The Relationship Between Sleep Quality and Social Support Concerning Daily Stress-Related Growth in Students

Pia Kronenfeld

Faculty of Behavioural, Management, and Social Sciences (BMS)
Department of Psychology, University of Twente
202000384: BSc Thesis Psychology

First Supervisor: Yudit Namer
Second Supervisor: Dr. Mirjam Radstaak

July 4th, 2023

Abstract

The current study investigated the relationship between students' everyday stress-related growth, sleep quality, and social support. This study contributed to the current state of research regarding factors that influence daily stress-related growth. Accordingly, a quantitative, longitudinal study using experience sampling was conducted to answer the research question *To what extent is daily stress-related growth associated with sleep quality and social support in students?* Data was gathered via an app that displayed the variables' questionnaires for the 63 participants. A correlation matrix and a linear mixed-effects model were utilised to evaluate the effect of social support on growth and social support as a moderator in the relationship between sleep quality and growth. The results showed a positive correlation between social support and growth in the context of daily stress. However, there was no significant correlation between sleep quality and growth when moderating for social support. The findings supported the assumption already made in earlier research that social support contributes to facilitating stress processing, particularly in the current study context of stress-related growth. The survey promotes an understanding of factors that potentially lead to daily stress-related growth by emphasising the value of social support in fostering individual growth and resilience in the face of ongoing stress. Practical implications suggest the need to create a safe space for students, for instance, through peer support initiatives and social network-building tools. For future research, more extended study periods should be considered to explore a broader range of daily stress levels and improve inter-individual comparability.

The Relationship Between Sleep Quality and Social Support Concerning Daily Stress-Related Growth in Students

The perception of stress is a normal part of life, and its experience is natural and human. Physical and psychological signs of stress are a response to challenges or changes. This accompanying sense of physical and psychological tension can develop from anything that occupies an individual mentally, such as work, relationships, and financial issues (Felman, 2020). These feelings will eventually accompany everyone throughout their lives to let them get something done, to thoughtfully order a life-changing event, or consciously and deliberately solve a challenge (Felman, 2020). Not only can major life events lead to immediate or subsequent poor mental health outcomes, but everyday stressors and minor experiences can also play a role in developing mental issues if the individual has a hard time coping with them. Regular feelings of stress related to everyday events were linked to a rise in depression, anxiety, and other stress symptoms, as well as a decline in perceived well-being among students (Charles et al., 2013; Parrish et al., 2011; Schönfeld et al., 2018). High levels of reported stress and anxiety among university students are a worldwide concern, including in the Netherlands (Du et al., 2020; Robotham, 2008; Stoliker & Lafreniere, 2015).

However, stress is not only a burden. Research has shown that not every individual exposed to regular or occasional stress, whether perceived as major or minor, develops psychological problems or symptoms of possible mental illness (Sveen et al., 2016). Admitting to, facing, and overcoming feelings of stress can also yield positive outcomes at a later stage. The mental engagement with new possibilities after a challenge may also be a predictor of potential personal development, a harbinger of eventual positive changes and thought processes that may emerge following negative events (Roepke & Seligman, 2014). Also, a mixed-methods, partially longitudinal study by Park et al. (1996) found that people who participated in processing activities, such as breathing exercises, asking a friend for support, or physical engagement that helped them to overcome and solve their feelings of daily stress individually can experience improvements in self-esteem, spirituality, and social support. They were also more likely to be able to name and use coping skills that supported them. LoSavio et al. (2011) could confirm similar results based on daily events. Coming to stress-related growth, the positive mental development described above that may occur after processing stressful life events could already lead to an experience of stress-related growth (Park & Fenster, 2014). The willingness and attempt to deal with the life stressor, including coping mechanisms and reflective skills that help an individual to process, can lead to a positive change in the aftermath of stress, such as psychological, interpersonal, and spiritual growth, summarised as stress-

related growth. It may further lead to an improved self-concept and hopeful joy about now and the future because of the experienced successful ability to help oneself or get oneself helped in more challenging times and increase resilience (Park et al., 1996; Tedeschi et al., 1998). Daily stressful events can include arguments with family or friends or job-related stressors (Diehl et al., 2012; LoSavio et al., 2011). However, stress-related growth was mainly studied in the context of traumatic and major life events, and only a few studies have investigated the same effect based on daily events (Linley & Joseph, 2004; LoSavio et al., 2011).

