

**The Effects of Daily Stress and Self-Compassion on Personal Growth:  
An Experience Sampling Study**

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## Abstract

**Background.** Existing literature explores effects traumatic experiences can have on individuals, not only focusing on negative outcomes, but also on positive outcomes like post-traumatic growth (PTG). However, limited attention has been given to personal growth following daily stress, despite their ubiquity in everyday life. It would be gripping to see if individuals can experience growth after daily stress. The construct of self-compassion is worth investigating in this relationship, as studies have shown that it can alleviate stress in individuals.

**Objective.** The current research aims to explore the association between daily stress and personal growth in individuals' everyday life. Additionally, a moderating effect of state self-compassion will be examined.

**Method.** The research made use of an Experience Sampling Method (ESM) design for 11 days. Participants ( $N= 22$ ,  $Age= 24.9$ , 77.3% female) were recruited by convenience sampling. On the first day of the study, participants filled out a baseline questionnaire. During the following days, the participants received an identical questionnaire five times a day in which the state measures of daily stress, personal growth, and state self-compassion were assessed.

**Results.** Linear Mixed Model Analysis (LMM) disclosed a significant positive relationship between daily stress and personal growth ( $b = .48$ ,  $CI [.35, .62]$ ,  $p < .001$ ). However, state self-compassion was not a significant moderating variable ( $b = -.05$ ,  $CI [-.12, .02]$ ,  $p = .18$ ).

**Conclusion.** These findings reveal that daily stress can positively impact personal growth. Yet, state self-compassion does not moderate this relationship by alleviating stress and mitigating personal growth. Nevertheless, these findings provide novel insights into the association of daily stress and personal growth. Still, further research is needed to fully grasp this association.

*Keywords:* experience sampling method, personal growth, daily stress, self-compassion, state measures, stress and growth

## Introduction

Most individuals are exposed to a minimum of one traumatic event at least once in their lifetime (Knipscheer et al. 2020). Trauma, as defined by the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) of the American Psychiatric Association (APA, 2013), is outlined as an event in which a person is faced with death or the possibility of death, severe injury, or sexual assault. Examples of trauma-evoking events can be traffic accidents, rape, armed robbery, life-threatening illnesses, or abuse (Knipscheer et al. 2020). Even though these experiences are highly challenging for individuals and can have negative impacts on physical as well as on mental health (Knipscheer et al. 2020), daily stressors occur more frequently and are getting more in the focus of risk factors for mental health issues and psychological distress (Schönfeld et al., 2016). Especially since it has been demonstrated that experiencing stress in everyday life can have negative consequences on mental health in similar ways as trauma, for example by developing depression (Christmann et al., 2017). Further, Dohrenwend and Dohrenwend (1974) describe that there are everyday stressful events many individuals experience as normal, like going to school, relationships, and/or having a job, even though they can be stressful in their nature.

Despite the fact that experiences like trauma and daily stress, can have a negative impact on individuals, research has shown that individuals can also experience positive changes after traumata, which is known as post-traumatic growth (PTG) (Tedeschi & Calhoun, 2004). Nonetheless, there is few research examining growth in response to daily stress but research in response to traumatic stress shows that PTG can appear often and is constituted of five elements, namely life in general, relationships, personal strengths, new perspectives, and spirituality (Henson et al., 2021). To experience PTG, individuals have to engage in cognitive processing of the traumatic event, which should include the questioning of the fundamental believes and world views, personal values, and lastly, to continually evaluate the trauma evoking event (Schroevers et al., 2010). PTG can lead to a greater awareness of personal strengths and weaknesses in conjunction with more self-confidence. Additionally, new perspectives bring about a clearer understanding of one's life goals, and new inspiration (Tedeschi & Calhoun, 1996). As the focus on growth research lies within traumatic experiences, there is a gap in literature, as it is unclear if such a growth process can also take place after daily stress. Hence, the aim of this research is to see whether personal growth can be evoked after daily stress.

## Daily Stress and Personal Growth

Life can be very stressful for individuals by having to adapt to certain changes in their environment (Riepenhausen et al., 2022). Stressors of everyday life can vary from individual to individual and are hard to conceptualise. However, some everyday life hassles have been assessed and concern topics such as difficulties with social obligations (organizations and/or associations), difficulties with family responsibilities (parenting, school, household, etc.), health problems, financial matters, dissatisfaction with work, difficulties with university, dissatisfaction with the housing situation as well as conflicts with close others or other individuals like colleagues, neighbours, and landlords (Scholten et al., 2014).

Quite a few studies have already been conducted concerning stress and its detrimental impact on physical as well as mental health. Stress can lead to diabetes, cardiovascular disease and/or chronic pain (Danielsson et al., 2012), and has been linked to the onset of psychiatric disorders like depression and post-traumatic stress disorder (Hammen, 2005; Bangasser & Valentino, 2014), making it important to research more about possible positive effects. It is noteworthy that stress levels can vary, mostly depending on an individual's subjective perception and interpretation of the stressor and that some people are better able to support themselves through daily stressors, whilst other people may be more vulnerable to them (Atz, 2012). Since stress levels can vary, they are not perceived as stable (Lazarus & Folkman, 1984) and should be investigated as state measures (Matthews et al., 2003).

Personal growth can be defined as the experience of a constant advancement which includes one's realization of one's potential, openness for new experiences, improvements in self and behaviour and lastly an increase in self-knowledge and personal reflection (Ryff & Keyes, 1995). It has already been indicated that personal growth can arise after stress and does not require the experience of traumatic events (Kaurin et al., 2021; Losavio et al., 2011). Nonetheless, it is important to take into consideration that stress-related growth depends on a person's personality, world views, social support, socioeconomic status, pre-existing physical and psychological adjustment, and previous experience (Park, 1998).

Supporting the hypothesis that daily stress can evoke personal growth is a study which compared psychological adaptation to stressful events between breast cancer patients to a healthy control group. It was found that breast cancer patients did show higher scores in PTG but interestingly, the healthy control group showed some degree of growth after stressful situations as well (Ruini et al., 2015). It was hypothesised that PTG is more likely to arise if stress levels are perceived as tolerable accompanied by higher levels of psychological well-

being. This is attributable to the notion that individuals experiencing stress have better cognitive capacities for the mental processing to take place, as this is necessary to experience PTG (Ruini et al., 2015). This implies that growth might not necessarily depend on the severity of a stressor, as both groups of women demonstrated growth to at least some extent, but the subjective perception of being able to handle the stress and by not exceeding their resources (Ruini et al., 2015). One could interfere, that personal growth could then also manifest after daily stress.

