The Relationship between Stress and Resilience and the Role of Social Context: An Experience Sampling Study

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Abstract

The influence social support and social networks have on resilience, and stress is widely discussed in existing literature. However, the role of social contact in daily life in this relationship, is not yet largely researched. This study aimed to investigate whether general social contact and different types of social contact moderate the relationship between stressful events and negative affect. A convenience sample of 67 participants (*M=29, Male 46,27%, Female 53.73%*) completed questionnaires up to 10 times a day for 7 days. Negative affect was assessed with the negative affect component of the 8-item positive and negative affect schedule (PANAS). Linear mixed models showed no significant association between stressful event, negative affect and social contact (*B=-0.11, p=.17*). Similarly, rather liked social contact (*B=-0.08, p=.35*), social contact with a friend (*B=0.11, p=.36*), family member (*B=-0.21, p=.11*), romantic partner (*B=-0.09, p=.46*), and unknown persons (*B=-0.15, p=.23*) also showed no significant moderation effects. The association between stressful events and negive affect was moderated by social contact with a colleague (*B=-0.29, p=.02*). The findings provide new insights such as that social contact with colleagues negatively moderates the relation between stressful events and negative effect. Moreover, by exclusively assessing between-person associations in this study, it became clear that more idiosyncratic study designs would be very interesting to incorporate in future research.

Introduction

Resilience, Stress, and Recovery from Stress

Stress is a construct prevalent in all areas of human life. According to the American Psychological Association (2017), 65 per cent of all workers in the USA feel that their profession is a significant source of stress in their lives. The consequences of stress exposure vary and can have devastating effects such as cardiovascular disease, depression, anxiety, trauma and other psychiatric disorders (eWu et al., 2013; Kivimäki et al., 2006). To this end, the concept of resilience has received significant attention recently due to the influence it poses on people's reactions to stressful situations. In existing literature, resilience is defined as overcoming negative effects from exposure to stress, preventing negative consequences of stress, and successfully coping with traumatic experiences (Garmezy et al., 1984; Masten & Powell, 2003; Luthar et al., 2000). Resilience does not prevent the experience of stress, but it allows individuals to recover more quickly from negative consequences of stressful stimuli (Fleshner et al., 2011). Additionally, different studies also found that individuals low in resilience showed higher levels of perceived stress (Thompson, 2018; Rahimi et al., 2014). Thus, the assumption can be made that resilience is negatively related to perceived stress.

Social Support and the Role of Social Context

Resilience in people is influenced by many factors, with social support being one resource that helps people adapt to stressful experiences. According to Hubbard et al. (1984), high levels of social support are associated with high engagement in healthy exercises, including nutrition, relaxation, safety, and health promotion. Furthermore, social relationships are a strong predictor of general health and self-care (Holt-Lunstad et al., 2010). According to Lo (2002), social support is an effective coping mechanism to deal with stress. Thus, people who engage in social relationships and experience social support are more likely to adapt to

stressful situations quickly. A person that experienced a stressful event might seek social contact to use social support as a resilient resource to adapt to stressful situations.

The social context people are in and how they socially interact pose an influence on the resilience-building process. According to Zautra et al. (2010), positive emotions are a crucial factor in fostering resilience in people. Thereby, social activities can play an important role. Firstly, social interaction opens the opportunity to develop and maintain positive relations with others which can elicit positive emotions. Secondly, social interaction can create positive feelings such as joy and pleasure. Thirdly, social interaction provides the opportunity to engage in problem solving behaviour and perspective taking, which may also enhance resilience in people. Thus, social interaction can help people adapt to stressful experiences by eliciting positive emotions or coping strategies. Also, Rohrer et al. (2018) suggest a positive relation between social contact and positive emotions, which is mediated by feelings of social connectedness. Additionally, these findings are substantiated in a study by Ungar (2015), who found that engaging in social interactions with other people fosters resilience in people. Thereby, profound interactional relationships with a primary caregiver, peers, colleagues, or teachers are especially resilience-enabling.

Different Types of Social Contacts

Throughout life, people build different kinds of social relationships. The family is the first and most important social contact people usually experience when growing up. Thereby, a person's overall development is shaped by the family context one grows in (Mertika et al., 2020). During adulthood, peer relationships begin to grow more important. According to Kornieko & Santos (2013), positive peer relationships predict the ability to adapt in a person. Also, positive peer relationships trigger less risky behaviour, which is linked to overall well-being (Telzer et al., 2015). Another type of relationship that becomes more important in

adulthood is a romantic relationship. Romantic relationships offer support, companionship, social status and proximity, often predicting overall well-being (Amato, 2015). Also, positive relationships with colleagues or supervisors increase well-being and contribute to team flourishing (Warren et al., 2017; Ragins & Dutton, 2006). Hence, people experience different types of social relationships in their life, with all of them having the potential to lead to overall well-being when they are of positive nature.

To this end, one could argue that social relationships or social contact that is perceived as rather liked has the potential to lead to overall well-being due to the positivity of the contact. Suggesting that rather liked social contact is equal to positive social interaction, this is in line with previous research stating that positive social interaction triggers increase in positive affect (Woodward et al., 2018; Vittengl & Holt, 2000). According to Francis et al. (2017), increases in positive affect trigger decreases in negative affect. Also, according to Joseph et al. (2020), the induction of positive emotions causes a comparable decrease in negative affect, supporting the bipolar continuum of positive and negative affect. At the same time, rather unliked social contact could have a counteractive influence as the contact might lack the positive emotions associated with the other person, or even lead to increased negative affect. However, despite the important role of social context for adaptation and well-being, more is needed to know about social context in ESM literature, how it behaves in relation to stressful events and resilience.

Experience Sampling Method

When studying social contexts, the Experience Sampling Method (ESM) offers in-time measurements that allow an exact recording of a situation. ESM is a sampling technique that prompts several measurements daily over a certain period (Kansky & Diener, 2017). One of the significant advantages of ESM studies is that they examine the direct impact of daily

events on people's affective states (Beal, 2015). Thus, by asking about the experienced negative affect after stressful events and the social context, ESM provides the advantage of providing detailed insights into contextual aspects. Moreover, ESM studies strive for high ecological validity by measuring the participants' experiences in their natural environment instead of laboratory settings (Beal, 2015). Resilience is mostly defined as an individual's ability to overcome the consequences of stress exposure, which makes the concept dynamic (Kuranova et al., 2020). ESM studies are beneficial for measuring those dynamic concepts that cannot be adequately assessed in other study designs as cross-sectional studies (Shiffman et al., 2008). Thus, resilience will be operationalised as the association between stressful events and negative affect in this study. Operationalising resilience into a dynamic concept allows a more nuanced understanding of how social context may affect resilience. ESM allows to draw a clear picture of the temporal trajectory of stress over the day (Vaessen et al., 2019). Therefore, ESM is a well-suited method for this study as people's context can be well assessed, as well as how stressful events and negative affect relate to each other in different situations.

