

Loneliness in the Daily Lives of University Students: An Experience Sampling Study
exploring the Role of Social Context and Trait Measures of Loneliness and Self-compassion

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Abstract

Background: Loneliness is typically investigated as a stable trait-like concept within cross-sectional studies using retrospective questionnaires. Recently, the experience sampling method has attracted attention for measuring affect as a momentary state to provide insights into the dynamics of emotional experience over time. The purpose of this study was to explore the in the moment experiences of state loneliness in the daily life of university students. Specifically, daily state levels of loneliness were explored in the light of different social contexts, as well as in relation to trait measures of loneliness and self-compassion.

Methods: In a sample of 35 university students, state loneliness and the social context were assessed three times a day over the course of one week via the smartphone application TiiM. On the last day, the retrospective UCLA Loneliness and Self-Compassion Short Form scales were administered. Linear Mixed Modeling was implemented to estimate marginal means of state loneliness per person over all measurement points as well as the mean levels of state loneliness for the whole group per measurement point. Furthermore, means of state loneliness for each social context (alone, non-intimate company, intimate company) were computed and compared. Carry-over effects of the social context on state loneliness at the next measurement were examined by means of lagged Linear Mixed Modeling. Finally, Pearson correlations were conducted between the marginal means per person over all measurement points and either trait loneliness or trait self-compassion to explore the association between state loneliness and trait loneliness and self-compassion. *Results:* Levels of state loneliness varied between and within persons. Students were most lonely without company, followed by non-intimate company and least lonely when they were in intimate company. The current social context appeared to mostly determine the level of loneliness in the moment with the exception of a carry-over effect of increased loneliness when students were alone after being in non-intimate company. Lastly, students that scored higher on trait loneliness also showed to have higher scores on state loneliness ($r = .66, p < .01$) and higher levels of trait self-compassion were associated with lower levels of state loneliness in university students ($r = -.51, p < .01$). *Conclusions:* This study extends the previous knowledge of loneliness by stressing loneliness to be a dynamic experience that is mostly dependent on the concurrent social context. Students scoring high on trait loneliness experience higher levels of state loneliness over the week while trait self-compassion reveals to be a protective factor for state loneliness. This study provides a theoretical base for future studies to build comprehensive theory integrating state loneliness in connection to context and trait variables to conduct research that could eventually help students cope with experiences of loneliness.

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Introduction

Loneliness is a universal human experience and has remained a consistent topic of interest throughout history, materializing in various forms of literature. Despite the early and recessive appearance of this concept, it has only recently – in the late 20 century – started to be acknowledged as an important domain of psychological study (Weiss, 1973). Since then, researchers have drawn up various definitions of loneliness that all agree in loneliness to be a phenomenon of perceived inadequacy of social connection and experienced as painful and detrimental (Lyon, 2015). Thus, it appears that loneliness has protractedly been and still is a threat to and a concern of humanity overall.

Despite its universality, loneliness has particularly been found to be present in young adults and college students (Cutrona, 1982; Qualter et al., 2013; Russel, Peplau, & Cutrona, 1980) and has shown to be a predictor of mental and physical health problems. Research has repeatedly indicated that the experience of loneliness in students can lead to anxiety, depression, alcohol or drug abuse, and poor academic performance (Karaoglu, Avsaroglu, Deniz, 2009; Swami et al., 2007). Furthermore, its problematic impact also extends to students' physical health, as perceived loneliness is associated with cardiovascular difficulties and distressing sleep issues (Caspi, Harrington, Moffitt, Milne, & Poulton, 2006). Hence, it becomes evident that the university student population has shown to be distinctively vulnerable to loneliness and its hazardous mental and physical health consequences and, thus, deserves special attention within this research domain.

Taking a closer look at this domain of research, it becomes apparent that loneliness is typically investigated as a trait-like concept within cross-sectional studies using retrospective questionnaires (e.g. the University of California, Los Angeles [UCLA] Loneliness Scale, Russell, Peplau, & Cutrona, 1980; or the Louvain Loneliness Scale for Children and Adolescents [LLCA], Marcoen & Goossens, 1993), intended to assess the extent to which participants feel lonely in general or on average in a preceding time interval. This underlines that, so far, loneliness has generally been assumed to be, or at least has been measured as, a relatively stable trait over time and across various situations. However, loneliness may not only be a stable trait, but can fluctuate in daily life relative to, among others, the context people find themselves in (Larson, 1981; Van Roekel et al., 2015). Nevertheless, short-time fluctuations of loneliness and its dependency on contextual factors are not considered in typical cross-sectional studies.

Researching loneliness solely as a stable trait-like characteristic may be both inaccurate and insufficient. Research has underlined variability and change over time to be an

essential characteristic of all emotions and affect. Their variability is even thought to be the reason why affect and emotions are experienced at all. Changes in affect have the function to inform individuals about the nature of the present event to be threatening or rewarding to stimulate an organism to respond with appropriate action to these personally relevant challenges (Kuppens, Oravecz, & Tuerlinckx, 2010). Therefore, changes over time and variability in emotions can be supposed. This indicates that loneliness could also be considered as a state with momentary fluctuations dependent on contextual circumstances. By measuring state levels of loneliness as they occur in real life, more knowledge about possible momentary fluctuations in state loneliness within individuals and their association with relevant contextual factors can be gained.

A methodology that has been developed to assess momentary experiences in real life is the Experience Sampling Method (ESM). This intensive longitudinal methodology allows researchers to study individuals in their natural settings, in real-time, and on repeated occasions (Conner & Mehl, 2015). It intends to circumvent the challenge of memory bias, which is typical for studies using self-report measures, by measuring state variables in real-time multiple times over the day and week (Kuppens et al., 2010). Emotions and affect are highly variable, they flow and fluctuate over time in response to changing internal and external events. Experience Sampling is suitable to capture this dynamic profile concealed by standard one-time surveys (Mehl & Conner, 2012). Since in ESM studies the participants report on their context and feelings in their real-world settings, this type of method is supposed to be more ecologically valid (Myin-Germeys et al., 2018). So far, no research has been conducted which explores momentary state loneliness in university students. Thus, this study will make use of the experience sampling method that allows the exploration of possible changes over time and momentary fluctuations of state levels of loneliness in relation to contextual factors in students.

Social Context and Loneliness

Little is known yet about how loneliness is experienced in daily life. Until now, only two studies have investigated state levels of loneliness in daily life, both focusing on adolescence (van Roekel, Verhagen, Engels, Goossens, & Scholte, 2014; van Roekel, 2018). These studies found that adolescents felt more lonely in situations when they were actually alone than when they were with others. This finding indicates that the experience of loneliness in adolescence can indeed be influenced by the social context. Nevertheless, these studies have focused on daily state experiences of adolescences and not on university students. Thus, it remains uncertain whether the same can be expected for university students.

The duration and frequency of time spent in different contexts are likely to change for university students. Studying at a university is a transitional phase from being an adolescent to being an adult, where students are allowed to fulfill their desire for individuality, while also seeking close and social relationships with others (Özdemir & Tuncay, 2008). Since university students often experience to live on their own for the first time, away from family and hometown friends, as well perceive increased importance of social relationships (Weiss, 1973), the experience and perception of these different social contexts could also change for students. However, so far, no actual research has been conducted demonstrating how university students experience loneliness in connection with these social contexts in the moment. Yet, it seems important to investigate these associations since different social contexts may have a different function and relevance to students as compared to adolescents.

Regarding theory on social behavior, differences in social context are expected to be accompanied by differences in the experienced level of loneliness. According to the Social Baseline Theory (Beckes & Coan, 2011), early in history, humans survived and prospered only by banding together with others to provide mutual protection and support and to share resources. Therefore, being with other humans granted them a baseline state of relative calmness. On the contrary, being disconnected from other individuals was a life-threatening circumstance which required the individual to be more alert for possible dangers and to engage in more emotion regulation efforts, since it is not possible to share the risk and threat vigilance with anyone else. As a consequence, loneliness evolved as an emotional signal to take action to renew or built the social connections that are necessary for survival (Cacioppo, & Hawkley, 2009). Thus, an individual is less concerned and calmer when being with others and prefers being in social company over being alone.

Nevertheless, as the human species further developed and was able to join more complex social settings, not every type of company could still be regarded as beneficial. While intimate contact might grant individuals the mentioned benefits due to trust and interdependence, non-intimate company does not necessarily allow for risk and resource sharing. In fact, it may even pose a threat to the individual due to a competition of resources or rejection from a social group. This theoretical foundation underlines the relevance to investigate how students experience different social contexts of being alone or in the company of intimate or non-intimate others.

