. Furthermore, this method can provide researchers a deeper insight into the daily experiences of participants, as ESM data collection takes place over several days across multiple participants. Moreover, as the studied phenomena is assessed in daily life of participants, this may result in more natural behaviour and experiences, compared to laboratory environments (Van Berkel et al., 2017).

The data for this study have been collected for the purpose of two bachelor theses at the University of Twente (Adam, 2020; Wallisch-Prinz, 2020). For the current study, this data set will be used. The data collection took place during November 2019 for a total of 9 days. The first day was just to prepare the participants for the course of the study by providing them necessary information about the procedure. For the following seven days, participants received six ESM questions three times a day, which they were asked to fill out. On day 9, participants were then sent the trait questionnaires about gratitude, self-compassion, loneliness and stress. Active sampling was used as participants self-reported their daily experiences of self-compassion and loneliness (Conner & Lehmann, 2012).

2.2 Participants

This study included 34 university students between 18 and 31 years old ($M = 20.65$; $SD = 3.15$). Most of the participants were women (85.3%), while three men were included (8.8%). Moreover, one gender variant/non-conforming (2.9%) and one transgender woman (2.9%) participated in this study. Regarding nationalities, 50% of participants were German and 38.2% were Dutch. Furthermore, Bulgarian (2.9%), Indian (2.9%), Indonesian (2.9%) and Vietnamese (2.9%) people also took part in the present study. Participants were recruited using convenience sampling by using the University of Twente SONA system. Additional participants were retrieved by consulting personal acquaintances of the researchers. Inclusion criteria for this study were for participants to be a registered student, possess sufficient English skills, above the age of 18 and have a smartphone in order to be able to download and use the The Incredible Intervention Machine (TiiM) application.

2.3 Materials

As the data collected was the result of a joint study of two researchers, questionnaires that will not be used for the purpose of the current study, were also included. Regarding trait measurements, these were The Multi-Component Gratitude Measure (MCGM), the UCLA Loneliness Scale and the Perceived Stress Scale (PSS). Furthermore, the daily questions not relevant for this study were about stress, gratitude and social context. In total, six ESM questions were retrieved daily and four trait measurements were executed at one time point. Following, only the measurements relevant to the present study are discussed.

The Incredible Intervention Machine (TiiM)

TiiM is an application which was developed and is provided by the BMS Lab of the University of Twente. It allows researchers to study participants long-term and frequently by setting up modules of questionnaires according to a set schedule. The questionnaires will then become available to participants at the set time frames and they will be reminded by receiving a push notification on their smartphone. For the present study, three time frames a day were created. Therefore, ESM questions needed to be answered between 8 and 10 am, 12 and 2 pm, and 7 and 9 pm. Participants would receive push notifications in order to remind them at 8 am, 12 pm and 7 pm every day (see Appendix 1). These signal-contingent triggers are an important element in ESM, as they reduce participant burden because they do not have to provide data on their own but instead are regularly reminded of doing so (Van Berkel et al., 2017).

Daily questionnaires

State self-compassion. As participants received the daily ESM questionnaires three times a day, it was a priority to lower participant burden in order to also increase the response rate. Therefore, a single-item assessing state self-compassion was chosen: "On a scale from 0 to 7, how kind do you feel towards yourself right now?". Participants then responded to this item using a Likert scale from 0 (strongly disagree) to 7 (strongly agree).

State loneliness. State loneliness has been assessed similar to a study conducted by Van Roekel et al. (2018), where they have explored state levels of loneliness in early and late adolescent samples in the US and the Netherlands. Hence, in the current study, participants were asked to respond to the statement "I feel lonely right now" on a Likert scale from 1 (strongly disagree) to 7 (strongly agree).

Trait questionnaire

Trait self-compassion. Trait self-compassion was assessed with the Self-Compassion Scale Short Form (SCS-SF). The SCS-SF has 12 items and is a shorter version of the long SCS, which has 26 items (see Appendix 2). In order to develop the SCS-SF, pairs of items for each of the six SCS subscales were selected for the shorter version and the correlation between the subscales of the SCS-SF and the longer SCS was tested. The total correlation between the English SCS-SF and the longer SCS was very strong ($r = .98$). Furthermore, Cronbach's alpha, which represented internal consistency of the SCS-SF was also very good (*alpha* = .86). However, as Cronbach's alpha for the subscales was lower and more variable (ranging between .54 and .75), it is recommended to use the longer version when information about a specific subscale is important. In the current study, the total score of the SCS-SF will be assessed and thus, the SCS-SF appears to be a good alternative to the longer version for the purpose of the current study (Raes, Pommier, Neff & Van Gucht, 2011). Examples of the 12 items of the SCS-SF are "When I feel inadequate in some way, I try to remind myself that feelings of inadequacy are shared by most people" and "I am disapproving and judgmental about my own flaws and inadequacies" (reversed item). Participants are asked to respond to the items on a 5-point Likert scale ranging from 1 (almost never) to 5 (almost always). Subsequently, the total scores of the SCS-SF would range from 12 to 60, where a higher score indicates higher levels of self-compassion.