Current Study

Until now, several studies have shown the positive effect of social support on the development of resilience. However, the effect of social context on the association between resilience and stress is not researched yet. By assessing resilience as the association of stressful events and negative affect, resilience can be implicitly measured as a state variable. In this study, social context is defined as the presence of different kinds of social contact. Thereby, it will be distinguished whether a person is alone or with company and whether the company is liked or not. Over their life-course, people build different types of social relationships as the relationship with their family, friends, romantic partners, or colleagues.

All these types of relatonships differ in context and can increase well-being in individuals. Therefore, it also will be examined whether different types of social context, namely social contact with a family member, a friend, romantic partner, colleague, or unknown people, have a different influence on the relationship between stressful events and negative affect. Hence, the following research questions are formulated; *RQ1: "Does social contact moderate the relationship between stressful events and negative affect?", "RQ2: Is the relationship differently moderated by liked and unliked contacts?" RQ3: "Is the relationship differently moderated by different types of social contact (family member, friend, romantic partner, colleague or unknown people)?"*. Based on existing literature, the following is hypothezised: *H1: Social contact reduces negative affect in individuals when in a stressful situation. H2: Rather liked social contact reduces negative affect in individuals when in a stressful situation, whereas rather unliked social contact increases negative affect. H3: Different types of social contact reduce negative affect in people when in a stressful situation but to varying extents.*

Methods

Participants

To be eligible for the study, participants had to be at least 18 years old, English speaking, and possess a smartphone that can use the application "Ethica". For the recruitment of participants, selective convenience sampling was used. Selective convenience sampling is a type of non-probability sampling where members of a target population that meet specific criteria are selected. As this study exhibited a high response demand, it was expected that not all participants might be motivated to maintain a high response rate. With selective convenience sampling, participants are invited via personal networks, which helps gaining a sample of more motivated and reliable participants compared to anonymously sampled

participants (Etikan et al., 2016). Furthermore, a 40 € voucher was raffled among participants as an extra incentive to participate in the study, which is found to increase response rates in ESM studies (Van Berkel et al., 2017). According to Van Berkel et al. (2017), previous ESM literature recruited an average of 53 participants. In this study a total of 113 participants in the VAS-Scale condition and 130 participants in the Likert-Scale condition were recruited.

Materials

Baseline Questionnaire

In the baseline questionnaire, demographic questions about age, gender, nationality, occupation, and highest degree obtained, were administered. Besides the demographic questions, several self-report questionnaires were administered as well, however, those were used for different studies and not relevant for this study. The same accounts for the daily questionnaires. Only the daily questionnaires used in this study will be described in the following.

Daily Questionnaires

To measure negative affect, the 8-item version of the positive and negative affect schedule (PANAS) was used, applying only the negative affect components. These questions were "How 'anxious', 'irritable', 'down', 'guilty' do you feel right now?" with the participants replying on a 7-point Liker Scale from 1 (not at all) to 7 (very much). The use was based on previous studies, which measured a high internal consistency for the negative affect component (α=.76; α=.74) (Thompson, 2007; Hartmann et al., 2015). In this study, the negative affect items had acceptable split-half reliability (rs =.66).

One question to assess whether the participant experienced a stressful event in the last hour was administered. The question was retrieved from the ESM item repository (ESM item

repository, n.d.), and was "Think of the most striking event in the last hour. How (un)pleasant was this event or activity?", with the participants replying on a 6-point scale from -3 (very unpleasant) to 3 (very pleasant). Indications between -3 and 0 were coded as "1" (stressful event), while indications between 1 and 3 were coded as "0" (no stressful event). The question was also used in previous ESM studies (Geschwind et al., 2010; Habets et al., 2022).

Lastly, to assess social context, the participants were asked; "Who are you with right now?" With the answering possibilities being "Family member (1), friend (2), romantic partner (3), colleague (4), unknown people (5), I am alone (6)". Indications of 6 were coded as "0", which indicates no social contact. Indications of 5 or below were coded as “1” which indicates social contact. Social contact further was distinguished into the different types of social contact. When somebody was not alone, they were prompted to indicate an additional question; "I like this company" indicating on a 7-point Liker scale with 1 (not at all) to 7 (very much). Indications of 5 or below were coded as "0", representing rather unliked social contact, and all indications from 6 or above were coded as "1", representing rather liked social contact. As the frequency of rather liked social contact was significantly higher than the frequency of rather unliked social contact, the cut-off from 5 or below for rather unliked social contact produced a more even distribution. The use of this question was in line with previous research (Jung, 2021; Veltmann, 2021).

Design and Procedure

This study is part of a longitudinal study running in waves of data collection, with this study being the third wave. The first data collection wave occurred between the 7th – 13th of November 2022. The second data collection wave was conducted between the 13th - 19th of February 2023. Other students conducted those first two waves of data collection during their bachelor's thesis. The third wave, collected in this study, took place between the 16th – 22nd

of April 2023. Before the data collection, participants were randomised into two conditions (VAS-Scale Condition & Likert-Scale Condition) for methodological research in another study. In this study, the data set of the Likert-Scale condition was used, due to the higher sample size in that condition. Afterwards, the participants were invited via email and provided with the instructions. Each participant had to download the application "Ethica" and register with the study code which the researcher provided. At the start of the study, each participant was provided with the informed consent, which had to be agreed on to proceed with the study. Next, a one-time baseline questionnaire was administered with a duration of about 20 minutes to complete. Each participant had to complete the baseline questionnaire. In case of non-completion, the participants were reminded after 8, 24 and 72 hours. The baseline questionnaire did not expire. Simultaneously, the participants were given daily questionnaires triggered at 10 moments per day. The daily questionnaires took about 3 minutes to complete, were sent each day between 7.30 and 22:30 at random moments and expired after 15 minutes. This type of ESM triggering is called signal contingent triggering and has the advantage of reducing bias from situational factors and providing a more accurate picture of the participant's experience by triggering at random moments (Van Berkel et al., 2017). Additionally, if a person experiences particular emotions or events only at certain times of a day, signal contingent triggering captures these experiences more accurately (Van Berkel et al., 2017).

Data Analysis

To analyse the data, the statistical software RStudio was used. First, all participants who did not comply with the minimum response rate of 30% were removed. This aligns with previous ESM research that employed a similar compliance rate of 33% (Wouters et al.,

2018). Subsequently, the four questions concerning negative affect were grouped into one variable to create an average score.