The Social Baseline Theory and previous research suggest that people experience different levels of loneliness when they are alone, in non-intimate company, or intimate company (Beckes & Coan, 2011; van Roekel et al., 2014; van Roekel et al., 2018). It is

underlined that individuals feel especially lonely when being alone or with non-intimate others and thus, perceive these moments rather negatively. Nevertheless, research has shown that momentary affect may not only depend on the concurrent situational context. Within their experience sampling research, Marco and Suls (1993) investigated the time-lagged effects of daily stressors on negative mood (tense, unhappy, angry) within and across days and showed that prior negative experiences or a smaller stressor have a lasting effect on the individual. Similarly, research has indicated that loneliness in adolescents is increased when being with family after being alone (van Roekel et al., 2014) which is an indication for a carry-over effect. So far carry-over effects, specifically for social context on loneliness, have not been examined in university students. Exploring temporal relations will offer further insights into the loneliness experience of university students relative to their social context. Thus, besides the association of loneliness with the current context, such potential time-lagged carry-over effects will be additionally explored for each social context separately.

State and trait measures of loneliness

According to the differential reactivity hypothesis of loneliness, lonely individuals show different reactions to their social environments than non-lonely individuals, which maintains their loneliness level (van Rockel et al., 2018). Within their experience sampling study, van Rockel et al. (2018) found that high trait-level lonely adolescents experienced higher levels of state loneliness when they were alone, with non-intimate others (e.g. classmates) and intimate others (e.g. family) compared to low lonely adolescents. It implies state loneliness to be an in the moment experience which is influenced by a person's level of trait loneliness. This indicates that generally state loneliness may be experienced differently over time by people with high levels of trait loneliness compared to people with low levels of trait loneliness. Hence, this study will explore whether a higher mean level of state loneliness over the course of one week is indeed associated with a higher level of trait loneliness in university students.

Trait self-compassion and state loneliness

As previously mentioned, loneliness is often severely distressing to those who experience it and it plays a critical role in the onset of disorders as it is negatively correlated with positive psychological functioning, physical health, and general wellbeing (Cacioppo et al., 2000). However, several studies have indicated self-compassion to be a beneficial trait for general well-being and positive psychological functioning (Neff, 2003). Self-compassion is defined as a mindset which entails “nonjudgmental understanding” of one's suffering and

shortcomings, in which one's experiences are perceived as a part of "common humanity" (Neff, 2003). Self-compassion is composed of three components: (1) self-kindness in the face of failure, (2) a perception of common humanity, and (3) the maintenance of a balanced state of awareness of one's experiences (Neff, 2003). Thus, self-compassion involves the awareness and acceptance of painful, shameful, or unpleasant experiences, in which an objective, mindful understanding of these experiences links a person to others through a sense of shared humanity (Neff, 2003).

Investigating self-compassion in relation to state loneliness could be of advantage for university students, as it may help universities to tackle the problem of daily experienced loneliness in their students by designing positive interventions. Research on self-compassion highlights a possible relation to loneliness as self-compassion promotes social connection by facilitating a view of common humanity and shared experience that should decrease feelings of loneliness (Neff, 2003). Moreover, since self-compassion prevents over-identification, a cognitive distortion of only focusing on one's shortcomings which causes one to feel isolated, it may enhance positive social perceptions by preventing certain misconceptions of isolation (Neff, 2003; Wiklung, Gustin, & Wagner).

So far, there have been two studies that found a direct link between trait self-compassion and trait loneliness (Akin, 2010; Lyon, 2015). Their results showed moderate ($r = -.31, p < .01$) and strong ($r = -.56, p < .01$) negative correlations between loneliness and self-compassion. However, it becomes evident that research investigating loneliness and self-compassion has been limited to cross-sectional studies, investigating their group correlates with variables based on self-reported measures at one time-point, which may not correctly reflect the momentary experienced state feelings of loneliness over a certain time. One reason for that is that peoples' memory for their feeling over the past week is influenced by a variety of factors such as mood at the time of recall, personality traits, or cultural norms (Mehl & Conner, 2012). However, repeatedly assessing momentary state loneliness in relation to trait self-compassion may provide a better representation of each student's loneliness experience as it occurs over the week, free of memory biases.

Moreover, examining the role of trait self-compassion in relation to state loneliness could be of advantage for students with regards to coping with loneliness daily. Studies have shown that self-compassion can be developed in training and meditation interventions (Smeets, Neff, Alberts, & Peters, 2014). This could implicate that fostering self-compassion in universities may enable a new approach to help students build critical resources to cope with loneliness experiences in their daily lives. Therefore, this study will examine whether the

weekly mean level of state loneliness is associated with trait self-compassion in university students.

The present study

The goal of this exploratory study is to examine daily state-level experiences of loneliness in university students. More specifically, it is aimed at exploring daily state levels of loneliness in different social contexts, as well as its relation to trait measures of loneliness and self-compassion. To date, little is known about how university students experience loneliness daily relative to their social context. In addition, previous research has indicated trait variables to play an important role in the level of state variables which stresses the importance of exploring trait loneliness in relation to state loneliness (Tennen, Suls, & Affleck, 1991). Lastly, examining the role of trait self-compassion in relation to feelings of state loneliness over time may offer opportunities for students regarding the development of resources within positive psychology interventions.

To investigate experiences of loneliness in students' daily life the following explorative research questions are formulated:

RQ 1: How do university students experience daily loneliness within one week?

RQ 2: How is social context related to daily experiences of loneliness in university students?

RQ 3: How is state loneliness related to trait loneliness in university students?

RQ 4: How is state loneliness related to trait self-compassion in university students?

Methods

Participants and Design

The present study concerns a post-hoc analysis of data collected by Adam (2019) and Wallisch-Prinz (2020) at the department of Positive Psychology and Technology of the University of Twente. In this study, the intensive longitudinal experience sampling method (ESM) was used to repeatedly measure state loneliness and the social context of university students in their daily life over the course of one week. Further, a single questionnaire survey design was employed to obtain the students' demographic data and trait variables loneliness and self-compassion.

To recruit the participants, a convenience sample strategy was conducted by making use of the Test Subject Pool BMS (SONA) System of the University of Twente, social networks, and personal invitations. In SONA, students of the Behavioral, Management, and Social science Faculty (BMS) of the University of Twente could receive 2.5 test subject hours as compensation for their participation. All participants confirmed an informed consent online after they were informed about the study and their right to withdraw at any moment. The BMS ethics committee approved the study. The inclusion criteria for the participants required the participants to be students, above the age of 18, and to have good English proficiency. In addition, they were required to own and be able to use a smartphone with either Apple or Android operating system to meet the compatibility requirements of the *The Incredible Intervention Machine (TIIM)* (the BMS Lab, n.d.) application used in this study.

In total, 59 participants took part in the study. The number of participants in ESM research varies from study to study but is usually much smaller than in typical cross-sectional survey studies. In their systematic literature review, van Berkel, Ferreira, and Kostakos (2017) found a median number of 19 participants taking into consideration a variety of ESM studies. However, previous research specifically on state loneliness and social context used samples whose sizes exceeded 100 participants (van Roekel et al., 2013; van Roekel et al., 2018). Thus, the current study considered a sample size in between (i.e., around 60) to be suitable while considering possible dropouts and missing data.

The study was conducted in November 2019 over the course of eight days. Of these eight days, seven consecutive days were used for the measurement of the state variables loneliness and social context. Due to the possibility that participants' state experiences differ depending on the day of the week, they might feel lonelier on weekdays since they have less choice in with whom they want to spend their time during study and working days compared

to the weekend (van Roekel, 2018). Therefore, one week was considered as suitable to capture every day of the week to ensure meaningful results. Furthermore, it was decided to not extend the study over a longer period to reduce the strain for the students that may result from using their phone to answer questions several times daily even in situations they consider inappropriate for phone usage. Hence, conducting the study only over one week was intended to minimize the burden for the participants and consequently increase motivation and conscientious participation. Day eight was used to retrospectively measure the trait variables of loneliness and self-compassion and the students' demographic characteristics.

Materials

All measurements were in English language and assessed via the TiiM application.

Daily measures

State Loneliness. For assessing the state variable loneliness, the single item “I feel lonely right now” was used. Participants were asked to indicate their level of momentary loneliness on a 7-point Likert-scale, ranging from 1 (strongly disagree) to 7 (strongly agree). This item was taken from previous studies measuring state loneliness in US American and Dutch samples of early and late adults (van Roekel et al., 2013; van Roekel et al., 2018) and has shown to be strongly correlated ($r = .65$, $p < .001$) with the validated UCLA Loneliness Scale (Third Version; Russell, 1996) in a pre-hoc study (Adam, 2019). This suggests this single loneliness item to be a valid measure for state loneliness.

Social Context. For measuring the variable social context participants were asked the question “Which people are you with at the moment?” and to answer by choosing from the categories “Family”, “Partner”, “Friends”, “Fellow students”, “Co-worker”, “other” and “I am alone” as it was done in previous studies (van Roekel et al., 2013; van Roekel, et al., 2018). They were allowed to give multiple responses in case the participants were with different types of companies at the same time. For analysis, these responses were recategorized into “intimate company” (family, partner, friends), “non-intimate company” (fellow students, co-workers, other) and “alone”. In the case that students responded with multiple answers at one measurement point, the intimate category was used for analysis. This means that in the case a participant answered to be around fellow students and friends at the same time, this response was coded as “intimate company”.