However, further research for this hypothesis is needed, as research in the context of daily stress and personal growth is limited. In addition to this, past research has put a focus on cross-sectional designs, making it important to see the fluctuating nature of the construct of stress in a research design like an experience sampling method (ESM). Furthermore, researching about daily stress and personal growth should be extended, for example by looking into what other constructs might affect the association. The construct of self-compassion has been shown to have a significant effect on stress, especially individuals with elevated levels of self-compassion have been shown to experience less stress (Krieger et al., 2015). This makes it contributory to see how self-compassion could affect the relationship between daily stress and personal growth.

### **Self-Compassion**

According to Neff (2003) the concept of compassion can be described as the sharing of the suffering of another person or animal. When being compassionate, individuals recognise that people or animals in their environment suffer, leading them to produce a desire to help them alleviate this suffering, to become free from it (Neff, 2003). Further, Neff (2003) coined the term self-compassion. Being self-compassionate is about being kind to yourself unconditionally, especially in the face of discomfort and suffering (Neff, 2003; Bohlmeijer & Hulsbergen, 2018). It means to support yourself through the adversities of life in a caring way, and to realise that this suffering is part of the human condition (Neff, 2003; Bohlmeijer & Hulsbergen, 2018). This construct is made up of three main components, namely self-kindness, common humanity, and mindfulness (Neff, 2003). Self-Kindness refers to the ability to be caring and kind towards yourself, contrary to being very critical, especially when faced with adversities like weaknesses, illnesses, failures, or unpleasant emotions. Common Humanity can be described as the fact that pain and general discomfort are shared human experiences. It can serve as a reminder that we are all dealing with adversities, and that we are all faced with weaknesses and failures. Lastly, mindfulness in the context of self-compassion, is particularly

about the ability to stay attentive and kind towards oneself, even when confronted with adversities like unpleasant emotions, experiences, and thoughts (Neff, 2023).

Scientific investigations have shown that individuals who are higher in self-compassion are less likely to experience feelings of fear, sadness, irritation, uncertainty, and stress, and that if these emotions do arise, they are experienced less intensely. Moreover, individuals who are high in self-compassion are less prone to repress negative experiences since they are better able to support themselves through this suffering. Further, individuals high in self-compassion experience more feelings of happiness and optimism, as well as to engage more in activities which give them joy (Bohlmeijer & Hulsbergen, 2018; Fong & Loi, 2016). In addition, research has shown that it increases greater well-being, life satisfaction, and feelings of social connectedness (Barnard and Curry, 2011; Neff et al., 2007).

Self-compassion has also been consistently linked to the concept of PTG and stress in research. For instance, Wong & Yeung (2017) demonstrated that individuals higher in self-compassion have more adaptive coping mechanisms, which are, in turn, related to higher levels of PTG. Moreover, Liu et al. (2021) found that self-compassion presents a negative effect on PTSD and a positive effect on PTG, indicating its capacity to buffer against distress following trauma. Likewise, MacBeth & Gumley (2012) discovered that individuals high in self-compassion experience less stress and possess better abilities to alleviate the consequences of stress (Stutts et al., 2018). Similar findings were also acquired by a daily measurement study in which individuals with elevated levels of state self-compassion were shown to perceive less stress (Krieger et al., 2015).

Empirical research has also indicated that self-compassion can act as a significant moderator, especially exerting a role in the associations of stress. To illustrate, one study found that self-compassion can act as a moderator by weakening levels of rumination in individuals and, therefore, for them to experience less stress (Samaie & Farahani, 2011). In addition, there are also findings which indicate that self-compassion weakened the effect of perceived stress on burnout in nurses (Abdollahi et al., 2021), and lastly, self-compassion was found to be a significant moderator in the relationship between trauma exposure and psychological distress in a sample of undergraduate college students (Shebuski et al., 2020). Specifically, the results indicated that students with higher self-compassion showed less psychological distress after having experienced a trauma (Shebuski et al., 2020). All these studies show that self-compassion can act as a buffer against distress or challenging situations, as it is an indicator of psychological well-being (Barnard and Curry, 2011; Neff et al., 2007), a resource for adaptive coping (Neff et al., 2007), and has a negative association with psychopathologies (MacBeth &

Gumley, 2012), showing how it might be a component of psychological resilience (Shebuski et al., 2020).

Based on the insights that self-compassion cannot only have a direct positive effect on PTG and alleviate stress, but also by seeing how it can act as a moderator in various relationships, it would be both captivating and valuable to determine how self-compassion acts as a moderator in the context of personal growth after daily stress. It is crucial to investigate these relationships not only based on trait measures, but instead to capture the dynamic fluctuations in the construct by measuring it on a day-to-day basis. Solely relying on trait measures cannot capture the dynamic nature of self-compassion (Schnepper et al., 2020), as it can vary based on an individual's daily experience and is mostly applied by individuals in response to suffering (Neff et al. 2007). Therefore, understanding the temporal dynamics of self-compassion can offer valuable knowledge on its impact on the association between daily stress and personal growth.

### **Current study**

Considering the cumulative evidence, the primary aim of this study is to investigate if personal growth in individuals can be evoked by daily stress. More specifically, whether participants experience personal growth after daily stressors and how state self-compassion affects this relationship. To achieve this objective, an ESM study design will be applied. This enables the assessment of daily fluctuations of the concepts and, thus, permits to analyse temporal dynamics. This aim gives rise to two research questions.

*RQ1: To what extent is personal growth related to daily stress?*

Therefore, the following hypothesis has been determined.

*H1: A positive association between daily stress and personal growth is expected.*

The second research question has been added to build up on the first research question, enabling a more thorough investigation of the association.

*RQ2: How does state self-compassion moderate the relationship between personal growth and daily stress?*

Considering the aforementioned literature, one could imply that state self-compassion exerts a negative influence on the association. It is reasonable to infer that individuals higher in self-compassion are less susceptible to experience stress (Stutts et al., 2018), resulting in

comparatively lower levels of personal growth. With these aspects in mind, a second hypothesis has been established.