2.4 Procedure

Before the actual start of the study, a pilot testing with two participants was executed in order to test the functioning of the TiiM application with regards to the administered surveys. The

pilot-study took place over the course of three days. Afterwards, the actual data collection was started.

Participants were first instructed on how to register and download the TiiM application. Subscription was possible through the SONA System of the University of Twente or via a URL subscription link of TiiM. Following this, participants were asked to register by entering an E-Mail address, password, their age, gender, nationality and student status. After registration, participants were asked to download the TiiM application via Google or Apple Play Store.

On day one of the study, participants were informed about the following course of data collection and thus, prepared for the next eight days. They received information about the study background, as well as their rights and contact information of the researchers. Subsequently, they were then asked to give their consent if they choose to participate in the study. For the following seven days, participants received the six ESM questions three times a day. In order to go from one ESM question to the next, the previous one had to be answered. On the last day (day 9), participants did not receive the ESM questions but instead the trait measurements. The first one was a gratitude measurement and participants were notified at 8 am. After filling out one trait measurement, the next one was made available. Thus, following the gratitude measure, were the self-compassion, stress and then loneliness questionnaires.

2.5 Data analysis

Data analyses were performed using IBM SPSS Statistics 24 and Microsoft Excel. First of all, descriptive statistics and frequencies were used in order to assess characteristics of the sample. Moreover, the results of the SCS-SF were analysed using frequencies in order to get an overview of the total scores and subscales among the sample.

As recommended by Conner and Lehmann (2012), participants who show no variation in their responses should be excluded from analysis. Therefore, one participant had to be excluded because he showed no variation in state loneliness and almost no variation in state self-compassion.

The person means for state self-compassion were estimated to assess the average level of state self-compassion per participant. Furthermore, all variables were standardized in order to be better able to interpret the effect and compare the confidence intervals. The interpretation of the correlation coefficients was done according to Cohen (1988). A coefficient above .10 indicates a weak effect, a value of .30 or above a moderate correlation and a coefficient of .50 and above would demonstrate a strong association.

A linear mixed model analysis with state self-compassion or state loneliness as dependent variable and participant as fixed factor was executed, in order to receive the estimated marginal means per participant. To explore the first research question, a linear mixed model analysis with state self-compassion as fixed covariate and state loneliness as dependent variable was conducted.

Furthermore, two trait self-compassion groups were created by doing a median split. Below the median was coded as 1 for low trait self-compassion and median and above was coded as 2 for high self-compassion. This variable was then used in the interaction analysis using a linear mixed model, to explore the interaction of trait self-compassion group on state self-compassion and state loneliness. The SPSS file was then split into these two groups in order to execute linear mixed model analyses per group to find the association for each group separately. Therefore, associations between state self-compassion and state loneliness were then displayed for both groups independently in the output.

In order to explore the third research question and to validate the daily self-compassion item, a Pearson correlation was executed using the trait self-compassion variable and the person means variable of state self-compassion.

Additionally, using Microsoft Excel, graphs were created to visualise the results, as well as to visualise the course of state self-compassion and state loneliness in individual participants. For the individual cases, two participants of the low trait self-compassion group and two participants of the high trait self-compassion group were chosen in order to represent both groups. Furthermore, participants who were representative of the results by showing negative associations between the variables were chosen, as well as some showing interesting patterns. These would be patterns with for example strong fluctuations or showing rather stable levels of state self-compassion and state loneliness. This was done in order to show the possible variations and even exceptions of the results within participants for this sample.

3. Results

3.1 Descriptive statistics

Regarding the trait self-compassion questionnaire, the minimum score within this sample was 20, while the maximum was at 52 ($M = 36.62$; $SD = 8.42$). The theoretical scale of the SCS-SF shows a minimum of 12 and a maximum of 60. Therefore, the results of the trait self-compassion questionnaire for this sample seem to be within the average when compared to the English sample of the validation study for the SCS-SF (Raes et al., 2011). The descriptive

statistics of the subscales of the SCS-SF can be seen in Table 1. The sample of the current study scored highest on mindfulness, followed by common humanity and then self-kindness.

Table 1. Descriptive statistics of the SCS-SF.

SCS-SF scales	Minimum	Maximum	M	SD
Total scale	20	52	36.62	8.42
Self-Kindness	3	10	6.79	1.90
Self-Judgment	2	10	4.74	2.22
Common Humanity	3	10	7.65	1.77
Isolation	2	10	5.18	2.22
Mindfulness	4	10	7.94	1.71
Over-identification	2	10	4.32	2.21