Fixed measures

Sample characteristics. On the last day of the study, participants were asked to complete a self-report measure consisting of questions about demographical characteristics containing age, gender, nationality, and student status. Moreover, the test battery included the UCLA Loneliness Scale (Third Version; Russell, 1996), the Self-Compassion Scale Short Form (SCS-SF; Raes, Pommier, Neff, & Van Gucht, 2011), the Perceived Stress Scale (PSS) (Cohen, 1983), and the Multi-Component Gratitude Measure (MCGM) (Morgan et al., 2017) to measure the constructs of interest as trait-like characteristics. The PSS and the MCGM were included for the research of other studies at the faculty Positive Psychology and Technology of the University of Twente. The current study made use only of the UCLA Loneliness Scale and the Self-Compassion Scale Short Form for measuring trait loneliness and trait self-compassion.

Trait loneliness. To measure the trait variable loneliness, the UCLA Loneliness Scale (Version 3) (Russel, 1996) was used. The UCLA Loneliness Scale is a self-report inventory used to measure how often a person feels disconnected from others. To date, this original English version has been validated in a variety of populations including college students (Russel, 1996), and has shown to have excellent reliability for students (Cronbach $\alpha = .92$). The current research confirmed the excellent internal consistency reliability of the measurement scale with $\alpha = .94$. Correlational studies using university student samples have supported high validity of the instrument. For instance, the results of this scale were highly correlated with different measurement instruments of loneliness. It is viewed as the standard questionnaire in this field and represents the most reliable measure for loneliness in university students (Vassar & Crosby, 2008; Russel, 1996). This scale contained 20 items for instance, “How often do you feel that no one really knows you well?” or “How often do you feel that you are lacking companionship?” measuring the construct loneliness on a general basis. Participants were asked to respond to these items on a 4-point scale ranging from 1 (never) to 4 (always) (see Appendix A for the whole UCLA Loneliness scale). The scores range between 20 and 80 with higher scores indicating higher levels of loneliness. Scores were obtained by reversing responses to nine positive worded items and then summing all scale item scores.

Trait self-compassion. The trait variable self-compassion was measured using the Self-Compassion Scale Short Form (SCS-SF) (Raes, Pommier, Neff, & Van Gucht, 2011). The SCS-SF is a shorter version of the original Self-Compassion Scale by Neff (2003) and

was developed by selecting two items of each of the original six SC sub-scales (self-kindness, Self-judgement, common humanity, isolation, mindfulness, and over-identification) that showed the highest correlation with the overall scale. The SCS-SF consists of 12 (instead of 26) items and students were asked to respond to the items on a 5-point Likert scale ranging from 1 (almost never) to 5 (almost always) concerning how they typically act towards themselves in difficult times. Six two-item subscales reflect the concepts self-kindness (items: 2, 6), self-judgement (items: 11, 12), Common humanity (items: 5, 10), isolation (items: 4, 8), mindfulness (items; 3, 7), and over-identification (items; 1, 9). Examples of items are “I try to be understanding and patient towards those aspects of my personality I don’t like” or “When I fail at something that is important to me I tend to feel alone in my failure” (see Appendix B for the whole SCS-SF scale). Scores on the SCS-SF range from 12 to 60. For computing a total self-compassion score, the negative subscale items self-judgment, isolation, and over-identification were reverse scored and computed into a total mean, with a higher mean indicating a higher level of self-compassion. The SCS-SF has shown to have adequate internal consistency ($\alpha = .86$) and correlates very highly with the original long version ($r = .97$) (Raes, Pommier, Neff & Van Gucht, 2011). The current study confirmed the internal consistency of the measurement scale ($\alpha = .82$). Its validity has shown to be good in previous psychometric studies with ethnically diverse participants (Zhang et al., 2019).

The Incredible Intervention Machine

The TIIM application was used to conduct all the measurements. This application, developed by the BMS lab of the University of Twente (The BMS Lab, n.d.), is applicable for iOS and Android operating systems and allows participants to respond to questionnaires on their smartphones after receiving a signal in terms of a push notification. When a new questionnaire is made available to the participant, a push notification is sent to the participant to invite him or her to open the application and respond. It is possible to time each push notification and to determine the time frame of its accessibility for the participant. After a response is confirmed and sent, the participant is asked to wait for the next test battery to become available.

Procedure

The study took place over the course of eight days, of which the first seven days were used to measure the state variable loneliness and the momentary social context. Signal contingent sampling (Conner & Lehmann, 2012) was used to collect the data on momentary

levels of loneliness and the momentary social context at time points that could not be predicted by the students. This way the students were not able to adapt their daily routine according to the measurement points of the study which was intended to increase the validity of the study. For each day three time-frames were set in which the participants received a signal to respond to the items at a random time point. The time frames were scheduled in the morning between 8 and 10 a.m., in the afternoon between 12 and 2 p.m., and in the evening between 7 and 9 p.m. With regards to sampling frequency and period, most previously conducted ESM studies measured 10 times a day for over a time frame of six consecutive days (Verhagen, Hasmi, Drukker, van Os, & Delespaul, 2016). However, measuring three times a day was considered appropriate for two reasons. First, measuring at only three time-points a day was meant to lower the burden for the participants. Second, it was important to assess the students' experiences at time points that represent the different parts of the day. This in turn allowed for the collection of data in different social contexts, since many students are living in shared apartments, might be at their classes, or meeting their friends. In case the participants did not respond immediately, a reminder was sent after 30 minutes before the time frame ended. If the participant did not respond until the time window ended, the questions were no longer accessible for the participant and this time point was counted as missing data for this participant.

Before the data collection started, the participants accessed the study either via SONA or an URL link that was provided to them. As a next step, the participants downloaded and installed the mobile phone application TIIM. Further instructions and all the questionnaires were made available to them within TIIM in English language. Then, the students were provided with the procedure and asked to provide their informed consent. Afterward, the participants responded to the questions regarding their current experiences at each measurement point. The daily single items were randomly ordered. On the last day (day eight), the test battery composed of the trait questionnaires and demographic questions was made available to the participants at eight o'clock in the morning. Finally, at the end of the study, the students were thanked for their participation and welcomed to contact the researchers for further questions about the study and its results.

Data Analysis

To analyze the data, IBM SPSS Statistics 24 was used. Before the analyses were conducted to answer the research questions, sum scores of the trait loneliness and self-compassion scales were computed separately for each participant and subsequently merged

with the ESM data of state loneliness and social context. As a next step, mean scores for the trait loneliness and self-compassion scales were calculated respectively, for each participant. Then descriptive statistics were analyzed based on the demographic data including age, gender, and nationality. Additionally, the distribution, mean scores, and Cronbach's alpha of trait loneliness and trait self-compassion were calculated.

A series of repeated-measures Linear Mixed Modeling (LMM) analyses with autoregressive covariance (AR1) structure were conducted to obtain Estimated Marginal means (EM means) for the repeated measures of state loneliness per 'person', 'measurement point', and 'time of the day'. Hence, state loneliness was entered as the dependent variable whereas the fixed independent factor was set to be either participants, measurement point, or the recoded dummy variable time of the day with the categories 'morning', 'afternoon', and 'evening'. In addition, post-hoc tests with Least Significant Difference correction were conducted to compare the state loneliness means between the different times of the day.

To explore the role of social context in relation to state loneliness, multiple repeated-measures LMM analyses were conducted to obtain means of state loneliness for several types of companies in order to examine differences between these means. First, it was examined whether state loneliness differed between situations in which students were alone compared with situations in which they were with company in general. Therefore, a dummy variable with the categories 'alone' and 'company' was created and added as a fixed factor to the Linear Mixed Model. In the following Linear Mixed model, it was tested whether state loneliness differed between situations in different types of social context. This was tested in the same way as the previous procedure now by entering a dummy variable with the categories 'intimate company', 'non-intimate company', and 'alone' to the model. Subsequently, a post hoc test using the Least Significant Difference (LSD) correction was conducted to compare the means of state loneliness between the three categories. This way, it was possible to obtain means and standard deviations of loneliness for all categories and their mean difference.

Next, it was tested whether state loneliness when being alone or in different types of company was influenced by the type of social context in the previous measurement (Table1) in terms of a time-lagged effect. Thereby, each measurement that followed another measurement during the same day was taken into consideration and recoded into a variable representing either situation A, B, C, or D (See Table1). Thus, the measurement from evening to morning was not used in the analysis. Hence, four Linear Mixed model analyses were conducted in which for each model state loneliness at the current assessment T was the

dependent variable, predicted by each of the four dichotomous dummy variables expressing either Situation A versus B or C versus D. Since these effects were investigated during days and the time of the day may influence the results, all analyses were controlled for ‘time of the day’ by including it as a fixed covariate. Lastly, state loneliness means at the current assessment T between Situation A and B, and between Situation C and D were compared.

Table 1

Carry-over effects of Social Context on State Loneliness

Model	Situation A		Situation B	
	T-1	T	T-1	T
1.	Alone	Alone	Intimate company	Alone
2.	Alone	Alone	Non-intimate company	Alone
	Situation C		Situation D	
	T-1	T	T-1	T
3.	Alone	Intimate company	Intimate company	Intimate company
4.	Alone	Non-intimate company	Non-intimate company	Non-intimate company

Note. Four categorical variables were created in which Situation A=0, Situation B=1, and Situation C=0, Situation D=1.