Dummy variables were created for the social contact variables. For the question "Who are you with right now?" a dichotomous variable was created: thereby it was distinguished between social contact (1) and no social contact (0). For the question "I like this company", a dichotomous variable distinguishing between "rather liked" and "rather unliked" social contact was created. Rather liked social contact was categorized as (1) and rather unliked as (0). To identify stressful events, responses to the question "Think of the most striking event in the past hour, how (un)pleasant was this event?" were categorised. Stressful events were coded as (1) while no stressful events were coded as (0). Additionally, from the question "Who are you with right now?" the five different social contact categories (Family, Friend, Romantic Partner, Colleague, Unknown, No Contact) were transformed into five dummy variables. Each category was coded as (1) if the indication matched and as (0) otherwise. The category "No contact" served as reference category.

With ESM data, one of the challenges is that per participant, multiple data points are assessed, and some data points are missing as participants mostly do not manage to fill in everything. Therefore, linear mixed effect models using the lmer function from the lme4 package were applied (Bates et al., 2014). Mixed effect models have the advantage that they make use of all available data, account for repeated assessments on the same subject and can adequately handle missing data (Gueorguieva & Krystal, 2004). Also, to account for the nested data due to the 70 measurements per participant, a mixed effect model is proposed to be a well-suited analysis (Cheng & Kelly, 2011). Fixed effects are employed to answer the research question, and random effects are used to account for correlations within a group. Participants were included as random effects, and the independent and dependent variables as fixed effects.

When analysing the first hypothesis about the moderation effect of social contact on the association of stressful events and negative affect, negative affect was set as the dependent variable, with social contact and stressful event being the independent variables and additionally used as interaction variables.

Negative affect was again employed as a dependent variable to test the second hypothesis, about rather liked and rather unliked social contact. Rather liked social contact and stressful event were set as independent variables. In this hypothesis an interaction of rather liked social contact with stressful event was tested.

For testing the third hypothesis, about the five different categories of social contact, negative effect was the dependent variable, whereas the five different contact categories (Family, Friend, Romantic Partner, Colleague, Unknown) were set as independent variables alongside stressful event. Each of the five dummy variables was employed in an interaction effect with stressful event.

Results

In this study a total of 130 participants were recruited. However, after removing participants that did not comply with the minimum response rate of 30%, 67 participants (31 males, 36 females) were left. The participants had a mean age of 29 (M = 23, SD = 12,72), with nearly the whole sample being German (62 German). The rest of the demographics can be found in Table 1.

Frequencies of assessed variables

Table 1

Sample Characteristics (N=67)

Variable	Category	Frequency	%
Sex			
	Male	31	46,27
	Female	36	53.73
Nationality			
	German	62	92.54
	Dutch	3	4.48
	Other	2	2.98
Degree of Education			
	Middle School	1	1.48
	High School	33	49.24
	Bachelor	21	31.34
	Master	8	11.94
	PhD	2	2.98
	Other	2	2.98
Status of Employment			
	Working	21	31.33
	Self-Employed	3	4.48
	Student	29	43.27
	Studying & Working	13	19.39
	Other	1	1.48

As shown in Table 2, this sample exhibited an uneven distribution in the conditions of stressful and non-stressful events, with most participants experiencing non-stressful events. Similarly, during assessments involving social contact, rather liked social contact was twice as common (66.12%) as rather unliked social contact (33.87%). The categories of social contact assessed for the third hypothesis varied in their measurement frequencies, with

friends being the most common, followed by romantic partners, family members, colleagues, and unknown individuals.

Table 2

Frequency distributions of the variables used to test the three hypotheses

Variable	Condition	Frequency	%
Hypothesis 1:			
Stressful Event:	No Stressful Event	1741	79.79
	Stressful Event	441	20.21
Social Contact:	Absence of Social Contact	981	44.87
	Presence of Social Contact	1213	55.13
Hypothesis 2:			
Social Contact:	Rather Liked Contact	802	66.12
	Rather Unliked Contact	411	33.87
Hypothesis 3:			
Family SC:	Presence of Family Contact	235	10.72
	Absence of Family Contact	1959	89.37
Friend SC:	Presence of Friend Contact	350	16.14
	Absence of Friend Contact	1844	83.95
Romantic Partner SC:	Presence of Romantic Partner Contact	284	12.92
	Absence of Romantic Partner Contact	1910	87.17
Colleague SC:	Presence of Colleague Contact	192	8.78
	Absence of Colleague Contact	2002	91.32
Unknown SC:	Presence of Unknown Contact	154	7.01
	Absence of Unknown Contact	2040	93.08

Results of the Hypotheses

As indicated in Table 3, the interaction of stressful event and social contact, that was tested for the first hypothesis, was negatively associated with negative affect but not significant (*B=-0.11, p=.17*). The interaction of stressful event and rather liked social contact, that was tested for the second hypothesis, was also negatively associated with negative affect, however, insignificantly (*B=0.15, p=.15*). As rather unliked social contact was used as reference category, it can be concluded that also rather unliked social contact is not significantly related to the association of stressful event and negative affect.