When looking at the mean levels of state self-compassion and state loneliness (figure 1), it can be seen that participants with low average levels of state self-compassion often show higher levels of mean state self-compassion. With a higher average level of state self-compassion, more participants showed lower levels of average state loneliness. However, as it also becomes apparent from this figure, there are still exceptions where participants with high mean state self-compassion also show quite high levels of state loneliness.
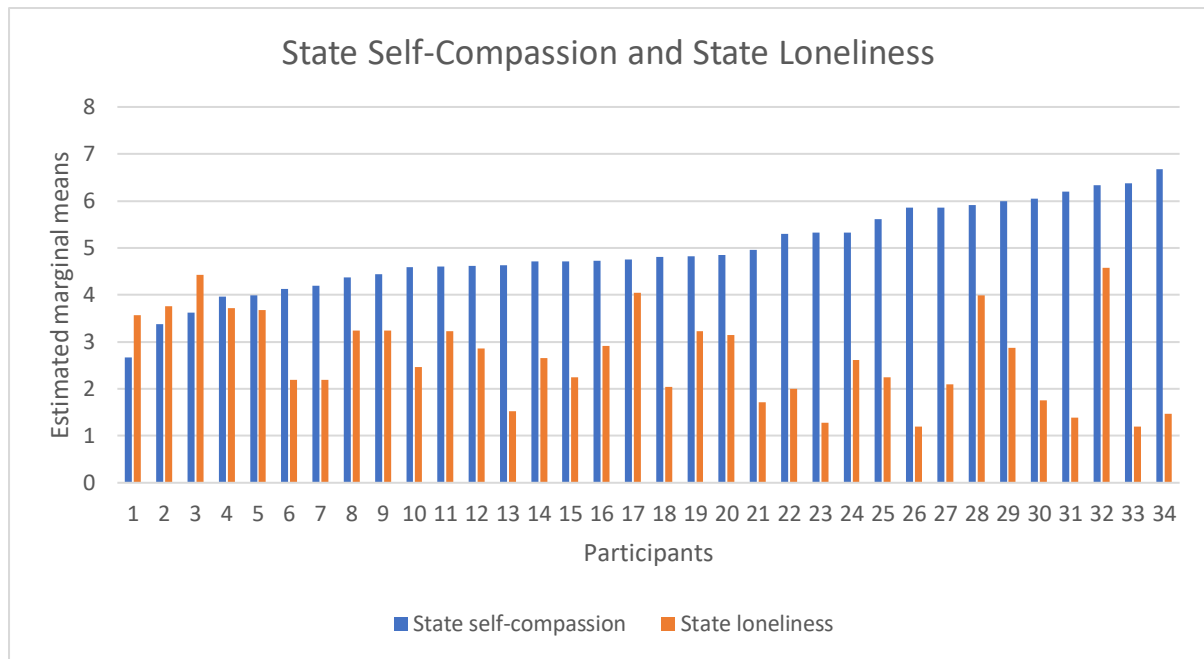
Figure 1. State self-compassion and state loneliness (estimated marginal means) per participant – sorted from low to high state self-compassion.

3.2 State self-compassion and state loneliness

In order to explore the first research question, the overall association between state self-compassion and state loneliness over time was tested using a linear mixed model analysis. For this, the standardized variables were used. The results revealed a negative and significant correlation between state self-compassion and state loneliness ($ß = -.38$, *SE* = .04, *p* < .001, *95% CI* [-.45, -.31]). This means that higher levels of state self-compassion are associated with lower levels of state loneliness at that timepoint.

3.3 Interaction of trait self-compassion

A median split of trait self-compassion was executed, which resulted in a median of 36. In this sample, 44.1% (*N* = 15) fell into the below median trait self-compassion group and 55.9% (*N* = 19) were categorised into the median and above trait self-compassion group. As a next step, the interaction effect of high and low trait self-compassion groups on the relation between state self-compassion and state loneliness was investigated using a linear mixed model analysis. This revealed a significantly negative interaction term ($ß = -.17$, *SE* = .07, *p* = .02, *95% CI* [-.31, -.03]) for the below median group, with median and above as reference category, meaning that the below group showed to have a more negative relation between state self-compassion and loneliness. For the low trait self-compassion group, this was apparent in a moderate negative association ($ß = -.46$, *SE* = .05, *p* < .001, *95% CI* [-.56, -.36]). In the high trait self-compassion group, a significantly negative, but weak, association was found ($ß = -.29$, *SE* =

.05, *p* < .001, *95% CI* [-.38, -.19]). Therefore, people with lower levels of trait self-compassion seem to have a stronger negative association between state levels of self-compassion and loneliness than people with higher trait self-compassion scores.