*H2: State self-compassion weakens the positive relationship between daily stress and personal growth.*

## Methods

### Research Design

The present study employed an Experience Sampling Method (ESM) to evaluate participants daily experiences. The data was collected for 11 days by self-reported measurements. On the first day participants filled out demographics and for the following ten days they filled out an identical questionnaire five times a day. This approach mitigates recall bias, which is associated with retrospective reports, increasing reliability and ecological validity, the extent to which results can forecast real-life behaviours (Hektner et al., 2007; Kuppens et al., 2022). Moreover, this design facilitates to investigate fluctuations and momentary experiences since it can account for temporal dynamics (Hektner et al., 2007; Kuppens et al., 2022) of the participants' state of personal growth, self-compassion, and daily stress. This is particularly important for this study, as daily stressors are experienced as less stressful over time (Schneider, 2006). Lastly, researchers can put a focus on individual cases, examining within-person differences based on time, week, or context (Kuppens et al., 2022).

### Participants

Participants of the study were recruited by using convenience sampling, utilizing the Test Subject Pool System of the University of Twente (SONA) or by being directly contacted by the researcher in-person or via social media. To take part in the study, participants had to be at least 18 years old, required sufficient English skills to be able to comprehend the content of the study, as well as to have a smartphone to download and use the Ethica app. Lastly, participants had to actively give informed consent and answer at least 30% of the state measurements to be included in the data analysis.

In total, 49 participants signed up for the study. However, 27 participants had to be excluded because they did not answer enough state measures, resulting in a sample size of 22. Despite the rather large loss of participants who could not be included in the analysis, the sample size remains representative. According to van Berkel et al. (2017), a sample size of at least 19 participants is considered representative for ESM studies.

The age range of the participants was between 19 to 54 years ( $M=24.91$ ,  $SD=6.92$ ).



77.3% of participants identified as female and 81.8% participants identified as German. Further, at the time of the study taking place, most participants had completed a bachelor's degree (68.2%). The complete sample characteristics are displayed in Table 1.

**Table 1**

*Overview of the Sample Characteristics (N=22)*

Characteristics		Frequency (f)	%
Gender	Female	17	77.3
	Male	5	22.7
Nationality	German	18	81.8
	Dutch	1	4.5
	Other	3	13.6
Education	Highschool	3	13.6
	Bachelor	15	68.2
	Master	3	13.6
	Other	1	4.5

## **Materials**

This study was conducted in accordance with four other researches of the University of Twente. Hence, there were more questionnaires being assessed, however, as they were not intended to be used for the present research, they will not be discussed here.

The study consisted of a few materials, which included the Ethica application to create an online survey study which assessed demographics and the state measures of personal growth, daily stressors, and state self-compassion. Moreover, participants used their own mobile devices for the study.

### ***Ethica***

Ethica is an application for web devices and smartphones and can be used for momentary assessments via an app (Ethica Data, 2023). The studies can be created on the

Ethica website, and the questionnaires can be sent out on pre-determined time intervals, or based on random signals (Ethica Data, 2023). In addition, researchers can determine when a questionnaire should expire and at what point push notifications should be sent out to minimise data loss (Ethica Data, 2023). Further, Ethica verifies secure storage of the data which is in accordance with the regulations of the Ethical/Institutional Review Boards (IRBs) (Ethica Data, 2023).

### ***Baseline Questionnaire***

**Demographics.** Participants had to answer questions about their age, gender, nationality, and highest educational degree completed at the time of the study to get some insights into participants demographical data (Appendix A).

### ***State Questionnaires***

**Daily Stress.** This item was added from an online database ('ESM item repository'), which has a gathering of many ESM items that were also used by other studies (Kirtley et al., 2023). The item is 'Think of the most striking event or activity in the last hour. How (un)pleasant was this event or activity?' (Appendix B). This item was able to be scored on a Likert scale from -3 'Not at all' to +3 'Very much'.

**Personal Growth.** This scale was developed by the researchers as no adequate personal growth state questionnaire has been found. This scale consists of two items of which the first one being 'In the last hour I felt capable of handling difficulties' and the second one being 'In the last hour, I felt that life is a continuous process of learning, changing and growth' (Appendix C). The first item was adapted from the post-traumatic growth inventory short form. Both items are scored on a Likert scale ranging from 1 'Not at all' to 7 'Very much'. This can lead to a total score ranging between 2 to 14, with higher scores indicating more personal growth. Reliability analysis revealed an  $\alpha = .54$  which can be interpreted as a poor reliability of the scale.

**Self-Compassion.** State Self-Compassion was measured with two items, one of which was derived from the self-compassion scale short form and adapted to fit the wording of ESM studies. This item was also used in another ESM study by Müller (2020). This item is 'During the last hour, I have been tolerant of my own flaws and inadequacies' and can be scored on a Likert scale ranging from 1 'Never' to 7 'Always'. The second item is 'During the last hour, how kind did you feel towards yourself?' (Appendix D) which can also be answered on a Likert scale from 1 'Never' to 7 'Always' and has also been used in other ESM studies already

(Loenhout, 2022; Wischmann, 2022). Therefore, the total score can range between 2 to 14, with higher scores indicating higher levels of state self-compassion. This scale shows a good reliability with  $\alpha = .84$ .

## **Procedure**

An Ethical Approval by the University of Twente has been appointed before the enrolment process for the study had started (Approval code: 230092). The data collection started on the 20<sup>th</sup> of March 2023 and participants were able to join up until the 17<sup>th</sup> of April 2023 via the Ethica app which was installed on the smartphones of the participants. Participants could sign up for the study via a link which was provided by the researcher leading to the Ethica website or by signing up on SONA. Once the study was added to Ethica, participants were presented with information about the purpose, aim, and duration of the study. Moreover, participants received the information about their right to withdraw from the study at any given moment without having to indicate a reason. Further, participants were asked to direct emails to the researcher or the Ethics committee in case of questions or ethical concerns (Appendix E). This information was followed by an informed consent (Appendix E). Next, the participants were able to fill out the baseline questionnaire. For the ensuing ten days of the study, participants had to fill out an identical questionnaire five times a day with 11 items per questionnaire. This seemed to be enough measurement points to obtain whilst keeping the burden of participants as low as possible. Further, it should have taken participants around three to four minutes to complete each daily measurement. This would result in 50 state measures per participant if all questionnaires were completed by them.