Finally, Pearson correlations were calculated between EM means of state loneliness per “person” and the dichotomous variable ‘any company’ (company vs. alone), trait loneliness, and trait self-compassion to investigate the relation between the state variables and trait measures. For the Pearson correlations, the effect sizes were interpreted at .10 (small effect), .30 (medium effect), and .50 (large effect) Cohen, (1988). The statistical significance was set at $p < .05$ and $p < .001$.

Microsoft Excel was used to create visual representations of the EM means of state loneliness over persons and over time. Line charts were created to depict EM means of state loneliness over time and bar charts to depict the state loneliness means over participants. In addition, further graphs were created to illustrate the state loneliness scores over time and social context for a selection of participants. These graphs were used for a visual analysis of differences in state loneliness over time and social context within and between participants.

Results

Of the 59 students that signed up for the study, 19 students could not take part in the study due to compatibility problems of the TiiM application with the iOS operating system. In addition, five participants were excluded from the study because they did not complete the trait questionnaires. In total 35 participants from age 18 to 40 ($M = 21.2$, $SD = 4.51$) were included in the current study. The sample included 4 men, 29 women, 1 transgender woman, and 1 gender-variant participant with 17 participants being of German, 14 of Dutch, one of Indonesian, one of Indian, one of Vietnamese, and one of Bulgarian nationality. From the first to the seventh day, participants were asked to respond to the state measurements of loneliness and their social context at a total of 21 time-points. In total, participants responded to 21 (100%) out of the 21 measurements. Table 2 provides an overview of the general demographic characteristics of the 35 students.

Table 2

Means (M) and Standard Deviations (SD), Frequencies (n) and Percentages (%)

Variables	Category	All Students (N= 35)
Age, M (SD)	Years	21.20 (4.51)
Gender, n (%)	Male	4 (11.4)
	Female	29 (82.9)
	Transgender Woman	1 (2.9)
	Gender Variant	1 (2.9)
Nationality, n (%)	German	17 (48.6)
	Dutch	14 (40.0)
	Indonesian	1 (2.9)
	Indian	1 (2.9)
	Vietnamese	1 (2.9)
	Bulgarian	1 (2.9)
UCLA Loneliness Scale, M (SD)		45.37 (11.00)
Self-Compassion Scale-SF, M (SD)		30.40 (5.72)

Generally, the students did not score high on the trait variable loneliness. The mean score $M = 45.37$ (11.00) indicated a medium to a low score in the possible range between 20 and 80. With regards to the variable trait self-compassion, the mean score $M = 30.40$ (5.72) showed that in general participants scored medium to low when considering the possible range 12 to 60. In total, participants spent most of their time alone (41.8%) and with intimate others (41.8%), and less often with non-intimate others (16.5%) over all 21 assessments.

Moreover, participants experienced variability in state loneliness during the week indicating participants to differ in experiencing state loneliness (Figure 1). A substantial variation of state loneliness both within- and between persons can be observed. In general, the

group seemed to experience a rather low level of state loneliness ($M = 2.62$) in the possible range from 1 to 7. Thus, there is an initial indication for state loneliness to be experienced differently within and between participants as well as state loneliness to be a rather dynamic variable.

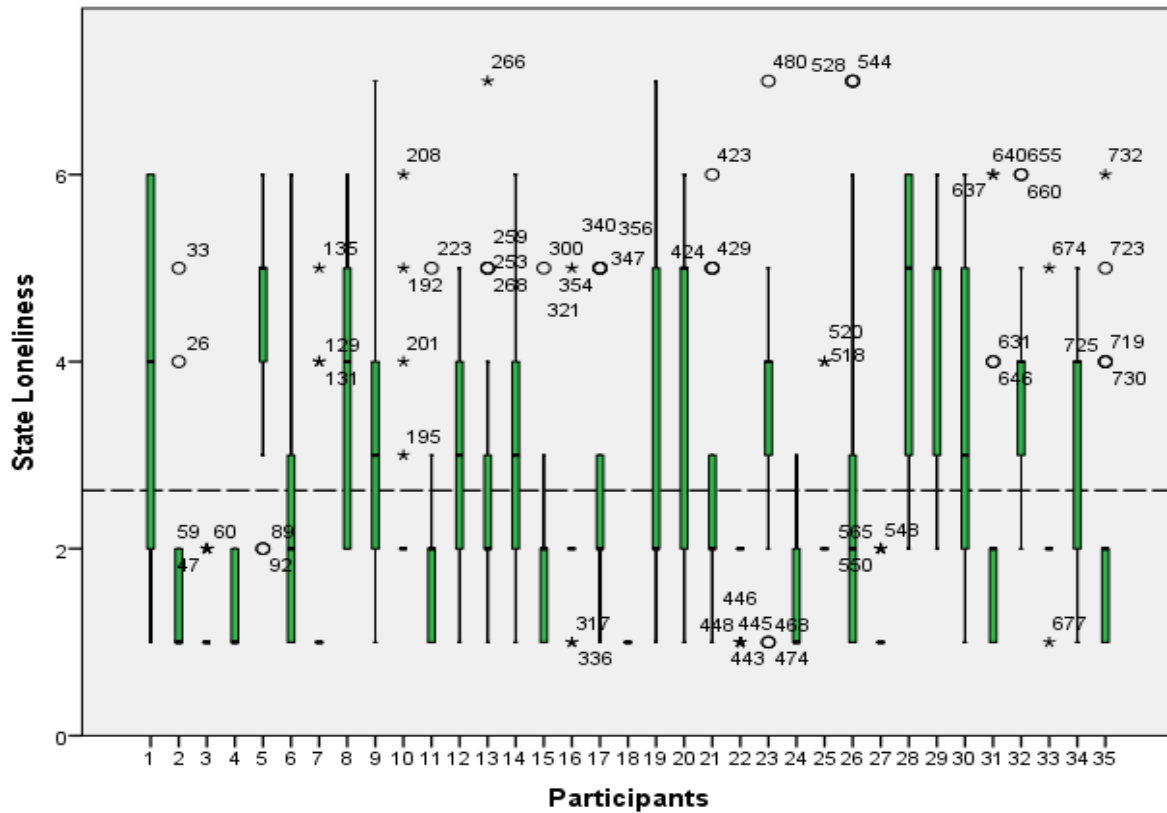


Figure 1. Variation of state loneliness for each participant with a reference line indicating the group mean ($M = 2.62$).

A Linear Mixed Modelling analysis was conducted to obtain Estimated Marginal means (EM means) for all measurement points per person for the state measurements of loneliness. The factor ‘participant’ was found to have a significant fixed effect ($F = 11.36, p < .001$), indicating that state loneliness differs significantly between participants. Figure 2 illustrates the computed means for state loneliness per participant over all time points. Large differences between participants were observed. Participant 18 had the lowest mean state loneliness with a score of 1.00, while Participant 5 had the highest mean state loneliness with a score of 4.58.

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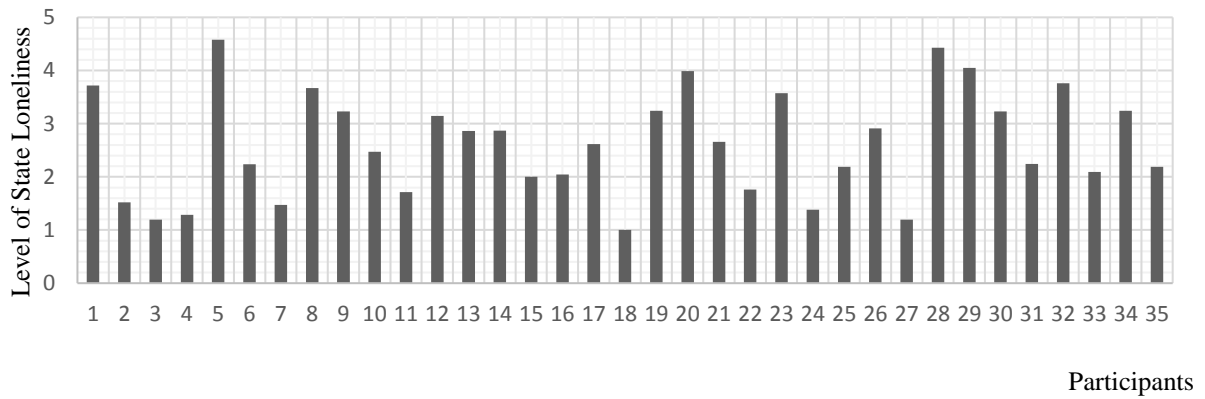


Figure 2. Mean state loneliness per participant.