3.4 Trait self-compassion and average state self-compassion

Using Pearson correlation, the association between trait self-compassion and the mean state self-compassion levels was explored. This would show the validity of the state self-compassion item as well as the association between trait and state self-compassion in this sample. The analysis resulted in a strong, positive correlation (*r* = .56, *p* < .001). Therefore, people with higher trait self-compassion levels also seem to have higher average levels of state self-compassion, while people with a lower trait self-compassion score, show a lower mean score of state self-compassion.
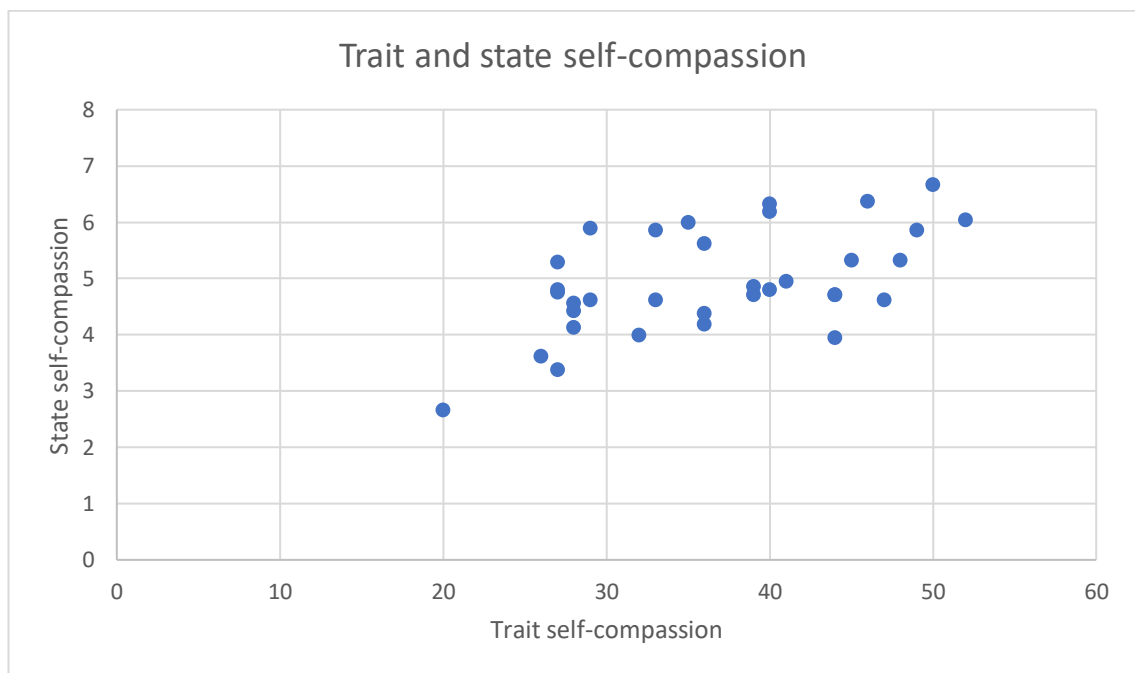
Figure 2. Correlation between trait self-compassion scores and person mean state self-compassion among the participants.

3.5 Individual cases

The following section focuses on individual cases, in order to represent different patterns of associations of state self-compassion and loneliness over time within this sample. For this representation, two participants of the low trait self-compassion group and two participants of the high trait self-compassion group were selected. They were chosen in order to show momentary associations that represent the results of this study but to also show exceptions to show

variations of these patterns. The Pearson correlation for state self-compassion and state loneliness was calculated for each individual, as well as a graph showing the course of these variables.

The first participant that was selected for individual representations was participant 4243. This participant belongs to the low trait self-compassion group with a total score of 26. He was selected because he is a good example of a negative correlation of state self-compassion and state loneliness ($r = -.52$, $p = .02$), as it was also shown to be the case for other participants with low trait self-compassion. As it can be seen in figure 3, especially on timepoints 9, 13 and 19, a negative association is displayed. Participant 4243 displayed a mean state self-compassion score of 3.62, which laid below the sample's median of 4.79. Therefore, this participant also represents a low trait self-compassion and low state self-compassion score, as there was shown to be a significantly positive association between these variables.
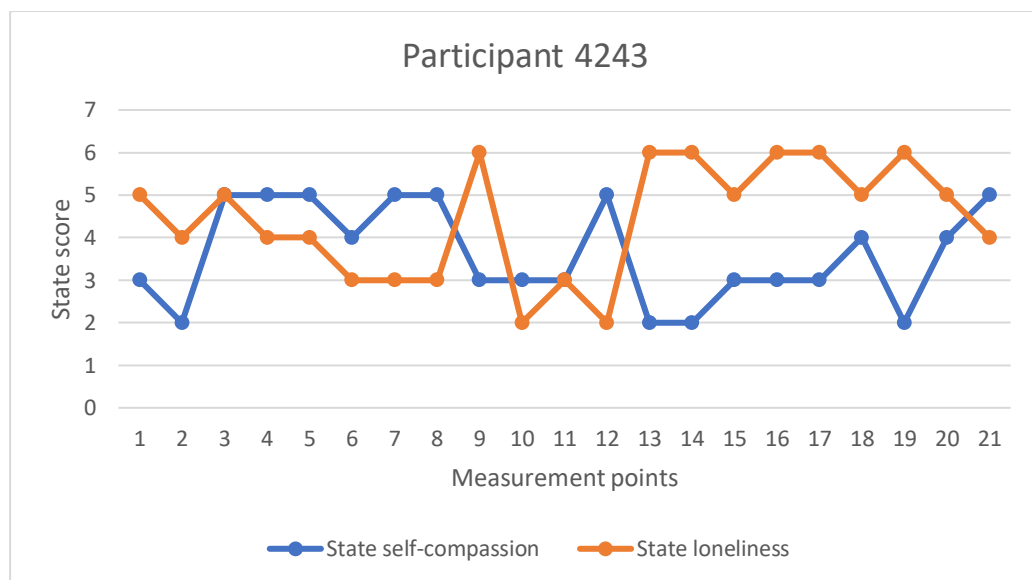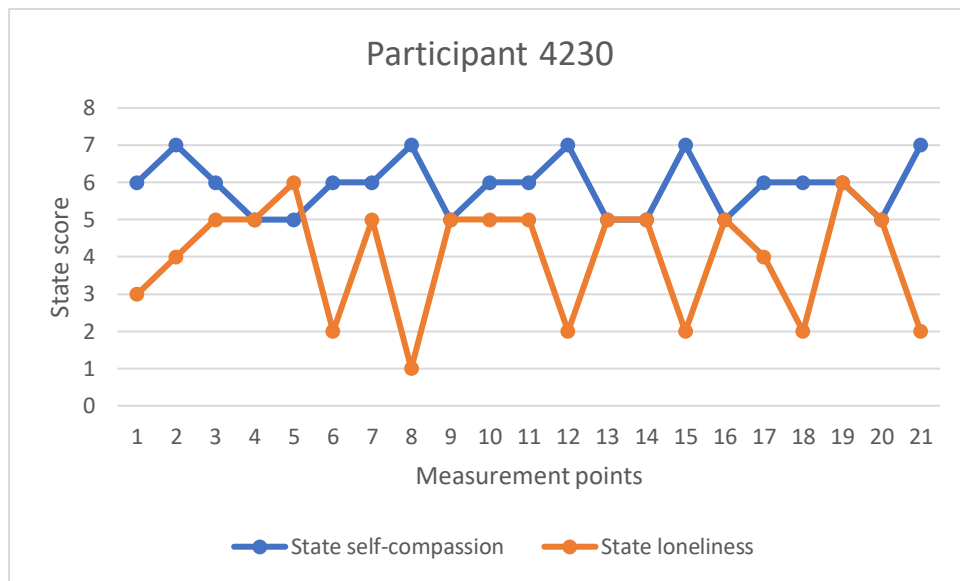