The questionnaires were sent out via fixed signal-contingent sampling, meaning that the questionnaires were sent out at 10 AM, 1 PM, 4 PM, 7 PM, and 10 PM. Additionally, the questionnaires were sent out in time intervals enabling participants to have one hour to answer the questionnaires, and therefore, minimise data loss and decrease recall bias. Likewise, participants received push notifications when the next questionnaire was available to fill out, as well as two reminder notifications after 25 and 40 minutes when participants have not completed the questionnaire in that time frame. Lastly, participants had to answer each question before being able to go to the next one, which was done to further minimize data loss.

## **Data Analysis**

In the first step, the two datasets, baseline and state measurements, were exported from Ethica to the statistical programme IBM SPSS statistics version 27. Next, the dataset was prepared for statistical analyses. Therefore, a time variable was created which indicates the

measurement point of the questionnaire. The daily stress item was recoded from -3 to +3 to 1-7. Further, the total scores and mean score of the scales, as well as the Person Mean (PM) scores and Person Mean Centred (PMC) scores, were calculated. Afterwards, the Little's Missing Completely at Random test (MCAR) was conducted to check whether the data is missing at random.

Following the completion of the dataset preparation, descriptive statistics were calculated. Moreover, line plots which show the within-person fluctuations of the state variables were created as well as boxplots which show the variability in answers for each participant.

To answer the first hypothesis a Linear Mixed Model (LMM) analysis was run to account for the nested structure of the data. The PMC score of personal growth was used as a dependent variable (DV) and the PMC score of daily stress as a covariate. To account for the nested structure of the data, the participant variable was included as subject, and the time variable as repeated effects. To answer the second hypothesis, another Linear Mixed Model Analysis was run. It will be the same analysis as with the first hypothesis, but a moderation effect was added. Further, a first-order autoregressive covariance structure (AR-1) was used for both analyses, as this structure assumes that measurement points which are closely assessed are more correlated (Barnett et al., 2010).

## Results

### Descriptive Statistics

Descriptive statistics are displayed in Table 2.

**Table 2**

*Means, standard deviations and inter-correlations of the state measures in the final sample (N=22).*

Variable	Mean (SD)	1	2	3
1. Personal Growth	9 (2.2)	-		
2. State Self-Compassion	8.7 (2.6)	.51**	-	
3. Daily Stress	4.5 (1.6)	.38**	.42**	-

*Note.* SD = Standard Deviation; \*\* = Correlation is significant at the 0.01 level (2-tailed).

## Preliminary analysis

### *Little's Missing Completely at Random (MCAR)*

The test showed that the data were missing at random ( $\chi^2(3) = 2.48, p = .47$ ), and does not depend on the values of the data.

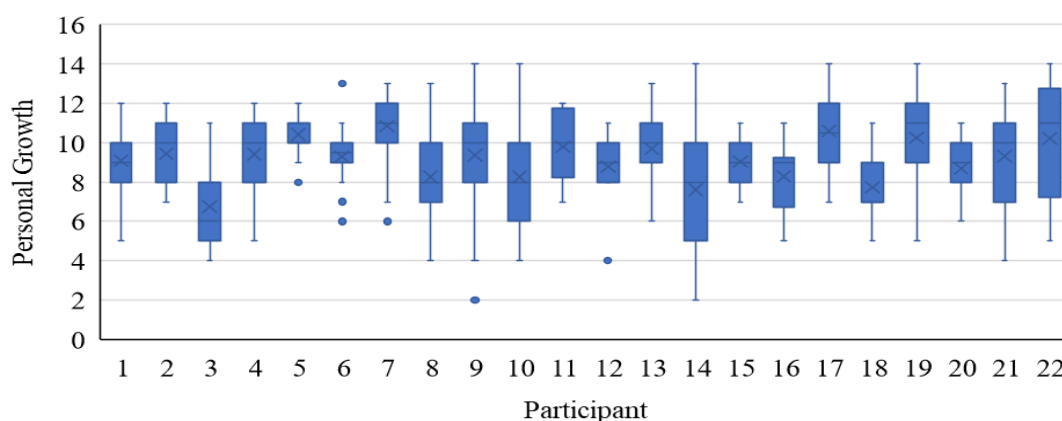
### *Variability*

The boxplots represent the variability of the participants answers per state measurements of personal growth, daily stress, and state self-compassion. A longer box shows that there is much variation within the scores of participants.

Participants seemed to have an average to high level of personal growth without much variation between the participants. Also, within scores do not vary that much, only participants 14 and participant 22 vary more in their answers with a range of scores between five and 13 (Figure 1). Moreover, participants five and six show a rather small boxplot, indicating that there was not a lot of variation in scores, with scores ranging around 10 and 11 for participant five and scores ranging from nine and ten for participant six (Figure 1). Still, both these participants also show outliers in their answers, which are indicated as individual dots, lying outside the box. These outliers represent extreme values compared to the overall distribution in the dataset.

### Figure 1

*Boxplot depicting the variation in experiencing Personal Growth for each participant.*

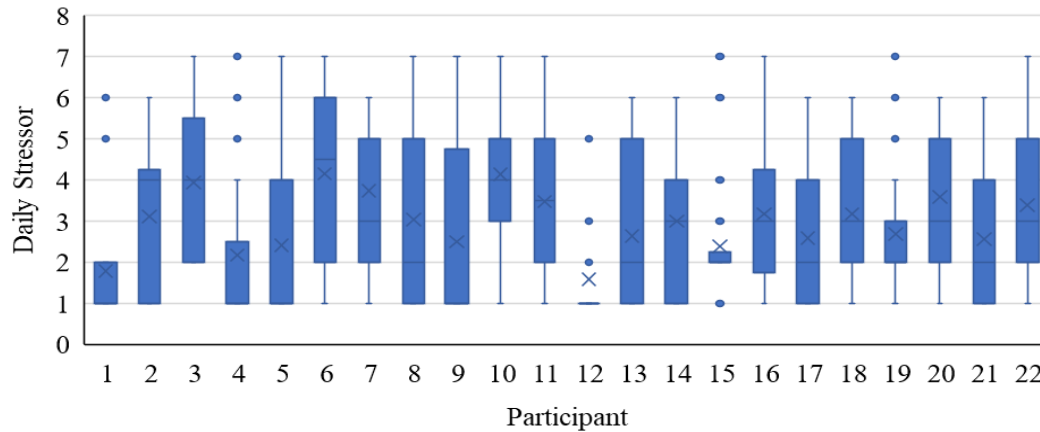


Daily stress was more variable within persons, as can be seen by the length of each boxplot per participant (Figure 2), as they are longer than in Figure 5. This indicates that daily stress was quite fluctuating for each participant, with scores ranging from one to six.