A second Linear Mixed Modeling analysis was conducted to obtain EM mean scores of all participants per measurement point for state loneliness. The fixed effect of the factor ‘measurement point’ was not found to be significant, indicating that mean state loneliness did not differ significantly between the different measurement points. Figure 3 illustrates the computed means for loneliness per measurement point and thus, the development of loneliness in the total sample over the course of one week. It starts with time point 1 being the first measurement in the morning and ends with 21 being the last measurement in the evening at the end of the week. State loneliness had its peaks in the evening in the middle of the week (point 9, $M = 3.00$, $SD = 1.80$) and in the morning of the last day of the study (point 19, $M = 3.00$, $SD = 1.70$). The lowest level of state loneliness was measured in the afternoon (point 8, $M = 2.00$, $SD = .97$) right before the highest measurement point 9. State loneliness showed high variability in the middle of the week with and a gradual upward trend towards the end of the week. However, the factor measurement points did not show to be significant and the observed mean state loneliness did not differ significantly between the different measurement points.

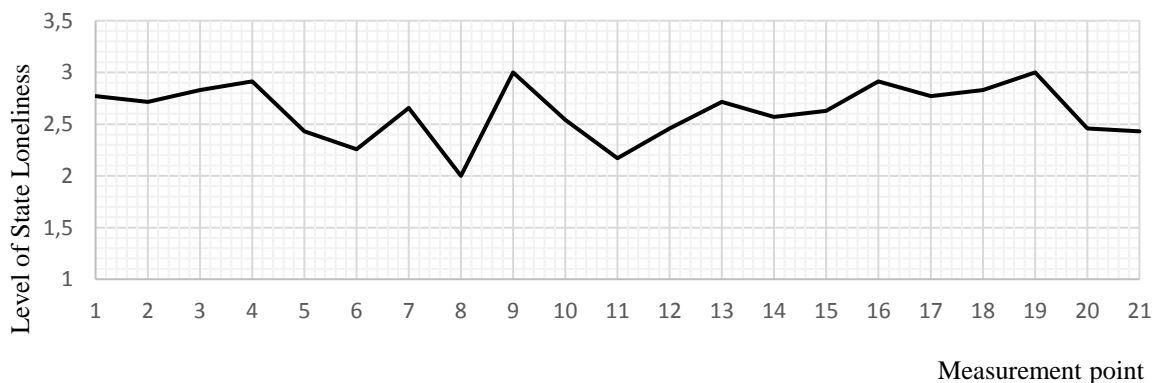


Figure 3. Mean state loneliness per measurement point over time.

Next, a Linear Mixed Modeling analysis was conducted with state loneliness as the dependent and ‘time of the day’ as the independent fixed factor to obtain the EM means of the scores for all participants at each time of the day for state loneliness. The factor ‘time of the day’ was found to have a significant fixed effect ($B = 2.63$, $SE = .10$; $F = 5.24$, $p < .001$.) Thus, an overall significant difference in means of state loneliness for the time of the day is indicated. Further, post hoc tests using the Least Significant Difference (LSD) correction revealed a significant reduction in mean of state loneliness ($p < .001$) from morning ($M = 2.79$, $SD = 1.56$) to afternoon ($M = 2.44$, $SD = 1.41$). This indicates that over the week state loneliness was significantly higher in the morning than in the afternoon. Further, state loneliness seemed to differ slightly between morning and evening ($M = 2.79$, $SD = 1.56$ vs. $M = 2.63$, $SD = 1.56$) and between afternoon and evening ($M = 2.44$, $SD = 1.41$ vs. $M = 2.63$, $SD = 1.56$), which was, however, not statistically significant.

Social Context

Firstly, it was examined whether state loneliness differed between situations in which students were alone compared with situations in which they were with any company. Therefore a Linear Mixed Modeling analysis with ‘company’ as a fixed factor was conducted to obtain the EM means for the conditions alone and company. The results revealed a significant fixed effect of the factor ‘company’ on state loneliness ($B = .669$, $SE = .10$; $F = 41.23$, $p < .001$). This indicated that state loneliness was significantly higher when being alone than when being in any company ($M_{alone} = 3.01$, $SD = 1.58$ vs. $M_{company} = 2.34$, $SD = 1.49$).

Moreover, a second Linear Mixed Modeling analysis was conducted with state loneliness as a dependent and ‘social context’ as a fixed factor to investigate differences in EM means between situations in which students were alone, in intimate company, and in non-intimate company. Again, a significant fixed effect of the factor ‘social context’ was found ($F = 23.00$, $p < .001$). This indicates that overall mean state loneliness differed statistically significantly between the social contexts. Furthermore, post hoc tests using LSD correction indicated significant differences in the mean states of loneliness between all three social contexts (see Figure 4). State loneliness was the highest when being alone ($M = 3.01$, $SD = 1.58$), followed by non-intimate company ($M = 2.57$, $SD = 1.53$), and lowest when being in intimate company ($M = 2.25$, $SD = 1.46$) (see Figure 4 for the mean differences between contexts).

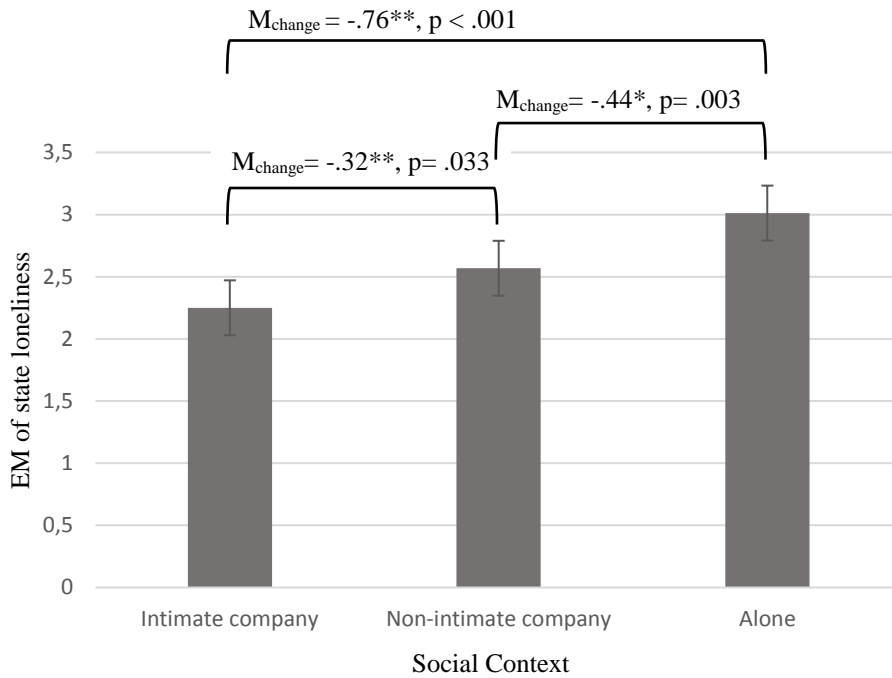


Figure 4. Estimated marginal means of state loneliness per type of company. Error bars are given for each mean, representing the 95% confidence interval. Mean changes of state loneliness between social contexts with the corresponding p-values are given above brackets. * $p < .05$, ** $p < .001$.

Carry Over Effects of Social Context on State Loneliness

Moreover, it was tested whether the effects of being alone or with non-intimate or intimate company were dependent on the social context at the previous measurement in terms of a carry-over effect (see Table 1). To begin with, the first two models were examined in which Situation A (two following measurements of being alone) was compared with Situation B (no prior solitude). Therefore, two Linear Mixed Modeling analyses were conducted with either Model 1 or Model 2 as independent variable and state loneliness at T as dependent variable. A significant effect for the factor ‘Model 2’ ($B = .576$, $F = 4.37$, $p = .038$) but not for ‘Model 1’ was found. For the situations in which students were currently alone (Model 2 in Table 1) higher levels of loneliness in Situation B compared to Situation A were found (see Table 4). This finding indicated that being in non-intimate company at T-1 had a facilitating effect on loneliness at T since students felt even more lonely in situations when they were alone at T after prior non-intimate company than when they were alone at both times (see Table 4). In addition, no significant differences were found in levels of loneliness between Situation A and B for Model 1 (see Table 3). This indicated that being alone at the current

assessment T had the strongest effect on loneliness, largely independent of whether students were alone or in intimate company at the previous assessment.

Table 3

Model Results of Carry-Over Effects of Social Context on State Loneliness

Model	Situation A (alone-alone)	Situation B (company-alone)	Mean change (A-B)	p
All Company	2.93(1.50)	3.12(1.71)	-.191	.323
1. Intimate	2.93(1.56)	3.03(1.56)	-.088	.616
2. Non-intimate	2.93(1.56)	3.51(1.65)	-.576*	.038*
	Situation C (alone-company)	Situation D (company-company)	Mean Change (C-D)	
All company	2.36(1.51)	2.35(1.50)	.028	.859
3. Intimate	2.20(1.34)	2.27(1.51)	-.090	.588
4. Non-intimate	2.94(1.66)	2.51(1.34)	.494	.148

Note. State loneliness means are given for each Model per Situation. Standard deviations are given in parentheses. * $p < .05$

N=35

Furthermore, it was investigated whether levels of loneliness differed between Situations C (prior solitude) and D (no solitude). Hence, two further Linear Mixed Modeling analyses were conducted with either Model 3 or Model 4 as independent variable and state loneliness at T as the dependent variable. No significant effects for both fixed factors ‘Model 3’ and ‘Model 4’ were found and thus, also no differences were found in mean levels of state loneliness between Situation C and D for both Models (see Table 3). This indicated that regardless of the situation students were in at T-1 (non-intimate company, intimate company, or alone), their state loneliness levels did not differ significantly at T when they were in non-intimate or intimate company. Thus, it can be concluded that being in any company at the current assessment (T) appeared to have the strongest effect on state loneliness independent of social context students were in at the previous measurement.