Figure 3. State self-compassion and state loneliness within participant 4243 for the 21 measurement points of the study.

Participant 4230 belongs to the low trait self-compassion group with a score of 29. However, his mean state self-compassion score laid at 5.90, which is above the median of 4.79. Therefore, this participant does not represent the result of a positive correlation between trait self-compassion and state self-compassion. This shows that, although a low trait self-compassion level is very likely to be associated with a low state self-compassion level, this must not always be the case. Participant 4230 displays a strong negative correlation between state self-compassion and state loneliness ($r = -.71$, $p < .001$). Furthermore, this participant's state self-compassion seems to be rather stable during the course of the study, only ranging between 5 and 7. Although state self-compassion does not vary in a broad range, state loneliness does

range from scores of 6 to 1 during the course of the study. Therefore, even small changes in state self-compassion were correlated with great increases or decreases in state loneliness in this participant (e.g. timepoint 8, 9 and 12).
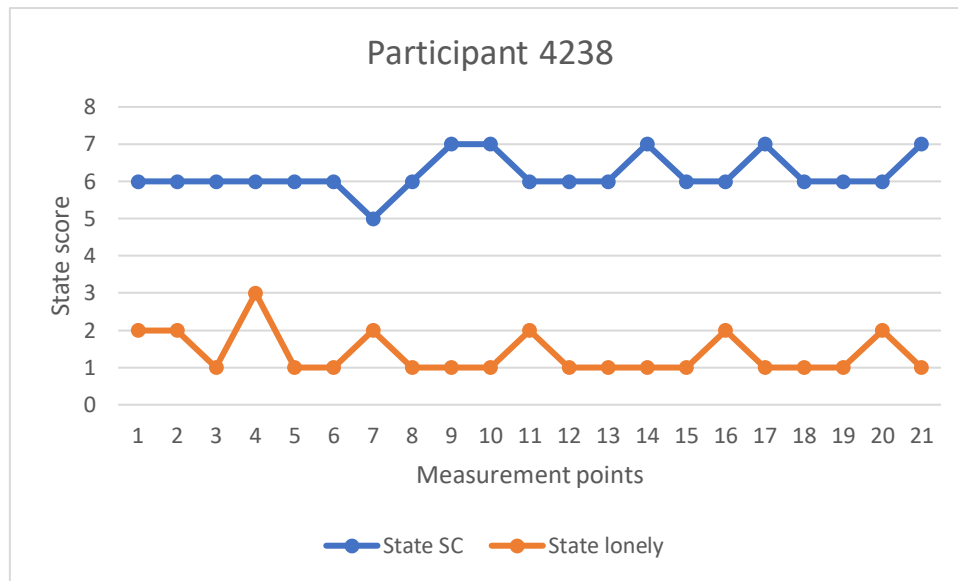

Figure 4. State self-compassion and state loneliness within participant 4230 for the 21 measurement points of the study.