Nevertheless, participants 12 and 15 show many outlier answers compared to the rest of the sample (Figure 2), showing extreme values.

**Figure 2**

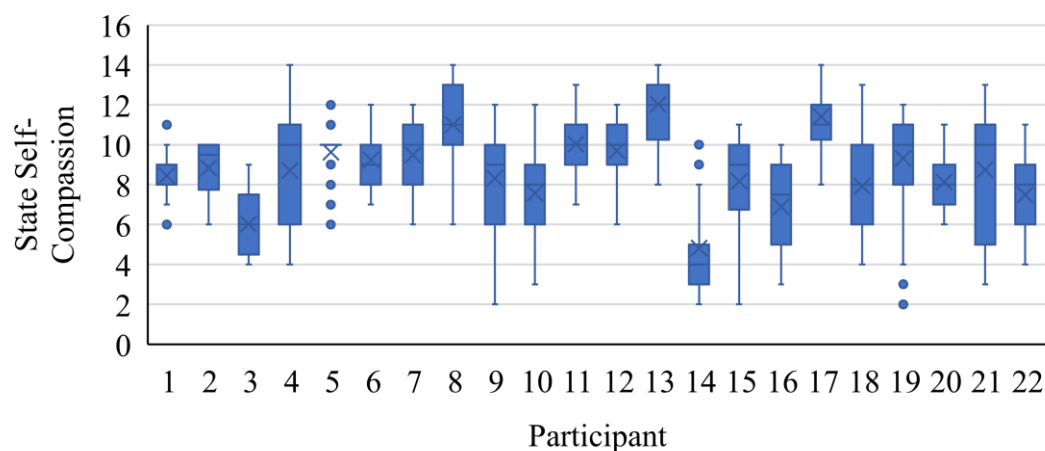
*Boxplot depicting the variation in experiencing Daily Stress for each participant.*



For state self-compassion, there is not as much variability within participants and the answers that they have given (Figure 3), especially when comparing it to the boxplots of daily stress (Figure 2). Participant 5 does not have a boxplot, but displays many outliers, indicating values which are extreme compared to the overall pattern of the answers and variability of the present sample. Variability between participants is given and is higher compared to between person variation for personal growth (Figure 1) and daily stress (Figure 2).

**Figure 3**

*Boxplot depicting the variation in experiencing State Self-Compassion for each participant.*

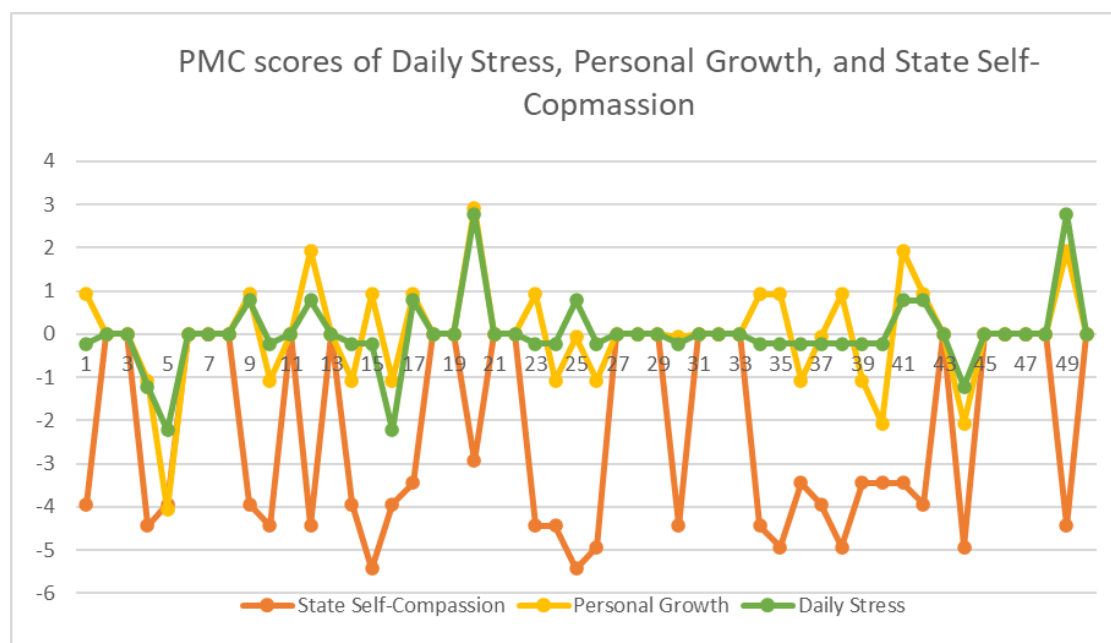


### *Visualisation of Within-Person Fluctuations*

Figures 4 and 5 purposes to show exemplary courses of the within-person fluctuations of the different variables over the period of ten days for participant 1 and 3. It becomes apparent, that state self-compassion and personal growth mostly behave in opposite directions, and that daily stress fluctuates over time but steadies towards the middle of the ten days and then reaches a peak during the end for participant 1 (Figure 4). Further, it becomes apparent that daily stress and personal growth appear to move in similar directions, so when daily stress is low, personal growth scores are low as well.