Table 3

Output of Linear Mixed Models for the 1st and 2nd Hypothesis

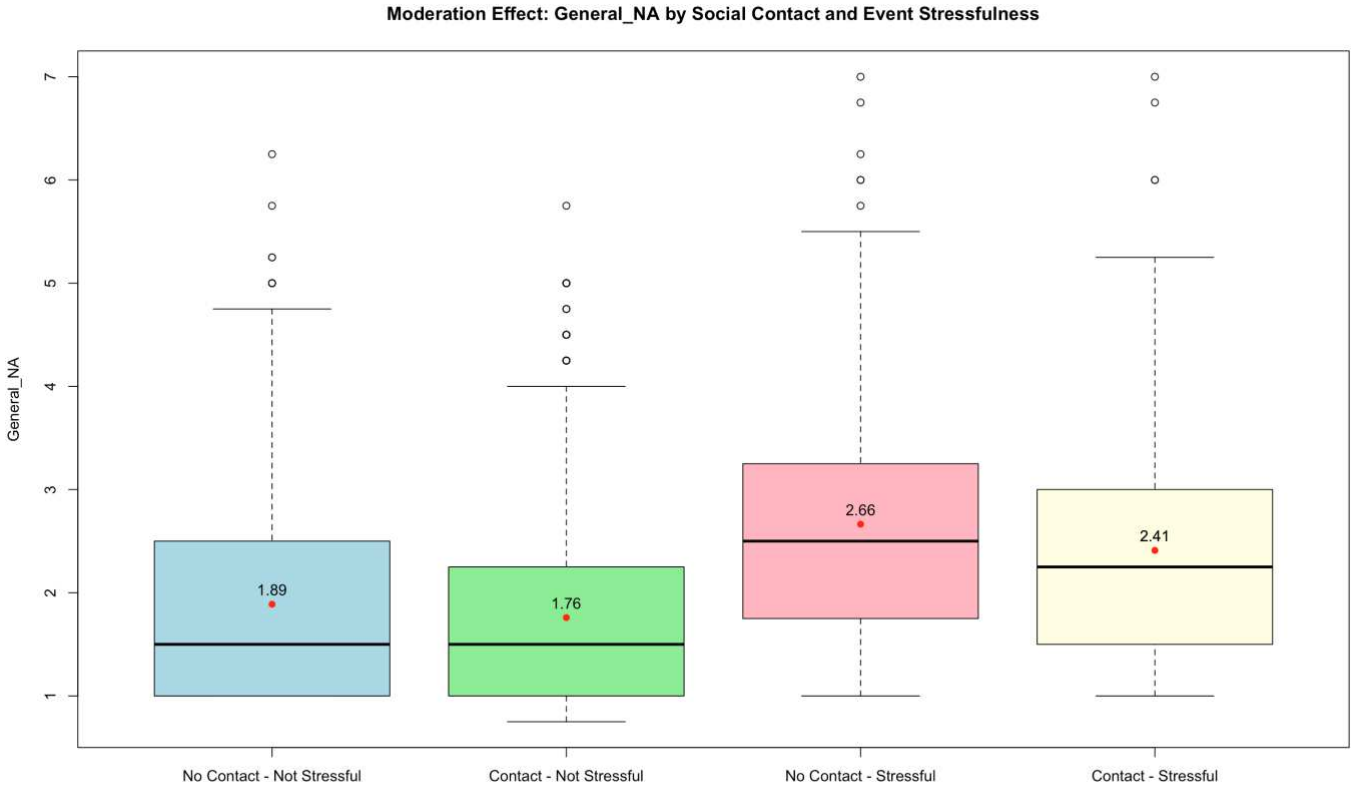
Independent Variable	*Estimate*	*SE*	*df*	*t*	*Sig*	*Confidence Interval*
1st Hypothesis						
Stressful Event	0.74	0.06	2128.01	12.55	<0.01	[0.62, 0.85]
Social Contact	-0.09	0.04	2138.11	-2.68	<0.01	[-0.16, -0.02]
Stressful Event * Social Contact	-0.11	0.06	2124.00	-1.37	0.17	[-0.25, 0.04]
2nd Hypothesis						
Rather Liked Social Contact	-0.19	0.04	2138.20	-4.78	<0.01	[-0.27, -0.01]
Stressful Event * Rather Liked Social Contact	0.15	0.10	2121.58	1.40	0.15	[-0.26, 0.10]

In Figure 1, the variables used for the 1st Hypothesis were compared under four different conditions. First, when there was no social contact, and no stressful situation, the negative affect means of people were higher (1.89) than when there was social contact and no stressful situation (1.76). Secondly, when there was no social contact and a stressful situation,

negative affect was higher (2.66), than when there was social contact and a stressful situation (2.41).

Figure 1

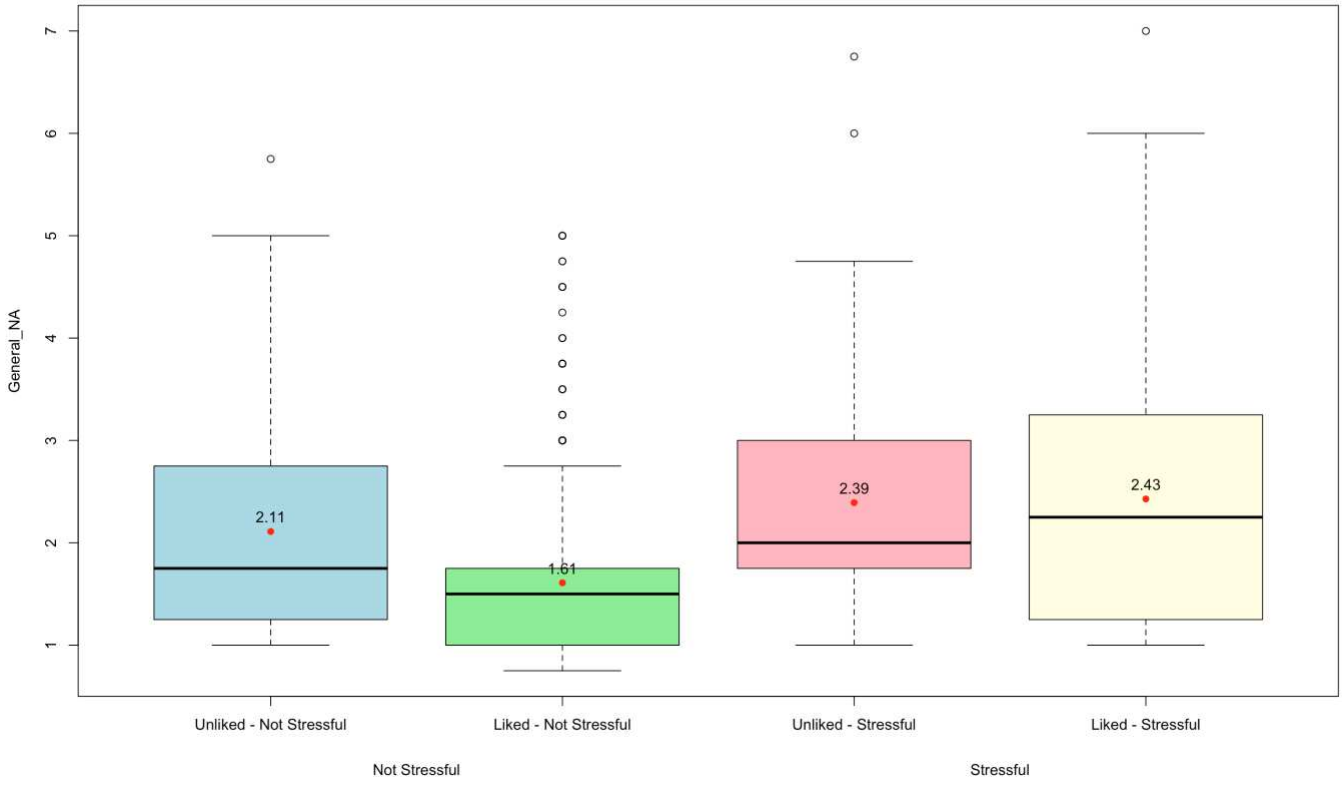
Boxplot comparing the means of the no social contact and social contact conditions when in no stressful situation and when in a stressful situation.



In Figure 2, the variables used for the 2nd hypothesis were again compared under the four different conditions. When there was rather unliked social contact in no stressful situation, the mean of negative affect was higher (2.11), compared to the mean of rather liked social contact when in no stressful situation (1.61). When a person was with rather unliked social contact in a stressful situation, the mean of negative affect was lower (2.39) than when with rather liked social contact (2.43).

Figure 2

Boxplot comparing the means of liked social contact and unliked social contact condition when in no stressful situation and when in a stressful situation



As indicated in Table 4, five different categories of social contact were tested on their relation to negative affect and respectively applied in an interaction effect with stressful event. The interaction of stressful event with the social contact categories family (*B=-0.21, p=.11*), friend (*B=0.11, p=.36*), romantic partner (*B=-0.09, p=.46*) and an unknown person (*B=-0.15, p=.23*), were all found to be insignificantly related to negative affect. The interaction of stressful event with social contact of a colleague was positively significant related to negative affect (*B=-0.29, p=.02*).