The next participant belongs to the group of above the median trait self-compassion with a total score of 41. Furthermore, this participant has a mean state self-compassion score of 4.95, which is above the median of 4.79. Participant 4214 displays a strongly negative association between state self-compassion and loneliness ($r = -.63$, $p < .001$). This shows that there are also participants in the high trait self-compassion group who show a strong association, although this seemed to be more likely for participants in the low trait self-compassion group, according to the results. When looking at figure 5, this negative association can especially be observed at timepoints 13, 15 and 17. This participant shows great fluctuations of self-compassion at some timepoints, ranging from 3 to 7. State loneliness seems to be more stable, only showing greater fluctuations at two timepoints.
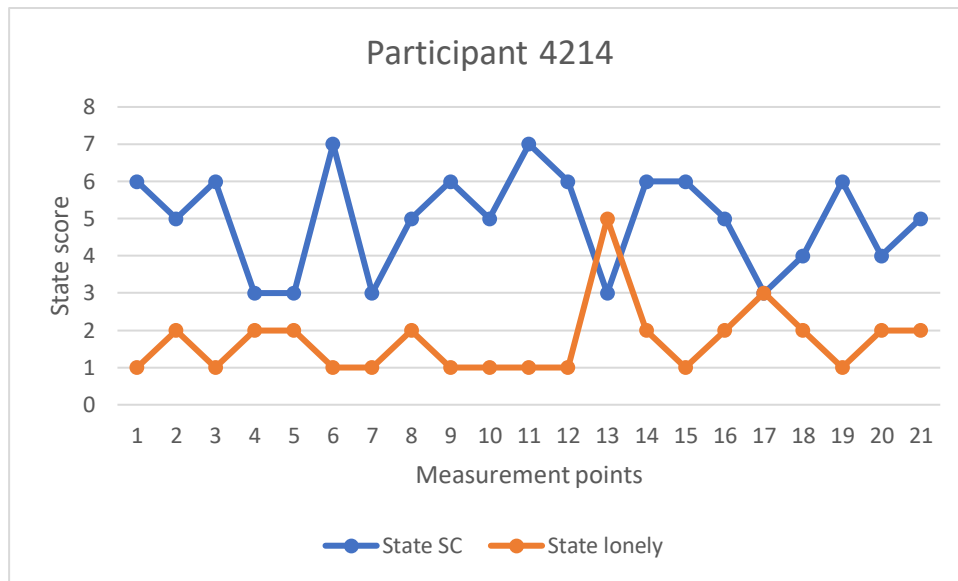
Figure 5. State self-compassion and state loneliness within participant 4214 for the 21 measurement points of the study.

Participant 4238 displayed a trait self-compassion score of 40 and a mean state self-compassion score of 6.19, which is above the median. Overall, this participant showed to have a negative association between state self-compassion and state loneliness, which, however, was not significant ($r = -.42$, $p = .06$). Nevertheless, on some timepoints a negative association can be observed (e.g. timepoints 7, 8, 17). In general, this participant showed to have a low variability of state loneliness, only ranging between 1 and 3. On most timepoints state loneliness remains stable or varies between 1 and 2. State self-compassion shows a similar pattern with a range between 5 and 7, mostly ranging between 6 and 7 and also remaining on a stable level for a few timepoints in a row (e.g. from timepoint 1 to 6). Therefore, fluctuations of both variables are quite small and also show a lower frequency than it was the case for the other cases shown.

Figure 6. State self-compassion and state loneliness within participant 4238 for the 21 measurement points of the study.

4. Discussion

4.1 Discussion

4.1.1 State self-compassion and state loneliness

The results of this current study confirm the negative correlation between self-compassion and loneliness that has been found in the cross-sectional studies by Akin (2010) and Lyon (2015). However, as these have focused on the trait levels of these constructs, some hypotheses of this study differed as the state levels were assessed. It was proposed that there may be a positive correlation as self-compassion may act as a buffer and is applied especially in moments when one is struggling with for example loneliness (Neff & Dahm, 2015). The three emotion-regulation systems may be suitable for prediction of daily, individual patterns as emotions are providing us with momentary feedback in our daily interaction with the environment (Gilbert, 2014). The possible buffering effect of self-compassion may link to the emotion-regulation systems, as the soothing system may especially be required when feeling threatened since it is needed to soothe overarousal and acts as a regulator for the threat and drive systems (Gilbert, 2009). Loneliness may activate the threat system because it makes individuals feel unsafe and heightens their sensitivity to other threats, which also drives anxiety (Cacioppo et al., 2006). Therefore, one hypothesis was that state self-compassion and loneliness might show a positive association. However, for this sample, this was not the case.

Overall, feeling high on self-compassion at one moment was associated with lower levels of loneliness, while a higher state of loneliness was correlated with low levels of self-compassion. A study by Li et al. (2020) has shown that daily self-compassion was negatively associated with perceived stress. Therefore, state self-compassion also showed a negative correlation with a negative emotion like stress, just as it was the case in the present study for loneliness. Hence, state self-compassion may not necessarily show its buffering effect by displaying a positive association, as it might be expected. Relating the negative association found to the emotion-regulation systems, it could also be the case that feeling lonely activates the threat system, while deactivating the soothing system and the other way around. This has also been supported by Rockcliff, Gilbert, McEwan, Lightman, and Glover (2008, as cited in Neff & Dahm, 2015) in relation to stress. They have shown that conducting a brief self-compassion exercise lowered levels of the stress hormone Cortisol. Furthermore, Kirschner et al. (2019) have shown that applying a short-term self-compassion exercise leads to higher parasympathetic activity, being in line with a possible activation of the soothing system. Feeling self-compassionate may then activate the soothing system, making one feel calm and cared for, and deactivate the threat system. This would make it more likely to feel lonely when not being self-compassionate at one moment and to feel self-compassionate when not feeling lonely at another moment.