Correlations between State Loneliness and Trait Variables

Table 4

Pearson Correlations between the EM Means per Person and Trait Variables

Variables	1	2	3
1. State Loneliness			
2. Company	-.10**		
3. Trait Loneliness	.66**	-.14**	
4. Trait Self-Compassion	-.51**	.02	-.60**

Note. * $p < .05$, ** $p < .001$

N=35

Several bivariate Pearson correlation analyses were conducted (see Table 4). The EM means per person of state loneliness showed to be significantly and strongly positively related with trait loneliness ($r = .66, p < .01$). Figure 5 illustrates this relationship as it can be observed that higher mean scores on state loneliness are accompanied by higher scores on trait loneliness for each participant. This indicates that participants that scored higher on the daily measures of state loneliness also scored higher on trait loneliness and vice versa.

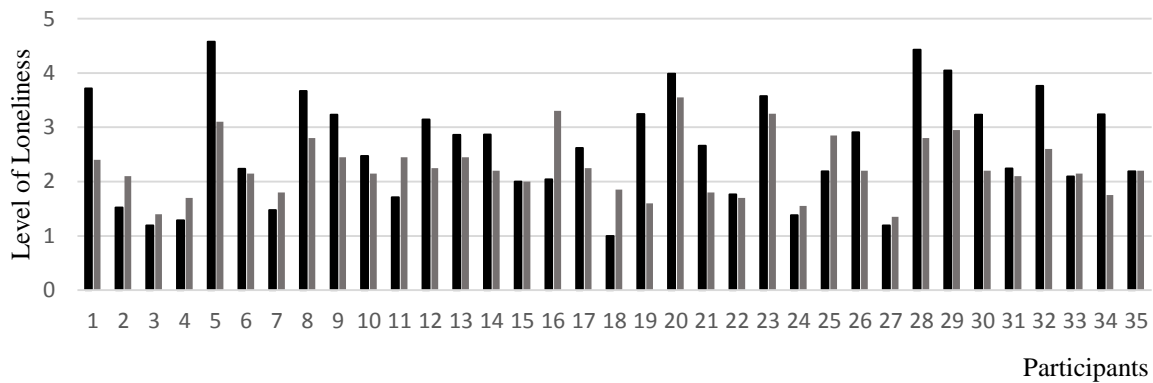


Figure 5. Mean state loneliness (in black) and mean trait loneliness (in grey) per participant.

Furthermore, the EM means per person of state loneliness also correlated strongly with the scores of trait self-compassion ($r = -.51, p < .01$). This indicates that participants who scored high on trait self-compassion, scored lower on daily measures of state loneliness than low trait self-compassion people who scored higher on daily measures of state loneliness (see Figure 6). Lastly, a significant, strong, and negative correlation was found between trait loneliness and trait self-compassion ($r = -.60, p < .01$). Thus, participants that scored higher on trait loneliness, showed to score lower on trait self-compassion and vice versa.

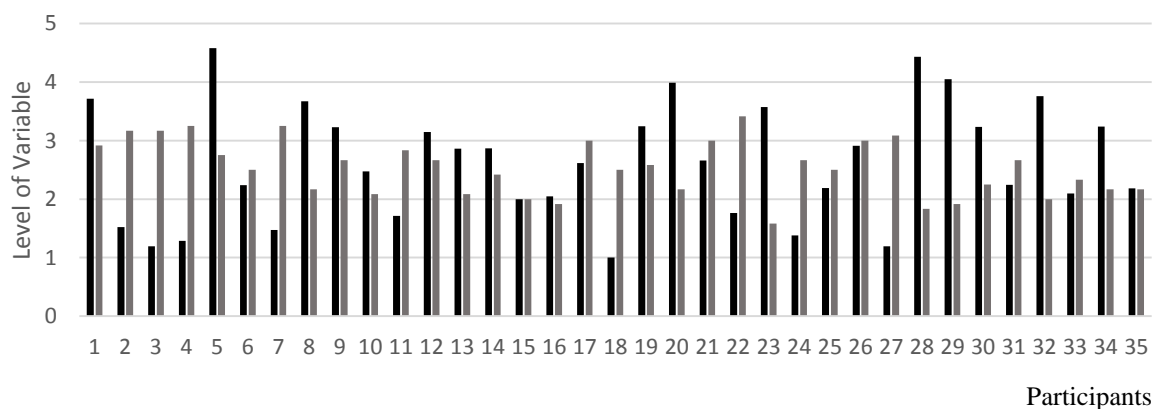


Figure 6. Mean state loneliness (in black) and mean trait self-compassion (in grey) per participant.

Visual analyses of individual cases

To gain a more detailed picture of students' state loneliness experiences over time, three participants were selected for further analysis on the individual level. The first of these, participant 5, had the highest average state loneliness score and a higher trait loneliness score (see Figure 5). It can be observed that this participant's curve is similar to the curve of the sample mean in terms of more variability and strong amplitude in the beginning and middle of the week and less variability at the end of the week. In contrast, while the curve of the sample mean runs below a mean level of 3, this participant's curve mostly runs above the average until a maximum state loneliness level of 6 with stronger amplitudes. In addition, it can be observed that this participant did not have any contact with intimate company during the assessments. In fact, he spent a lot of assessments alone (x-axis Figure 7.).

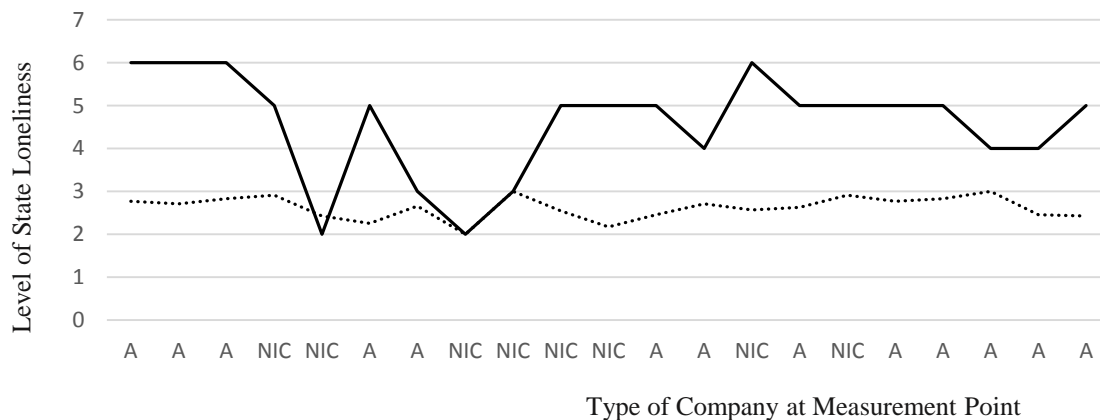


Figure 7. Mean state loneliness of participant 5 per type of company at measurement point over time (black) and sample mean of state loneliness over time (dotted line). Alone (A); Non-intimate company (NIC); Intimate Company (IC).

Participant 26 had average scores of state loneliness, trait loneliness, and self-compassion. However, she only indicated either very high scores or very low scores of state loneliness and no medium levels of state loneliness. This participant had not been in non-intimate company during the assessments. What is striking about the behavior of state loneliness over time is, that it is characterized by high amplitudes ranging from 1 to 7 with strong fluctuations. This participant experienced no or very little loneliness in one moment and the strongest loneliness in the following moment. Interestingly, state loneliness was only absent in times she was alone (see Figure 8.). Thus, this participant diverges from the general observation of experiencing less loneliness when in company than when being alone.

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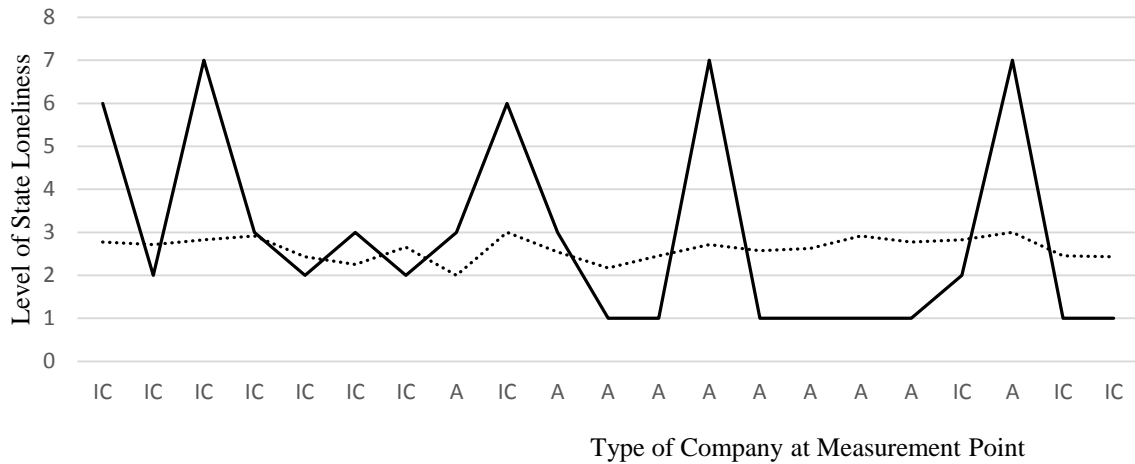


Figure 8. Mean state loneliness of participant 26 per type of company at measurement point over time (black) and sample mean of state loneliness over time (dotted line). Alone (A); Non-intimate company (NI); Intimate Company (IC).