Table 4

Output of Linear Mixed Model for the 3rd Hypothesis

Independent Variable	*Estimate*	*SE*	*df*	*t*	*Sig*	*Confidence Interval*
3rd Hypothesis						
Stressful Event	0.74	0.06	2120.15	12.52	<0.01	[0.62, 0.85]
Family	-0.01	0.05	2131.48	-0.06	0.93	[-0.12, 0.11]
Friend	-0.16	0.04	2125.82	-3.30	<0.01	[-0.27, -0.06]
Romantic Partner	-0.21	0.07	2154.79	-3.30	<0.01	[-0.33, -0.08]
Colleague	0.05	0.07	2123.22	0.73	0.45	[-0.08, 0.18]
Unknown	-0.08	0.08	2122.85	-1.04	0.30	[-0.23, 0.06]
Stressful Event * Family	-0.21	0.13	2114.77	-1.60	0.11	[-0.45, 0.04]
Stressful Event * Friend	0.11	0.12	2116.88	0.92	0.36	[-0.12, 0.33]
Stressful Event * Romantic Partner	-0.09	0.12	2116.98	-0.73	0.46	[-0.36, 0.16]
Stressful Event * Colleague	-0.29	0.14	2115.91	-2.21	0.02	[-0.56, -0.03]
Stressful Event * Unknown	-0.15	0.14	2114.64	-1.18	0.23	[-0.43, 0.10]

Discussion

This study investigated whether social contact moderates the relationship between stressful events and negative affect. Thereby, this research was led by the hypothesis that social contact, rather liked social contact and different types of social contact (Friend, Family, Romantic Partner, Colleague, Unknown) reduce negative affect in people when in a stressful situation and thus, moderate the association of stressful events and negative affect. Contrary it was hypothesised that rather unliked social contact increases negative affect in stressful situations.

This study found no significant effect of social contact on the association of stressful events and negative affect. A possible explanation for this finding is stated in previous research by Weil et al. (2012), who found that social involvement first exposes people to heightened stress levels in stressful situations. Only over time the social involvement starts to buffer the stress significantly. This is explained by the notion that in stressful situations, the social environment places increased demand on individuals. However, after the stressful experience passes, the social environment helps to buffer the experienced stress. In this study, negative affect was assessed in a time span of a maximum of one hour after the stressful event. Under the findings by Weil et al. (2012), the assessment of negative affect could have been too early after experiencing the stressful event, so no significant decreases in negative affect have occurred. Future research could conduct a repeated measurement with one measurement close to the stressful situation and another a few hours later to investigate if over time significant differences in negative affect emerge. Repeated measurements, have the advantage to capture within-person variations and thus, provide a more nuanced understanding of the variables of interest (Adolf et al., 2014)

Likewise, to social contact, rather liked and rather unliked social contact showed no significant effect on the association. In a study by McFadden et al. (2009), individuals shared more negative emotions with close people as they felt more comfortable than with people they knew for shorter periods of time. Further, the authors argue that emotions must first be experienced before they can be shared. Suggesting, rather liked social contact makes individuals feel comfortable, this could lead to releases of negative emotions as one feels in a safe environment. This in turn, could lead to increased levels of negative affect and explain the insignificane of the second hypothesis. The findings by Weil et al. (2012), could as well be a possible explanation for the insignificance of both rather liked and rather unliked social contact.

Another possible explanation could be found in measurement error. According to Higgins & Straub (2006), using well-validated and exact measurement scales is crucial to account for measurement error. The questions administered in this study to distinguish between rather liked and rather unliked social contact are not validated but only supported by other studies using them in their study designs (Jung, 2021; Veltmann, 2021). Also, the preciseness of the scales in assessing rather liked and rather unliked social contact is not validated. The participants indicated on a scale from 1 (not at all) to 7 (very much) how much they liked the company at the time of an assessment. First, the cut-off to distinguish between rather liked and rather unliked social contact was determined to be "4", so all indication of 4 or below were coded as rather unliked and from 5 or above as rather liked social contact. However, it was found that rather liked contact was assessed noticeably more often than rather disliked contact. Thus, a cut-off of 5 was chosen, with all indications of 5 or below being coded as rather unliked and from 6 or above as rather liked social contact. This cut-off produced a more even distribution between rather liked and rather unliked social contact. However, participants could have experienced a social contact as rather liked from an

indication of 3 or 4 already. For this, ambiguity was not accounted for. Thus, for future research it can be recommended to use validated questionnaires to account for measurement error.

Next, the analysis showed that most types of social contact (Family, Romantic Partner, Colleague, Unknown) had no significant effect on the relationship of stressful event and negative affect. Solely the interaction with social contact of a colleague exhibited a significant effect. These findings are interesting as one could assume that social contact with a person very close to oneself is more effective in buffering stress than with a more unfamiliar person. However, as delineated above, the findings by McFadden et al. (2009), could explain why social contact with a colleague significantly moderates the relationship between stressful events and negative affect. While closer social contact with friends, family and romantic partner do not. Also, existing literature on social contact in the work field found that positive interactions with colleagues increase well-being, which aligns with this study's finding (Warren et al., 2017; Ragins & Dutton, 2006).

A possible explanation for the insignificance of most findings of this study are between- and within-person measurements. The importance of within-person measurements has been extensively argued in existing literature, as most psychological theories or models seek to conclude relationships or processes that occur within individuals (Curran & Bauer, 2011; Hamaker, 2012). One can only infer between-person and within-person measurements if stringent statistical ergodicity assumptions are met (Kraiss et al., 2022). This means that the measured effects are consistent across individuals and lasting over time (Voelkle et al., 2014). As these assumptions are not accounted for, and no within-person measurements were conducted, individual fluctuation could provide different insights. It could be that individuals vary extensively in how they perceive the role of social contact association with stressful

events and negative affect. For future research, it would be interesting to look at within-person associations to account for possible fluctuations in how people perceive the role of social contact on the association of stressful events and negative affect.

Lastly, a factor that also needs to be considered is the statistical power of this study. Due to the low response rate in this study, only 67 participants could be integrated in the data analysis. Statistical power can be defined as the likelihood of determining whether the population effect one is looking for is present in the sample (Phillips & Jiang, 2016). It could be that due to the rather small sample size, this study is missing the statistical power to find significant results. For Future research a larger sample size could provide more statistical power (Vangeneugden, 2004).