There may also still be a buffering effect of self-compassion, as the available data cannot rule out this effect. It may just be that it displays as a negative, instead of a positive, association. State levels may have been reported when loneliness was high and self-compassion was not yet or could not be applied in that moment. As it has been shown in an experiment by Leary et al. (2007), doing a self-compassion exercise leads to individuals reporting lower levels of negative emotions. This could possibly also apply to feelings of loneliness in the current study. Hence, participants may have reported low levels of loneliness and high levels of self-compassion when self-compassion has already helped them to cope with a previously higher level of loneliness. A similar pattern can also be observed in the individual graphs. For example, in figure 5, the participant showed high loneliness and low self-compassion at timepoint 13. At the next measurement point, self-compassion has increased, while loneliness has decreased.

4.1.2 Taking into account trait self-compassion

For the interaction effect of trait self-compassion, it has been proposed in the introduction that taking into account low or high trait self-compassion, may strengthen the relationship between state self-compassion and loneliness due to upward and downward spirals (Fredrickson, 2013). Another possible prediction was that high trait self-compassion participants would

show a positive correlation due to a buffering effect (Neff & Dahm, 2015), while those in the low trait group would show a negative correlation. The results showed a stronger negative relationship in the low trait self-compassion group and a weaker negative relationship in the high trait group. The possible explanations proposed need to be treated with caution as the available data cannot yet confirm or reject the assumptions made.

As proposed in the introduction, a downward spiral (Fredrickson, 2013) could be a possible explanation for the stronger negative association in the low trait group. Having low trait self-compassion was strongly correlated to lower levels of state self-compassion in this study, also confirming the results of Waring & Kelly (2019). In a study by Neff et al. (2007), lower levels of self-compassion were correlated with higher levels of negative affect. According to Fredrickson (2013), negative emotions often narrow our attention and thought-action repertoire, which makes it more likely for these emotions to be maintained. Hence, in the low trait self-compassion group, more negative emotions and less state self-compassion might be experienced (Neff et al., 2007). When feeling lonely, they might more easily get into a downward spiral with narrowed attention and feel even more negative emotions (Fredrickson, 2013), while not being able to feel kind towards themselves in these moments. This could make it more likely for them to experience even higher levels of loneliness and lower levels of self-compassion in moments where they feel lonely.

In the introduction of the study, it was proposed that the high trait self-compassion group might show a stronger negative correlation based on upward spirals (Fredrickson, 2013) or a positive correlation based on the buffering effect (Neff & Dahm, 2015). However, the results showed a weak negative correlation in this group, contrary to the expectations. It might be that a change in state loneliness may not always be associated to a change in state self-compassion for the high trait self-compassion group. For example, in figure 6 it can be seen that state loneliness increases at one timepoint while state self-compassion remains on the same level. This could relate to more balanced out emotion-regulation systems. As stated by Gilbert (2009), people high on self-criticism tend to have overactive threat and drive systems and an underactive soothing system. Self-compassion can rebalance these systems and help to be able to feel safe within oneself and in relationships with others (Gilbert, 2009). Perhaps, participants high on trait self-compassion in the present study have more balanced out emotion-regulation systems. This may mean that their soothing system is more active and even if the threat system is activated, their self-compassion may not always decrease.

Another explanation could be that the level and frequency of fluctuations of state self-compassion and loneliness might be lower in the high trait self-compassion group. This might

also be assumed based on more balanced out and stable emotion-regulation systems (Gilbert, 2009). In the current study, it was indeed the case that there were more participants in the high trait group that showed similar patterns as seen in figure 6 with more stable levels of state self-compassion and loneliness than in the low trait group. However, the levels of fluctuations were only an observation which was not statistically tested and should be treated with caution. In a study by Kelly, Waring and Dupasquier (2020) there was no significant association between a person's mean state self-compassion and their standard deviation in self-compassion. This might reject the observation of the current study. Future research would be needed to clarify how trait self-compassion relates to the levels of fluctuation in state self-compassion and state loneliness.

A study by Waring & Kelly (2019) has shown that people with high trait self-compassion especially applied state self-compassion when being in an interpersonal context where they can share their failure with others. It was proposed that in this context, their assumption about common humanity is more easily confirmed. According to Van Roekel et al. (2015) adolescents feel lonelier in situations where they are alone. Therefore, in some lonely moments, participants in the high trait group might have had difficulties to practice self-compassion because they might have been in a context which does not remind them of common humanity (Waring & Kelly, 2019). This might explain the weak but still negative association found in the high trait self-compassion group. Furthermore, the emotion-regulation system, as already proposed, might apply for both groups and may explain the negative correlation in general with an active soothing system deactivating the threat system (Gilbert, 2014).