#### **Figure 4**

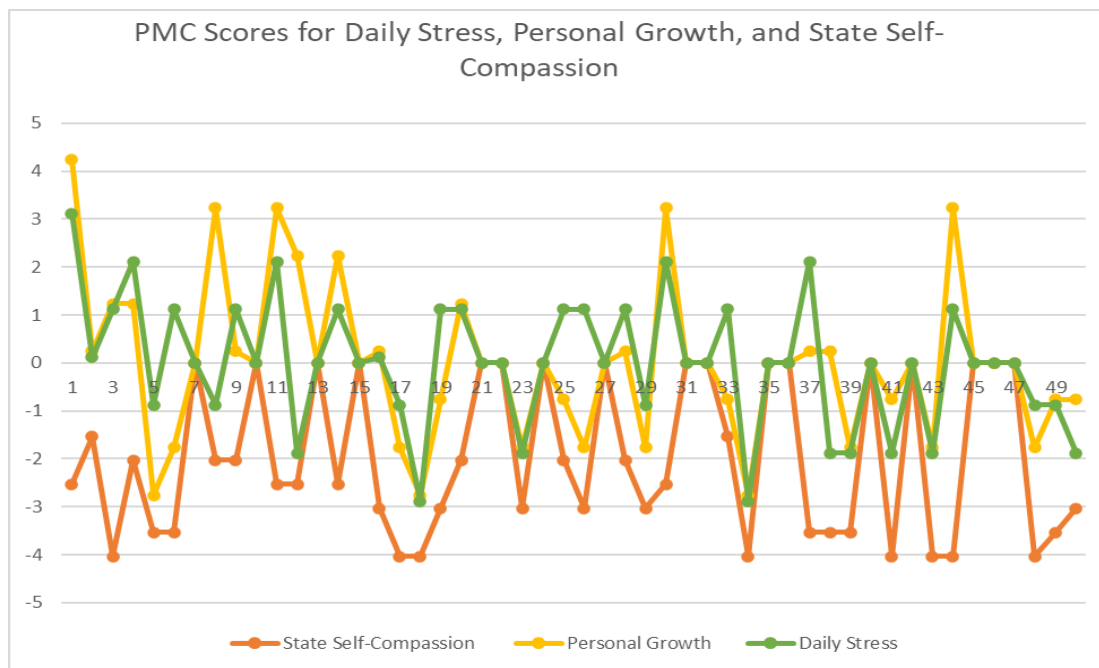
*Person Mean-Centred Scores of State Self-Compassion, Personal Growth and Daily Stress across time for Participant 1*



For participant 3, personal growth and daily stress move in similar directions, whereas state self-compassion shows more extreme values and moves in opposites directions more. Especially in the beginning, scores are more extreme, steadying towards the middle and then becoming more extreme towards the end again (Figure 5). This displays that the participant might have had a more stressful time during the beginning and end of the study.

#### **Figure 5**

*Person Mean-Centred Scores of State Self-Compassion, Personal Growth and Daily Stress across time for Participant 3*



## Hypothesis Testing

***H1: A positive association between daily stress and personal growth is expected.***

The outcome of the LMM for hypothesis one showed a significant positive relationship ( $b = .48$ ,  $CI [.35, .62]$ ,  $p < .001$ ). This result implies that daily stress positively affects personal growth in this sample. Therefore, hypothesis one can be accepted. An overview of the estimates can be found in Table 3.

**Table 3**

*Table of Estimates for the Effect of Daily Stress on Personal Growth*

Parameter	$b$	SE	$df$	$t$	Sig.	95% CI	
						Lower Bound	Upper Bound
Intercept	.01	.88	95.05	.12	.91	-.16	.18
Daily Stress	.48	.06	40.53	7.21	<.001	.35	.62

*Note.*  $df$ = Degrees of freedom;  $CI$ = Confidence interval of unstandardized estimates.

To further illustrate and visually represent this finding, Figure 6 shows a line plot with PMC scores of daily stress and personal growth for participant 11. When the participant scores





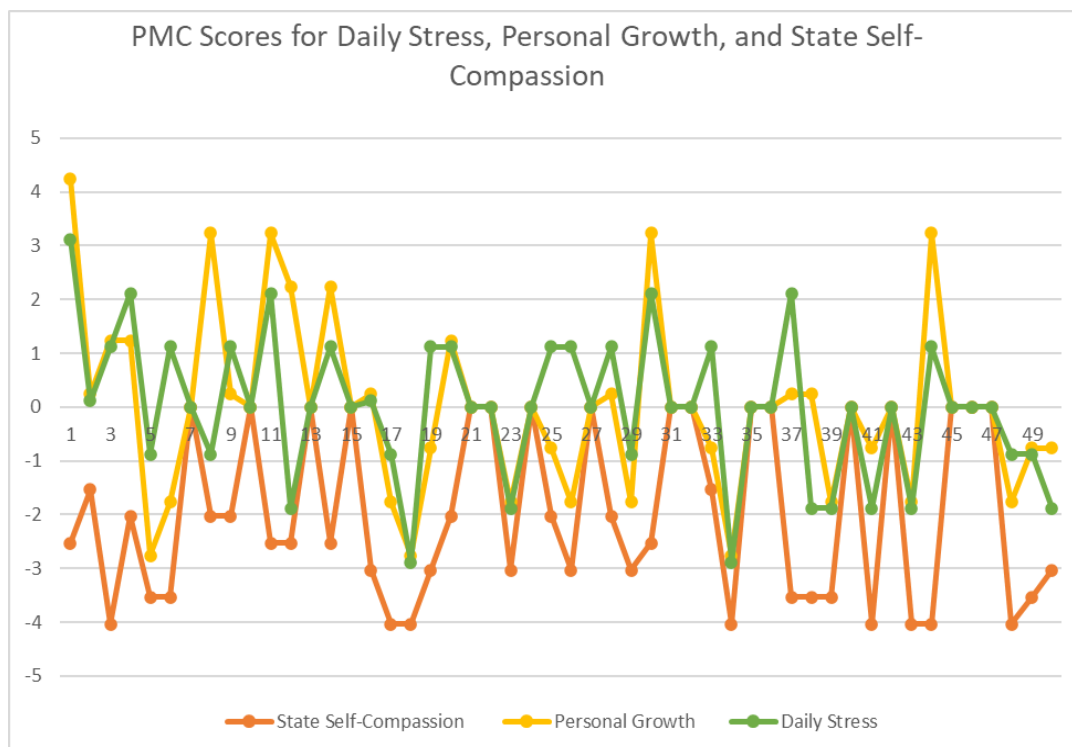
Intercept	2	.25	475.53	7.85	<.001	1.5	2.51
Daily Stress	.16	.15	468	1.08	.27	-.13	.47
State Self- Compassion	.45	.05	334.7	7.77	<.001	.34	.57
Daily Stress*State Self- Compassion	-.05	.03	129.36	-1.33	.18	-.12	.02

Note. *df*= Degrees of freedom; *CI*= Confidence interval of unstandardized estimates.