Strengths & Limitations

The main strength of this study is the experience sampling methodology, which gives an insight into the momentary levels of negative affect when a stressful event is present or absent. This kind of momentary measurement allows for more detailed information and high accuracy as retrospective bias is accounted for (Hogarth et al., 2007). Another strength of this study is that the sample was rather equally distributed in terms of the status of employment. 43 per cent of this sample were students, while 31 per cent of this sample belonged to the working population. Thus, participants were in different life stages, which allows to draw more nuanced inferences about the real-life applicability of this study. Also, this study had a high data collection frequency compared to other studies (Brockman et al., 2016; Johnson et al., 2016), which has the advantage of providing more information and, thus, give a more detailed insight into the psychological processes.

However, the low compliance rate in this study poses a limitation to this research. Half of the initial sample was excluded in this study even though a minimum response rate

criterion of 30% was applied. Previous studies also used a similar threshold (e.g., Wouters et al., 2018; Field, 2013). However, a meta-review of ESM studies reported an average compliance rate of 69% (Van Berkel et al., 2017). Also, the offering of incentives like a 40-euro voucher and Sona points for students from the University of Twente did not suffice to achieve a higher response rate. This is contrary to recent literature which stated these kinds of incentives increase response rates (Van Berkel et al., 2017). A possible explanation for this low response rate is that 31 percent of the sample were of the working population. Being at work, might decrease the possibilities to look at the phone and check for study notifications. Besides, the low response rate, another limitation is that 92% of the sample are German with 43 percent being students, which makes the sample homogenous and limits generalizability of the study.

Conclusion

To conclude, this research gives new insight how social contact influences negative affect in stressful events. Due to the experience sampling methodology, the observations are natural and accurate to everyday life. However, contrary to the expectations most findings showed no significant moderation effect of social contact. Implications of this study are that repeated-measurement designs are an interesting future direction as they provide a more nuanced picture of the temporal trajectory of the variables of interest. Also, within-person designs could provide interesting new insights as they might reveal explanations in individuell differences.

References

Adolf, J., Schuurman, N. K., Borkenau, P., Borsboom, D., & Dolan, C. V. (2014). Measurement invariance within and between individuals: A distinct problem in testing the equivalence of intra- and inter-individual model structures. *Frontiers in Psychology*, *5*. https://doi.org/10.3389/fpsyg.2014.00883

Amato, P. (2015). Marriage, cohabitation and mental health. Family Matters, 96, 5-13.Antonucci, T., Lansford, J., & Akiyama, H. (2010). Impact of Positive and Negative Aspects of Marital Relationships and Friendships on Well-Being of Older Adults. Applied Developmental Science, 5(2), 68-75. https://doi.org/10.1207/S1532480XADS0502_2

American Psychological Association. (2017). Stress in America: The State of Our Nation. https://www.apa.org/news/press/releases/stress/2017/state-nation.pdf

Bates, D., Mächler, M., Bolker, B., & Walker, S. (2014). Fitting Linear Mixed-Effects Models using lme4. arXiv (Cornell University). https://doi.org/10.48550/arxiv.1406.5823

Brockman, R., Ciarrochi, J., Parker, P., & Kashdan, T. (2016): Emotion regulation strategies in daily life: mindfulness, cognitive reappraisal and emotion suppression. *Cognitive Behaviour Therapy*, 46, 91-113. https://doi.org/10.1080/16506073.2016.1218926

Cheng, A., & Kelly, P. J. (2011). Application of a Hierarchical Model Incorporating Intrafamily Correlation and Cluster Effects. Nursing Research, 60(3), 208–212. https://doi.org/10.1097/nnr.0b013e31820a3dbe

Curran, P. J., & Bauer, D. J. (2011). The disaggregation of within-person and between-person effects in longitudinal models of change. Annual Review of Psychology, 62, 583–619. https://doi.org/10.1146/annurev.psych.093008.100356

ESM Item Repository. (n.d.). ESM Item Repository. https://esmitemrepositoryinfo.com/

Etikan, I., Musa, S. I., & Alkassim, R. (2016). Comparison of Convenience Sampling and Purposive Sampling. American Journal of Theoretical and Applied Statistics, 5(1), 1. https://doi.org/10.11648/j.ajtas.20160501.11

eWu, G., eFeder, A., eCohen, H., Kim, J. J., eCalderon, S., Charney, D. S., & Mathé, A. A. (2013). Understanding resilience. Frontiers in Behavioral Neuroscience, 7. https://doi.org/10.3389/fnbeh.2013.00010

Fleshner, M., Maier, S. F., Lyons, D., & Raskind, M. A. (2011). The neurobiology of the stress-resistant brain. Stress, 14(5), 498–502. https://doi.org/10.3109/10253890.2011.596865

Francis, L.J., Laycock, P., & Brewster, C.E. (2017). Work-Related Psychological Wellbeing: Testing the Balanced Affect Model among Anglican Clergy. *Religion, 8*, 118.

Garmezy N, Masten AS, Tellegen A. 1984. The study of stress and competence in children: a building block for developmental psychopathology. Child Dev. 55:97–111

Geschwind, N., Peeters, F., Jacobs, N., Delespaul, P., Derom, C., Thiery, E., van Os, J., & Wichers, M. (2010). Meeting risk with resilience: high daily life reward experience

preserves mental health. Acta Psychiatr Scand, 122(2), 129-138. https://doi.org/10.1111/j.1600-0447.2009.01525.x

Gueorguieva, R., & Krystal, J. H. (2004). Move Over ANOVA. Archives of General Psychiatry, 61(3), 310. https://doi.org/10.1001/archpsyc.61.3.310

Gross, J. J. and John, O. 2003. Individual differences in two emotion-regulation processes: Implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*, 85: 348–362.

Habets, P., Delespaul, P., & Jeandarme, I. (2022). The Importance of Context: An ESM Study in Forensic Psychiatry. Int J Offender Ther Comp Criminol, 66(1), 84-97. https://doi.org/10.1177/0306624X20986530

Hartmann, J. A., Wichers, M., Menne-Lothmann, C., Kramer, I., Viechtbauer, W., Peeters, F., ... & Simons, C. J. (2015). Experience sampling-based personalized feedback and positive affect: a randomized controlled trial in depressed patients. https://doi.org/10.1371/journal.pone.0128095

Higgins, P. A., & Straub, A. J. (2006). Understanding the error of our ways: Mapping the concepts of validity and reliability. *Nursing Outlook*, *54*(1), 23–29. https://doi.org/10.1016/j.outlook.2004.12.004

Holt-Lunstad, J., Smith, T. W., & Layton, J. B. (2010). Social Relationships and Mortality Risk: A Meta-analytic Review. PLOS Medicine, 7(7), e1000316. https://doi.org/10.1371/journal.pmed.1000316

Hogarth, R. M., Portell, M., & Cuxart, A. (2007). What risks do people perceive in everyday life? A perspective gained from the experience sampling method (ESM). *Risk Analysis: An International Journal*, *27*(6), 1427-1439. https://doi.org/10.1111/j.1539-6924.2007.00978.x

Hubbard, P., Muhlenkamp, A. F., & Brown, N. (1984). The relationship between social support and self-care practices. *Nursing Research*.