Participant 22 scored quite high on self-compassion and low on state and trait loneliness which is line with the results of the correlational analyses. Figure 9 shows that her state loneliness varied only between no state loneliness (1) and a bit state loneliness (2). This participant experienced no loneliness when she was in intimate company. When she was in non-intimate company or alone she always experienced a score of 2 during the week of the study. Furthermore, this participant did not show to have any fluctuation in state loneliness over the course of ten consecutive assessments and did not score higher than the sample mean at any measurement point.

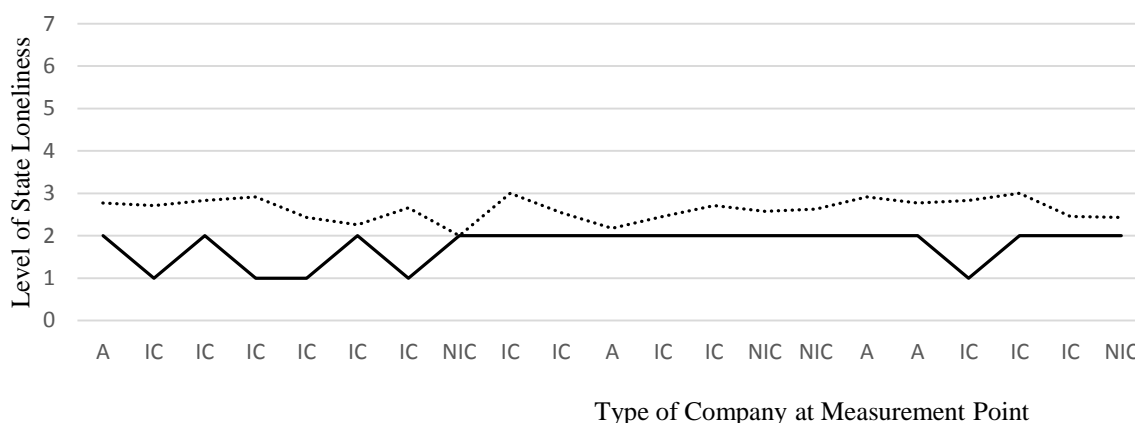


Figure 9. Mean state loneliness of participant 22 per type of company at measurement point over time (black) and sample mean of state loneliness over time (dotted line). Alone (A); Non-intimate company (NI); Intimate Company (IC).

Discussion

The overall purpose of the study was to explore in the moment experiences of state loneliness in the everyday life of students by making use of the experience sampling method. For this, the daily state levels of loneliness were explored in the light of different social contexts, as well as in relation to trait measures of loneliness and self-compassion. The results of this study indicated that state loneliness varied strongly within and between participants. Moreover, state loneliness fluctuated from one moment to another dependent on the social context and was the highest when students were alone, followed by being in non-intimate company, and lowest when being in intimate company. The social context at the current assessment had the strongest effect on state loneliness independent of the social context that students were in at the previous assessment, with the exception that students felt even more lonely in situations when they were alone after prior non-intimate company than when they were alone at both times. As expected, a higher mean level of state loneliness was strongly related with a higher level of trait loneliness which means that students who experience a higher level of mean state loneliness also experience a higher level of trait loneliness. Lastly, a lower level of state loneliness over time was also strongly related to a higher level of trait self-compassion which means that people who are more self-compassionate in general experience a lower level of mean state loneliness over time.

State Loneliness in daily Life

The results indicate a difference in the means of the state loneliness levels experienced across all measurement points between participants. This underlines that the mean state loneliness levels differ from person to person. Further, the graphical observations (Figure 1) and the individual analyses indicate that besides the difference in mean levels of state loneliness between persons, state loneliness behaves differently in terms of variation and behavior over time within each person. Even though some participants experience state loneliness with fewer fluctuations from time point to time point, for most participants strong variations with bigger amplitudes in state loneliness were observed. This is in line with research underlining variability and change over time to be an essential characteristic of all emotions and affect (Kuppens, Oravecz, & Tuerlinckx, 2010).

On the other hand, when analyzing the average of all participants' levels of state loneliness at each time point, no differences were found between the 21 measurement points. This result is expected since the differences in state loneliness between people at each measurement point are averaged out over people at the group level. Therefore, the observed

variation and change over time for each participant, which is shown in Figure 1 and the individual representations, are averaged out when taking the mean of all participants at each time point into consideration. Thus, this finding indicates no overall pattern of fluctuation and variation in state loneliness over time for the whole sample and stresses state loneliness with its variation and behavior over time to be an individual experience that differs from person to person.

However, a small group difference between state loneliness in the morning and in the afternoon was indicated. Previous ESM research on state loneliness over the day has indicated that higher loneliness levels in the morning may be related to increased cortisol levels after waking up (Doane & Adam, 2010). Future studies should further examine the relationship between time of the day and state loneliness to shed light on possible reasons for differences between these times. Moreover, the significant finding of time of the day underlines the need for future studies to control for the variable time of the day when assessing levels of loneliness or associations with other variables.

Social Context

Furthermore, the study aimed to explore how the social context is related to the daily experiences of loneliness for university students. Considering situations when students were alone compared to situations in which they were with any type of company, students were lonelier when they were alone compared to when they were with any type of company. This finding is in line with both the Social Baseline Theory (Beckes & Coan, 2011) and previous research on loneliness (Cacioppo & Hawkley, 2009) indicating that when being disconnected from others, loneliness evolves as an emotional signal to take action to renew or built the social connections that are necessary for survival.

Moreover, this association gives evidence that not only adolescents experience more loneliness when being alone as previous research has indicated (van Roekel et al., 2014), but also university students feel most lonely in solitude. In fact, in the current sample, the average state loneliness level for both contexts was even higher than in the previous study that focused on adolescents in a school context. Although, the previous study measured state loneliness with four items instead of one, both groups spent a comparable proportion of time alone and in social company. The higher score in university students may be explained by the specific context university students find themselves in. Most of the participants were first- and second-year students with different origins, who probably moved away from their home. Therefore, they may have just made new friends and have spent less time with their families compared to adolescents that see their families more often and have long-lasting friendships. The perceived

relationship quality of new friends and fellow students may, therefore, be even lower for university students than for adolescents within the school context. Thus, the results underline the important role of the university context for this research domain and raise the need for future studies to focus on university students.

More specifically, students felt most lonely when they were alone and more lonely when they were in non-intimate company compared to when they were in intimate company. Following this finding, Social Baseline Theory (Beckes & Coan, 2011) explains that whereas intimate contact might grant individuals with the benefits of risk and resource sharing due to trust and interdependence, non-intimate company does not necessarily allow these benefits but may even pose the risk of rejection from a social group. Therefore, non-intimate company including co-workers or fellow students is company that the participants may not voluntarily choose to spend their time with and thus, may see it as lower quality compared to the relation with intimate company such as friends and family. Hence, students seem to feel lonelier when they are in company that they do not necessarily have good relations with. Non-intimate company may not bring the same support and benefits as intimate company and may even represent a threat to the student due to social rejection. Research on social isolation and bullying has shown that students that are being isolated and bullied are not seen as being close or friends (Kochel, Ladd, Bagwell, & Yabko, 2015) and that the fear of rejection or actual rejection experiences of university students through fellow students are associated with loneliness (Jackson, Fritch, Nagasaka, & Gunderson, 2002). These findings underline the importance of intimate company in reducing feelings of loneliness in students.

Regarding the carry-over effects of social contexts on state loneliness, differences in loneliness when being alone at two following assessments (Situation A) compared to being first with non-intimate company and then alone at T (Situation B, see Table 1) were found. This finding is indicative of an exacerbating effect in state loneliness of non-intimate company on being alone afterward, since students felt more lonely when they were alone after being in non-intimate company (Situation B) compared to situations in which they were alone at both points (Situation A). Likewise, this result could be indicative of a contrast effect (Marco & Suls, 1993) since being alone after being in non-intimate company causes higher levels of loneliness than aloneness in Situation A (alone-alone) because of the contrast to the previous lighter loneliness experience in non-intimate company. Further research is needed to examine which specific effects can explain this result and whether it can be explained in terms of a carry-over or contrast effect.