Figure 7 shows a line plot with PMC scores of daily stress, personal growth, and state self-compassion for participant 3. As can be seen, the lines of daily stress, personal growth, and state self-compassion do not seem to interact with each other or cross over at certain times. This shows that there is no moderating effect of state self-compassion (Figure 7).

### Figure 7

*Line Plot depicting the association between PMC Scores of Daily Stress and Personal Growth, and State Self-Compassion for Participant 3*



### Discussion

The aim of this research was to see whether personal growth can be evoked by daily stress. Additionally, the relationship was further explored to see what other variables might affect the association between daily stress and personal growth. As self-compassion can have

a buffering effect on stress (Stutts et al., 2018), state self-compassion was added as a moderating variable. The current study has two main findings. Firstly, that daily stress positively affects personal growth, and secondly, that state self-compassion does not moderate this relationship in the present sample. Therefore, hypothesis one can be accepted, contrary, hypothesis two cannot be supported. This research adds to the literature as this is, to the researcher's knowledge, one of the first studies that explores whether personal growth can take place after daily stress in individuals in an ESM study design.

### **Interpretation of Results and Theoretical Reflection**

The finding that there is indeed a positive significant association between daily stress and personal growth is in line with several studies indicating positive effects after traumatic and/or stressful life events. A study by Siegel et al. (2005) found that 70% of women in one sample who were diagnosed with AIDS/HIV experienced growth afterwards. Additionally, nurses who worked in the intensive care departments during the COVID-19 pandemic had higher PTG scores compared to other nurses who did not work in intensive care or with patients suffering from COVID-19 (Chen et al., 2021). The mentioned studies do, however, focus on traumatic or very stressful life events and only do that in cross-sectional designs. The findings of this study advance the field by giving insight that growth can also take place after smaller stressors of everyday life. This might be explained with the findings of Tedeschi & Calhoun (2004) who describe that it is not the trauma that is leading to growth, but rather the reflective process after the trauma. This is similar to the findings of Park and Fenster (2004) who established that stress-related growth appeared more in individuals who engaged in adaptive coping strategies like positive reappraisal. Based on these insights, one can interfere that personal growth might not depend on the severity of a stressor/traumatic experience but rather on how an individual engages with it, for example with adaptive coping. However, future research in that regard is needed.

Moreover, it has been hypothesized that state self-compassion would weaken the positive relationship between daily stress and personal growth. This hypothesis was rejected, as no significant effect has been found. Several studies have indicated that self-compassion can alleviate stress (MacBeth & Gumley, 2012; Stutts et al., 2018; Wong & Yeung, 2017; Liu et al., 2021), which is why it was hypothesized that less stress would mitigate the effect on personal growth.

However, the findings of this study do not align with the aforementioned studies. This might be due to several reasons. The first is that the scale with which state self-compassion

was measured does not encompass all three dimensions of the concept of self-compassion (Neff, 2003). Therefore, the full construct of self-compassion was not measured but only the aspect of self-kindness. Hence, one could argue that this is why state self-compassion did not yield significant results in this study. It is plausible to expect that the other two dimensions could influence the relationship differently. For instance, individuals displaying higher levels of self-compassion might do that because they experience their stress as a shared human experience, which might contribute to the experience of less stress, mitigating levels of personal growth. Likewise, individuals who are more mindful might be better at being in the present moment to navigate through the stressor, affecting the level of personal growth. Future research could explore the importance of each dimension in the context of daily stress and personal growth, allowing to see a more nuanced understanding of each dimension and how that might contribute to a potential moderating effect. The understanding of how the different aspects of self-compassion do (not) influence daily stress and personal growth can explain why the current study did not yield significant results by only focusing on self-kindness.

Moreover, according to Neff (2003) individuals deploy self-compassion in the face of suffering. One could argue that the perceived level of daily stress experienced by the participants was too low for them to elicit a need to be self-compassionate towards themselves. Daily stress, contrary to traumatic experiences, might not be perceived as having to suffer from it. This would explain why research focusing on chronic stress or bigger life events, do find that self-compassion alleviates stress. To strengthen this argument, a study by Forkus et al. (2019) indicated that self-compassion moderates the relationship between exposure to morally injurious experiences and post-traumatic stress disorder, with depression severity, and deliberate self-harm versatility. Therefore, self-compassion might only buffer or alleviate stress with a certain intensity of the stressor (Salinger & Whisman, 2021), which was not achieved in this sample. This would be in line with the fact that reported levels of daily stress appear to be moderate and not as high in this sample.

A last explanation might also be that participants in this sample simply do not use self-compassionate behaviour as a way to cope with stress. It might be that they used other strategies which would then have moderated the association between daily stress and personal growth.

### **Strengths and Limitations**

One strength of this research is its novel approach to looking at the effect of daily stress, as this research presented that it can positively affect personal growth. Another strength of this research is the study design which was used. ESM studies allow to get insights into naturally

occurring experiences in the everyday life of participants (Hektner et al., 2007), making it especially important when researching daily stress and state self-compassion, as they can fluctuate throughout the day (Lazarus & Folkman, 1984; Matthews et al., 2003; Schnepfer et al., 2020). This can lead to more accurate research results than one-time measurements. Additionally, since the participants had to fill in the questionnaire five times a day, there is less of a problem with retrospective reports, making the data more accurate to the actual experiences of the participants (Hektner et al., 2007). This is especially important since the findings of Schneider (2006) illustrate that daily stress is experienced as less negative after some time has passed. Lastly, this design lets researchers put a focus on individual cases within the study distinctively. This means that a focus can be put on within-person differences to see how responses of one individual might fluctuate based on a different time of the day or week (Kuppens et al., 2022), giving more insights into variation of daily stress, personal growth, and state self-compassion within one individual.