Jung, J.A. (2021) *Exploring the Relationship between Social Contact and Well-Being among University Students: An Experience Sampling Study* [Master's Thesis, University of Twente]

Joseph, D. L., Chan, M. Y., Heintzelman, S. J., Tay, L., Diener, E., & Scotney, V. S. (2020). The manipulation of affect: A meta-analysis of affect induction procedures. *Psychological Bulletin*, *146*(4), 355–375. https://doi.org/10.1037/bul0000224

Johnson, J., O'Connor, D. B., Jones, C., Jackson, C., Hughes, G. J., & Ferguson, E. (2016). Reappraisal buffers the association between stress and negative mood measured over 14 days: Implications for understanding psychological resilience. *European Journal of Personality*, *30*(6), 608–617. https://doi.org/10.1002/per.2080

Kansky, J., & Diener, E. (2017). Benefits of well-being: Health, social relationships, work, and resilience. *Journal of Positive Psychology and Wellbeing*, *1*(2), 129–169. https://journalppw.com/index.php/jppw/article/view/15

Kaul, M., & Lakey, B. (2003). Where is the support in perceived support? The role of generic relationship satisfaction and enacted support in perceived support's relation to low distress. Journal of Social & Clinical Psychology, 22, 59–78.

Kivimäki, M., Virtanen, M., Elovainio, M., Kouvonen, A., Väänänen, A., & Vahtera, J. (2006). Work stress in the etiology of coronary heart disease—a meta-analysis. *Scandinavian journal of work, environment & health*, 431-442.

Kornieko, O. & Santos, C. (2013). The Effects of Friendship Network Popularity on Depressive Symptoms During Early Adolescence: Moderation by Fear of Negative Evaluation and Gender. Journal of Youth Adolescence, 43, 541–553.https://doi.org/10.1007/s10964-013-9979-4

Kuranova, A., Booij, S. H., Menne-Lothmann, C., Decoster, J., van Winkel, R., Delespaul, P., ... & Wichers, M. (2020). Measuring resilience prospectively as the speed of affect recovery in daily life: a complex systems perspective on mental health. BMC medicine, 18(1), 1-11

Kraiss, J. T., Kohlhoff, M., & Klooster, P. M. T. (2022b). Disentangling between- and within-person associations of psychological distress and mental well-being: An experience sampling study examining the dual continua model of mental health among university students. Current Psychology. https://doi.org/10.1007/s12144-022-02942-1

Lataster, T., Valmaggia, L., Lardinois, M., Van Os, J., & Myin-Germeys, I. (2013). Increased stress reactivity: a mechanism specifically associated with the positive symptoms of psychotic disorder. Psychological Medicine, 43(7), 1389–1400. https://doi.org/10.1017/s0033291712002279

Lo, R. (2002). A longitudinal study of perceived level of stress, coping and self-esteem of undergraduate nursing students: an Australian case study. Journal of Advanced Nursing, 39(2), 119–126. https://doi.org/10.1046/j.1365-2648.2000.02251.x

Luthar SS, Cicchetti D, Becker B. 2000. The construct of resilience: a critical evaluation and guidelines for future work. Child Dev. 71:543–62

Masten AS, Powell JL. 2003. A resilience framework for research, policy, and practice. See Ref. 63a, pp. 1–28

McFadden, S. H., Knepple, A. M., & Ba, J. D. S. (2009). Length and Locus of Friendship Influence Church Members' Sense of Social Support and Comfort with Sharing Emotions. *Journal of Religious Gerontology*, *15*(4), 39–55. https://doi.org/10.1300/j078v15n04_04

Mertika, A., Mitskidou, P., & Stalikas, A. (2020). "Positive Relationships" and their impact on wellbeing: A review of current literature. Ψυχολογία. Το Περιοδικό Της Ελληνικής Ψυχολογικής Εταιρείας, 25(1), 115. https://doi.org/10.12681/psy_hps.25340

Myers, M. (2000). Qualitative research and the generalizability question: Standing firm with proteus. *The Qualitative Report*. https://doi.org/10.46743/2160-3715/2000.2925

Quartana, P. J., & Burns, J. A. (2010). Emotion suppression affects cardiovascular responses to initial and subsequent laboratory stressors. British Journal of Health Psychology, 15(3), 511–528. https://doi.org/10.1348/135910709x474613

Phillips, G., & Jiang, T. (2016). Measurement Error and Equating Error in Power Analysis. *Practical Assessment, Research and Evaluation.*

Ragins, B., and J. Dutton. "Positive relationships at work: An invitation and introduction." *Exploring positive relationships at work: Building a theoretical and research foundation* (2006): 3-28.

Rahimi, B., Baetz, M., Bowen, R., Balbuena, L. (2014). Resilience, stress, and coping among Canadian medical students. PubMed. https://pubmed.ncbi.nlm.nih.gov/26451221/

Sandstrom, G. M., & Dunn, E. W. (2014). Social interactions and well-being: The surprising power of weak ties. *Personality and Social Psychology Bulletin*, *40*(7), 910-922. https://doi.org/10.1177/0146167214529799

Shiffman, S., Stone, A. A., & Hufford, M. R. (2008). Ecological momentary assessment. Annual Review of Clinical Psychology, 4, 1-32. https://doi.org/10.1146/annurev.clinpsy.3.022806.091415

Silverstein, L. B., Auerbach, C. F., & Levant, R. F. (2006). Using qualitative research to strengthen clinical practice. *Professional Psychology: Research and Practice*, *37*(4), 351–358. https://doi.org/10.1037/0735-7028.37.4.351

Smith, T. W., Ruiz, J. M., Cundiff, J. M., Baron, K. G., & Nealey-Moore, J. B. (2013). Optimism and pessimism in social context: An interpersonal perspective on resilience and risk. Journal of Research in Personality, 47(5), 562. https://doi.org/10.1016/j.jrp.2013.04.006

Telzer, E., Fuligni, A., Lieberman, M., Miernicki, M., & Galvan, A. (2015) The quality of adolescents' peer relationships modulates neuralsensitivity to risk taking. Social Cognitive and Affective Neuroscience, 10(3),389–398.https://doi.org/10.1093/scan/nsu064

Thompson, E. R. (2007). Positive and Negative Affect Schedule (PANAS): Development and validation of an internationally reliable short-form of the Positive and Negative Affect Schedule (PANAS). *Journal of Cross-Cultural Psychology*, *38*, 227-242. https://doi.org/10.1177/0022022106297301

Thompson, G. (2018). The roles of attachment and resilience in perceived stress in medical students. PubMed Central. (PMC). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6260503/

Ungar, M. (2015). Resilience and Culture: The Diversity of Protective Processes and Positive Adaptation. *Cross-cultural Advancements in Positive Psychology*, 37–48. https://doi.org/10.1007/978-94-017-9415-2_3

Vaessen, T., Viechtbauer, W., van der Steen, Y., Gayer-Anderson, C., Kempton, M. J., Valmaggia, L., ... & Myin-Germeys, I. (2019). Recovery from daily-life stressors in early and chronic psychosis. Schizophrenia Research, 213, 32-39.