On the contrary, a similar effect was not found when comparing two consecutive assessments of aloneness to situations in which students were alone after intimate company. This indicates that being alone at the current assessment T has the strongest effect on loneliness, independent whether students were alone or in intimate company at the previous assessment. This may be explained by the state loneliness experience being too low to have an exacerbating effect when being with intimate company. Future research is needed to further examine this assumption.

Furthermore, no differences were found in levels of loneliness between Situations C (prior solitude) and D (no solitude). This indicated that regardless of the situation students were in at T-1 (non-intimate company, intimate company, or alone), their state loneliness levels did not differ significantly at T when they were in non-intimate or intimate company. This result contradicts previous research showing an increase of loneliness for adolescents when being with family members after being alone in terms of a carry-over effect. This difference may imply that the family cannot compensate for the negative after-experience of being alone for adolescents as intimate-company can for university students. Research supports this finding by indicating an association between the increasing age of teens and more favorable affect reported in interactions with family members (Larson et al., 1996). Thus, it can be concluded that for university students being in any company at the current assessment (T) has the strongest effect on state loneliness independent of social context students were in at the previous measurement.

Associations with Trait Variables

The results finally demonstrated a strong and positive relationship between state loneliness and trait loneliness which indicates that students who have a higher level of trait loneliness, also experience higher levels of state loneliness in their daily life. The individual observation of Participant 5 (see Figure 7) who had the highest score of state loneliness and a very high score of trait loneliness, underscores this result since he did not have any intimate contact within the week and spent a lot of time alone. Also, previous research supports this finding by indicating that trait loneliness is positively associated with social isolation (Akin, 2015). This gives rise to the assumption that students who score higher on trait loneliness also score higher on state loneliness because they spend more time alone in general. Van Roekel et al. (2018) further indicates that individuals who are more lonely in general make use of their time alone in a less constructive way, as they tend to ruminate more while they are alone and have therefore higher levels of state loneliness. Further research should examine in more detail whether trait levels of loneliness significantly influence associations between state

loneliness and social context and examine the role of social isolation in the relationship between trait and state loneliness by considering how students spent their time alone and whether these activities influence their level of state loneliness.

Regarding the relation between trait self-compassion and state loneliness, the results showed a strong negative association between trait self-compassion and state loneliness. This means that students who have a higher level of trait self-compassion, experience lower levels of state loneliness in their daily life and vice versa. This relationship has not been investigated so far and this study is the first one to demonstrate this present association of self-compassion with state loneliness. This strong association strengthens the assumption of self-compassion not only to be a protective factor of trait loneliness as previous research indicated (Akin, 2010; Lyon, 2015) but also for the level of state loneliness experiences in daily life within one week. Both, trait loneliness (Akin, 2010; Lyon, 2015) and the mean level of state loneliness have shown a similar strong association with self-compassion. Research has indicated self-compassion to facilitate social connection (Neff, 2003), perceived social safeness (Akin & Akin, 2015), and reduced feelings of separation (Akin, 2010). In addition, research by Neff (2003) has indicated that self-compassion may reduce feelings of loneliness as it facilitates a stronger view of common humanity and shared experience. Self-compassion prevents cognitive distortions of focusing only on one's shortcomings that cause feelings of isolation and is argued to enhance more positive social perceptions (Neff, 2003). Thus, this finding is in line with argumentations for a relationship between state loneliness and self-compassion and it will be helpful for future studies trying to fill the gap in the literature in terms of a comprehensive theory integrating state loneliness and its within-person relations with self-compassion.

Strengths and Limitations

This study provided several strengths. First, the study can be assumed to have higher ecological validity due to the experience sampling method that allows measuring feelings of state loneliness and the related social context directly in the lives of the participants. Second, this study showed to have a very high response rate with no missing data to all the state and trait measures. Thirdly, the research showed to be quite reliable due to the high internal consistency for both measures of the trait variables. Lastly, the strong correlation between the state loneliness item and the trait loneliness measure (UCLA) indicates the single item to be a valid measure of state loneliness. A perfect correlation would imply the state assessment to be superfluous since measuring loneliness as a trait at one time point would then be the preferred method. No significant correlation or a weak significant correlation would implicate the state

measure to measure something different than the trait measure. Thus, this strong correlation between the state and trait measures of loneliness was expected, indicating convergent validity and both measures to assess a common construct and a person's level of loneliness.

However, some limitations should also be taken into consideration when interpreting the results of the study. Due to technical problems with the TiiM application, daily questions did not disappear after two hours. Hence, the morning questions, for example, could have been answered later in the day. This way respondents either remembered how they felt earlier or they just indicated how they felt in the moment. Thus, the ecological validity of the study might have been reduced by this technical issue.

Moreover, the study took place only over the course of one week. This way all weekdays were covered but other state affect- and context-variables might have influenced state loneliness. Besides, one week is not very long for an ESM study and may not be representative since participants might have felt especially strongly or mildly lonely in this particular week. Thus, future research is recommended to expand the time frame for the experience sampling to obtain more representative results.

Furthermore, the assessment of the actual weekdays could have provided valuable information for this explorative study in daily life. Previous research, for instance, has shown that adolescents feel lonelier during the week than on the weekend (van Roekel et al., 2015). The disregard of the actual weekdays in the data assessment prevented the researcher from drawing conclusions about the behavior and development of state loneliness within specific days or over the course of the week. Therefore, future studies are recommended to take the actual weekdays into account during the experience sampling to gain a more in-depth picture of state loneliness in daily life for university students.

Next, the different types of companies that students specified to be with at the moment, were categorized into intimate and non-intimate company. This way it is assumed that students tend to feel closer to family, friends, and their partner. However, this is not necessarily the case for all participants since some may not feel close to, for instance, their family members or friends. Maybe the students in this study did not feel very close to their friends just yet since most of them had just started their studies and were studying in their first year of University. Hence, future studies should take perceived intimacy into account by asking for it directly instead of assuming it.

Furthermore, it was not considered whether students chose to be alone which may have influenced the results. Students may feel less lonely when they are alone because they want to, compared to situations in which they did not choose to be alone. Future researchers

could add measures on whether students chose to be alone or not to gain more information about the effect of solitude and loneliness for students.

Lastly, the sample size of this study was problematic for a few analyses in this study when subgroups were compared. For the carry-over effects, the data was split into four more variables with two different categories which left some categories with a low number of responses. A bigger sample size is recommended for future studies to assure a good representation of the population and to increase their statistical power.

Implications and Conclusion

The present study aimed at exploring state loneliness in daily life while considering its relation to different social contexts, trait loneliness, and trait self-compassion. The results contribute to the growing amount of research underlining the importance of applying experience sampling methodology to measure variation in affect over time in addition to conventional methods of measuring trait variables. The mean level of state loneliness in the current sample was much higher than in studies focusing on adolescents (van Roekel et al., 2014; van Roekel et al., 2018) which underlines the importance for future research to especially attend to university students by observing trends regarding state loneliness and developing targeting interventions to decrease this unpleasant experience. This could be done by creating just in time smartphone interventions (Nahum-Shani et al., 2018), which are adapted to the individual needs at specific time points with integrated aspects of self-compassion.

In conclusion, the results of this study contributed to the assumption of variability and change over time to be an essential characteristic of affect by gathering important insights into the perspective of state loneliness to be fluctuating in daily life relative to the social context students find themselves in. Students scoring high on trait loneliness experience higher levels of state loneliness over the week while trait self-compassion reveals to be a protective factor for state loneliness. Researching loneliness solely as a stable trait appears to be insufficient since variability in loneliness seems to be the reason why it is experienced in the first place due to its signaling function (Kuppens, Oravecz, & Tuerlinckx, 2010). Particularly, these findings suggest the need for future research to acknowledge the importance of the experience sampling method by implementing it into research on state loneliness relative to the social context and affect in general. Lastly, given the high prevalence of loneliness in university students, researchers need to be at the forefront of understanding state loneliness, building comprehensive theory, and conducting research that could eventually help students deal with

these experiences. This study provides ideas for future directions and calls for further research to tie in.

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Appendices

Appendix A: UCLA Loneliness Scale

1. How often do you feel that you are “in tune” with the people around you?
2. How often do you feel that you lack companionship?
3. How often do you feel that there is no one you can turn to?
4. How often do you feel alone?
5. How often do you feel part of a group of friends?
6. How often do you feel that you have a lot in common with the people around you?
7. How often do you feel that you are no longer close to anyone?
8. How often do you feel that your interests and ideas are not shared by those around you?
9. How often do you feel outgoing and friendly?
10. How often do you feel close to people?
11. How often do you feel left out?
12. How often do you feel that your relationships with others are not meaningful?
13. How often do you feel that no one really knows you well?
14. How often do you feel isolated from others?
15. How often do you feel that you can find companionship when you want it?
16. How often do you feel that there are people who really understand you?
17. How often do you feel shy?
18. How often do you feel that people are around you but not with you?
19. How often do you feel that there are people you can talk to?
20. How often do you feel that there are people you can turn to?

Appendix B: Self-compassion Scale Short Form

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'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.