Still, there are several limitations to this study. The first thing is that it is hard to generalize the findings to other populations. This is due to the convenience sampling method as most participants identified as female, Germans, and the highest degree completed was a bachelor's degree, displaying a tendency of higher education in the sample. All of which makes it hard to draw conclusions to other populations. Second, the sample size is relatively small as participants had to be excluded if they did not answer at least 30% of the state measurements. Since a total of 27 of the recruited 49 participants had to be excluded, this might indicate that the study burden was too high with five measurements per day over a period of ten days, influencing how reliable the data really is. Additionally, this might have to do with what is known as 'response fatigue'. It might be that participants have not reported accurate experiences after some time due to less motivation because of the repeated measurements (Reynolds et al., 2015).

Moreover, the state measurement of personal growth did show quite a low reliability ( $\alpha = .54$ ), implying that the measurement of the construct is not consistent and could vary, yielding different results in the same sample. What adds to this is that one should be critical of whether or to what extent growth is actually being measured by the two items. The first item of the scale concerns the question of whether the participants felt able of handling difficulties which does not necessarily have something to do with personal growth, but rather if they felt capable of handling stress. According to the definition of personal growth, the construct is about the realization of one's advancement, not about the ability to feel capable. What might have been better is to include questions about growth domains which are included in the

definition, like the realization of one's potential, openness for new experiences, improvements in self and behaviour and lastly an increase in self-knowledge and personal reflection. Even though scales for ESM studies should be held as short as possible to keep the participant burden low (Van Berkel et al., 2017), it might have been better to extend the personal growth scale and to include more items which are related to growth outcomes. Therefore, it is not given that in this study the personal growth scale did indeed measure personal growth.

### **Directions for Future Research**

Looking at the beforementioned limitations, a few suggestions for future studies can be drawn. Above all, the association of daily stress and personal growth should be further investigated as this was one of the first studies to do that. This knowledge, that daily stress can evoke personal growth, can be of importance especially when looking at how to enhance this personal growth after daily stress, which could be a focus for future research. As has been mentioned before, it might not be due to the severity of the stressor but rather how an individual copes with it. Therefore, future research could focus more on adaptive coping mechanisms, certain thoughts, or ways to look at the stress, to see how these might take an influence on growth levels within individuals. The knowledge of why people experience personal growth after daily stress can help to invent resilience-building techniques or mindfulness-based interventions to enhance personal growth and lessen negative effects of stress on individuals physical and mental health.

What adds to this is the recommendation to further explore the association by adding different constructs as moderators or mediators, to see how they might impact or explain the association. This could be either focused on negative coping mechanisms like distraction or denial of daily stress and how this affects personal growth, or on adaptive coping strategies taking a break, breathing exercises, or changing how we think about a stressor, to see how that might affect personal growth.

Further, this study consisted mostly of females and higher educated individuals. One could argue that people who are better educated and/or female might handle daily stress differently or have a different stress level altogether which would then take effects on personal growth. Particularly since a study by Park (2010) indicated that women tend to report more stress-related growth. Moreover, a meta-analysis by Yarnell et al. (2015) found that men are higher in self-compassion than women, giving rise to the question if there could have been a significant moderation effect in a different sample. Therefore, a different sampling method is recommended, for example random or stratified sampling, so that a more accurate reflection of

the population's diversity is given, which can give more insights into generalizability than is given in this sample.

Lastly, it is also recommended to work against 'response fatigue'. Usually, four to ten measurement points between three days and three weeks are recommended (Conner & Lehman, 2012). Therefore, it is recommended to either keep five measurement points a day but shorten the days of the study to around five days or to keep the ten days and make less measurement points a day, for example three. In line with this is the recommendation to measure less constructs within one study in the future. It might be better to focus on two to three constructs in a more elaborate manner. Since this study was done in accordance with other researchers, it was only possible to assess scales with less items, to minimise participant burden. However, as can be seen with the reliability of personal growth and the fact that not all dimensions of state self-compassion were being able to be assessed, more items to measure these constructs might have been better.

## **Conclusion**

Most literature about stress to date focuses mostly on negative effects on individuals. Still, literature about PTG gives insights that even traumatic experiences can have positive effects on individuals, for example by deepening relationships and adding more meaning to one's life. What has not been a focus in literature is the question of whether personal growth can appear after stressors of everyday life. The current research contributed to filling this gap by giving insights into the association between daily stress and personal growth, as well as by seeing how state self-compassion acts as a moderator. The results show that daily stress can indeed evoke personal growth. Though, no significant effect of state self-compassion was found in this sample. These novel insights lay ground for further investigations of daily stress and personal growth, about what other construct might moderate the relationship, as well as to research more about why or how personal growth takes place after daily stress.

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## Appendices

### Appendix A- Demographics

1. What's your gender?

Female

Male

Non-binary/Third gender

Prefer not to say

2. What's your age?

3. What's your nationality?

Dutch

German

Other

4. What is the highest degree or level of school you have completed? If currently enrolled, mark the highest degree already received.

High school graduate

Bachelor's degree

Master's degree

Doctorate degree or higher

Other

5. What is your Sona ID? Fill in your personal number.

### Appendix B – Daily Stress

1. Think of the most striking event or activity in last hour. How (un)pleasant was this event or activity?

### Appendix C – Personal Growth

1. In the last hour I felt capable of handling difficulties

2. In the last hour, I felt that life is a continuous process of learning, changing and growth

#### **Appendix D – State Self-Compassion**

1. In the last hour, I have been tolerant of my own flaws and inadequacies.

2. In the last hour, how kind did you feel towards yourself?

#### **Appendix E - Informed Consent**

This study focuses on responses to daily stressors and consists of two parts. In the first part, you have to fill out some general questionnaires. You only need to do this once and it takes about 20 minutes. The second part of the study lasts for 10 days. Per day, you will get 5 notifications to complete a short questionnaire. Completing this short questionnaire will take about 5 minutes.

Your participation in this study is completely voluntary and all your responses are treated anonymously. None of the responses will be connected to identifying information and wouldn't be shared with third parties. Data will only be used for statistical analyses. However, you can withdraw from the study at any time! By simply stopping answering the daily questions without the need to give any reasons.

If you would like to have further information about the research, now or in the future, feel free to contact Mirjam Radstaak at:

[m.radstaak@utwente.nl](mailto:m.radstaak@utwente.nl).

If you have any complaints about this research, please direct them to Ethics Committee of the Faculty of Behavioural Sciences at the University of Twente, email: [ethicscommittee-bms@utwente.nl](mailto:ethicscommittee-bms@utwente.nl).