4.2 Limitations

One limitation of this study would be that mainly self-kindness was assessed for the daily questionnaires. Although this item displayed a good validity by showing a strong positive correlation with trait self-compassion, it probably was not able to grasp the whole concept of self-compassion on a state level. Using a daily item which assesses all three components, could have been helpful in interpreting the results, as some participants might have had higher scores on the other two components on the trait questionnaire and also applied these more in daily life than self-kindness. A new development was the creation of the State Self-Compassion scale by Neff et al. (2021). Although this scale was mainly developed for use in experimental settings, it could also be a possibility for future ESM studies to assess state self-compassion. Nevertheless, only using self-kindness might have had the advantage of reducing participant burden as there were less items for the participants to reply to, especially when noting that responses were

required three times a day and this was a joint research, resulting already in six different daily items (Van Berkel et al., 2017).

Furthermore, the study only covered one week, wherefore it could be the case that not the whole range of experiences was displayed. Doing a literature review, Van Berkel et al. (2017) found that an ESM study duration of around two weeks was the most common practice. However, a strength would be that participants in this study were asked to report on their self-compassion and loneliness three times a day and therefore, covering different times of the day. This might have been a benefit because state loneliness tends to be higher when alone than when in company (Van Roekel et al., 2015). Therefore, different contexts probably could have been assessed by sending out the questionnaires three times a day.

This is the very first ESM study assessing state self-compassion and loneliness, also in relation with trait self-compassion. It is exciting to now have first results on this topic and can also be seen as a strength as new insights have been gained. However, as there is not much comparable data available, the results and interpretations in the current study should be treated with caution. There is a need for further studies to confirm the results that were found and to explore the underlying mechanisms.

4.3 Recommendations

So far, the only studies on loneliness and self-compassion have been cross-sectional. The current study has shown that the state levels of these variables also show a negative correlation. However, questions of causality and the mechanisms underlying these results still remain unclear. The mechanisms of this negative association could be explored in a qualitative study. The study may also take the form of using ESM to confirm the negative relationship that was found in this study and then using interviews to explore the daily self-compassion practice and feelings of loneliness of participants. This study has also shown that there is a significant difference in the relation between state loneliness and self-compassion for groups of high and low trait self-compassion, but it remains unclear why this is the case, wherefore only assumptions based on different theories could be made. Taking into account low and high trait self-compassion groups in a qualitative study could be of interest to find out more about the different practices and experiences of self-compassion and loneliness, which might help to explain the interaction effect found in the current study.

In order to clarify causality, an experiment could be conducted. Therefore, a population with higher levels of loneliness could be chosen. For example, Victor & Yang (2012) have shown that adults under the age of 25 and those above the age of 65 had higher levels of

loneliness. The experimental group could then be asked to do a short self-compassion exercise, similarly as it was done by Leary et al. (2007), while the control group gets a neutral task. Loneliness and self-compassion levels would be assessed pre and post the experimental manipulation. This could clarify causality and show whether applying self-compassion could lower levels of loneliness. Furthermore, hormones associated with the threat and soothing systems may be measured in order to take a closer look at the role of the emotion-regulation systems.

A practical implication of this study would be that increasing state self-compassion levels might play an important role in dealing with feelings of loneliness. The mechanisms with which the negative association between state self-compassion and loneliness exists remain unclear. However, it can still be suggested that cultivating higher levels of state self-compassion can be related to having decreased feelings of loneliness in these moments. Although the 8-week program of Mindful Self-Compassion by Germer & Neff (2013) has shown to be effective in increasing self-compassion and decreasing several negative emotions, some simple daily practices may also already help. These practices could be taken from the Mindful Self-Compassion program, where informal daily exercises like "soothing touch" or "short self-compassion break" are practiced (Germer & Neff, 2013). Hence, teaching university students some easily appliable self-compassion exercises for daily life might help them to experience lower levels of state loneliness.

4.4 Conclusion

To conclude it can be said that this first study on state self-compassion and state loneliness, also in relation to trait self-compassion, has yielded interesting first insights. A negative association between state self-compassion and loneliness has been found, which was proposed to possibly relate to the emotion-regulation systems (Gilbert, 2014). High or low trait self-compassion was shown to have a significant interaction effect on this relationship. Participants with high trait self-compassion had a weaker negative association between state self-compassion and loneliness than participants with low trait self-compassion. This was assumed to relate to more balanced out emotion-regulation systems of people with high trait self-compassion (Gilbert, 2009), while the stronger association in people with low trait self-compassion was assumed to relate to a downward spiral effect (Fredrickson, 2013). Trait self-compassion has been found to be positively and strongly associated with state self-compassion, possibly transferring the experimental results of Waring & Kelly (2019) to daily life data. Further research on mechanisms and causality is needed because they still remain unclear in this first study. However, as a practical

implication, carrying out short and informal self-compassion exercises may already be of benefit in experiencing lower levels of loneliness in daily life.

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Appendices

Appendix 1

Push notification during the course of the study

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! :)

Appendix 2: The Self-Compassion Scale Short Form (SCF-SF)

How I typically act towards myself in difficult times…

Please read each statement carefully before answering. Using the scale given below, indicate, to the right of each item, how often you behave in the stated manner:

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 am 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 is 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.*	