Van Berkel, N., Ferreira, D., & Kostakos, V. (2017). The Experience Sampling Method on Mobile Devices. ACM Computing Surveys, 50(6), 1–40. https://doi.org/10.1145/3123988

Van Harmelen, A., Kievit, R. A., Ioannidis, K., Neufeld, S., Jones, P. B., Bullmore, E. T., Dolan, R. J., Fonagy, P., & Goodyer, I. M. (2017). Adolescent friendships predict later resilient functioning across psychosocial domains in a healthy community cohort. *Psychological Medicine*, *47*(13), 2312–2322. https://doi.org/10.1017/s0033291717000836

Vangeneugden, T., Laenen, A., Geys, H., Renard, D., & Molenberghs, G. (2004). Applying linear mixed models to estimate reliability in clinical trial data with repeated measurements. Controlled Clinical Trials, 25(1), 13–30. https://doi.org/10.1016/j.cct.2003.08.009

Velozo, J. D. C., Lafit, G., Viechtbauer, W., van Amelsvoort, T., Schruers, K., Marcelis, M., ... & Vaessen, T. (2023). Delayed affective recovery to daily-life stressors signals a risk for depression. Journal of Affective Disorders, 320, 499-506.

Veltmann, J.F. (2021) *Anxiety, Well-being, and Social Contacts in Daily Life of Students: An Experience Sampling Study* [Master's Thesis, University of Twente]

Vittengl, J. R., & Holt, C. S. (2000). Getting acquainted: The relationship of self-disclosure and social attraction to positive affect. *Journal of Social and Personal Relationships*, *17*(1), 53-66.

Voelkle, M. C., Brose, A., Schmiedek, F., & Lindenberger, U. (2014). Toward a Unified Framework for the Study of Between-Person and Within-Person Structures: Building a Bridge Between Two Research Paradigms. *Multivariate Behavioral Research*, *49*(3), 193–213. https://doi.org/10.1080/00273171.2014.889593

Warren, M. A., Donaldson, S. I., & Luthans, F. (2017). Taking positive psychology to the workplace: Positive organizational psychology, positive organizational behavior, and positive organizational scholarship. Scientific advances in positive psychology, 195-227. https://doi.org/10.1080/17439761003790930

Weil, F. D., Lee, M. K. O., & Shihadeh, E. S. (2012). The burdens of social capital: How socially-involved people dealt with stress after Hurricane Katrina. *Social Science Research*, *41*(1), 110–119. https://doi.org/10.1016/j.ssresearch.2011.06.006

Wouters, S., Thewissen, V., Duif, M., van Bree, R. J., Lechner, L., & Jacobs, N. (2018). Habit strength and between-meal snacking in daily life: The moderating role of level of Education. *Public Health Nutrition*, *21*(14), 2595–2605. https://doi.org/10.1017/s1368980018001283

Woodward, E. N., Walsh, J. L., Senn, T. E., & Carey, M. P. (2018). Positive social interaction offsets impact of low socioeconomic status on stress. *Journal of the*

National Medical Association, *110*(4), 371–377. https://doi.org/10.1016/j.jnma.2017.07.006

Zautra, A. J., Hall, J. S., & Murray, K. E. (2010). Resilience: a new definition of health for people and communities.

Appendix

Appendix A

Informed Consent

Dear participant,

Thank you for your participation in this study.

Brief summary of the project:

The study is using the Experience Sampling Method (ESM) to obtain data. This means that 10 times a day there will be a prompt to answer a questionnaire containing about 20 items, which will take about 1 minute to complete. The questions regard your psychological well-being in the specific moment you are receiving the questionnaire and the time in-between questionnaires. It is important to fill out as many questionnaires as possible to ensure the success of the project.

To participate in this study, we need to ensure that you understand the nature of the research, as outlined in the participant information sheet. Please confirm at the bottom of the page to indicate that you understand and agree to the following conditions:

- I confirm that I have read the participant information sheet for this study. I have had the opportunity to consider the information, ask questions, and have had these answered satisfactorily
- I understand that to take part in this study, I should
- Be at least 18 years old
- Possess a basic level of English
- I understand that personal data about me will be collected for the purposes of the research study including age, gender, nationality, level of education, current studies, and

primary occupation, and this data will be processed completely anonymous and in accordance with data protection regulations.

- I understand that taking part in this study involves that I will be filling in 10 questionnaires every day for one week.
- I am voluntarily taking part in this research, and I know that I can stop the research at any time without giving any reason, without my rights being affected
- I don't expect to receive any benefit or payment for my participation.
- I understand that I am free to contact the researchers or supervisor with any questions I may have in the future.
- I understand that the data collected in this study will be anonymized, and only be used for academic purposes i.e., writing a thesis for the bachelor and/or master.
- I understand that personal data that will be collected within this study will not be shared with anyone other than the study team.
- I agree to take part in this study.

If you have questions about your rights as a research participant, or wish to obtain information, ask questions, or discuss any concerns about this study with someone other than the researcher(s), please contact the Secretary of the Ethics Committee/domain Humanities & Social Sciences of the Faculty of Behavioural, Management and Social Sciences at the University of Twente by ethicscommittee-hss@utwente.nl

Appendix B

Baseline Questionnaires

Triggered once in the beginning, reminder after 8, 24 and 72 hours, does not expire

Demographics

- Age: How old are you?
- Gender: What gender do you identify as? Male, female, other
- Nationality: What is your nationality? Dutch German Other
- Occupation: What is your current occupation? Student, Working, Self-employed, studying and working, not working, other
- Highest degree obtained: Middle school (such as MBO, MTS, MEAO or Haupt- oder Realschule), High school (such as HAVO, VWO, HBS or Gymnasium/ Berufsschule/ Berufskolleg), High school, Bachelor, Master, PhD, Other

Appendix C

ESM Questionnaires

Negative Affect

Below you can find several questions about your current feelings. Please try to indicate how you felt right before you started to answer the questionnaire!

- How *anxious* do you feel right now?
- How *irritable* do you feel right now?
- How *down* do you feel right now?
- How *guilty* do you feel right now?
    - 1 (not at all) to 7 (very much)

Stressful Events

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

- -3 (very unpleasant) to +3 (very pleasant)

Social context

Who are you with right now?

- Family member, friend, romantic partner, co-worker/fellow-student, unknown people/others, I am alone

If not alone:

- I like this company:

  1 (not at all) to 7 (very much)