Social Support as a Coping Mechanism

The usage of social support can be an effective and promising coping mechanism to overcome stressful situations and the unpleasant feelings that accompany them (Lam, 2018; Swickert & Hittner, 2009). Social support can consist of different interactions and processes. As the name suggests, it involves supportive contact with other people, mainly to seek advice or to talk about the stressor with one or more friends, social groups, larger communities, authorities, etc. It is a social exchange that can affect behaviour patterns, social cognition, as well as values (Lam, 2018). A cross-sectional quantitative study from Geckova (2003) found that adolescents who perceived their social support as satisfactory and meaningful also showed less evidence of lower mental health problems and higher resilience in comparison to young adults who felt less socially supported. This could be due to a lessing effect that social support can evoke in terms of a stressor by enhancing a person’s coping or encouraging them to reframe the situation as less adverse because of the support available (Lam, 2018). A new perspective on the given stressor may also foster stress-related growth, as the definition suggests effective coping mechanisms help to increase the likelihood of stress-related growth. It can also be said that regardless of stress and the use of direct social support, having social connections already has a direct beneficial impact on a person’s well-being and resilience. This, in turn, can facilitate the overcoming of stressors with greater ease (Goodwin, 2004; Lam, 2018), leading to the potential experience of stress-related growth, mainly because the use of social connection can foster the engagement and solving processes of dealing with stressors. The availability of social support may increase the potential willingness to address stressors, making growth more likely since it involves confronting the stressor. Accordingly, social support may be a potential source for achieving growth after experiencing daily stressful events.

Sleep Quality and Its Impact

Another crucial factor for an individual is the demand and importance of sleep and the effects of a good or bad night's rest. Poor sleep quality is associated with less academic achievement and poorer mental and physical health (Trockel et al., 2000). Moreover, it has been

reported that there is an association between perceived stress and sleep deprivation among university students (Du et al., 2020). It has also been found that lack of sleep could cause everyday academic-related stressors, such as “overthinking about my future” or “anxiety from exams” (Almojali et al., 2017, pp. 5-6), to be rated as more severe compared to someone who is well-rested (Almojali et al., 2017). However, the relationship can also be reversed, and it is unclear whether stress now affects sleep quality or sleep quality affects stress (Almojali et al., 2017; Li et al., 2019; Van Schalkwijk et al., 2015). Both tendencies could be due to neurological or emotional reasons since stressful feelings and thoughts can make falling asleep more difficult or vice versa (Li et al., 2019). When well-rested individuals are more likely to approach stressors with a calmer and more balanced mindset, it may lead to a new perspective that enables them to reframe the stressor and find new solutions that could foster stress-related growth. An ecological momentary assessment study found that the diary ratings of teacher participants with higher stress conditions at bedtime had significantly lower stress levels the following morning (Petersen et al., 2012). When a good night’s rest seems to have a buffering effect on the experience of stress in stressful life phases, it could create an opportunity for individuals to develop new perspectives and adaptive coping strategies that can decrease the overall severity of the stressor in their lives. Gaining a fresh outlook and effective coping mechanisms may contribute to stress-related growth and improved well-being. Additionally, regarding posttraumatic growth, the sleep quality of refugees was a promising predictor, and they had less psychological distress during therapy and faster therapeutic outcomes (Özdemir et al., 2021). Therefore, it may be concluded that something similar could arise for daily stressful periods and daily stress-related growth.

Social Support and Sleep Quality

Based on a cross-sectional quantitative study in Thailand, university students' poor sleep quality was highly correlated with factors such as the tendency to receive less and give less social support. This finding could be derived from both perspectives, i.e. people who sleep better and well seem to have more social support, and people who do not perceive their social support to be high or sufficient tend to sleep less and poorer (Cheng et al., 2012). In a longitudinal within-subjects study involving paramedics, it was found that sleep quality did not seem to be related to stressors at work if they received support within or outside their working environment. However, they found that paramedics under high stress and believed their social support was occasionally less available had poorer sleep quality. Their quality of sleep was perceived as more restful if their stress level at work decreased (Pow et al., 2017). In another cross-sectional and correlational design study, social support was found to be a moderator for

the effects of stress on sleep in adolescents. Academic stress led to poorer sleep quality, while less stress led to a better night's sleep. In addition, higher social support seemed to buffer the effects of stress on sleep quality and sleep reduction (Van Schalkwijk et al., 2015). These results indicate a relationship between social support and sleep quality as potential influencing stress-related growth factors. The development of adaptable coping strategies, in this case, social support, in the face of stressors could be facilitated by enough social support and better sleep quality.

Aim of the Present Study

The current state of research about contributing factors to daily stress-related growth is a new psychological insight and therefore has yet to explore to a fuller extent. According to the research above on general factors of stress, social support, sleep quality, and stress-related growth. This study seeks to shed light on the relationship between these variables, particularly in the context of students. It is of importance to investigate daily stress-related growth in students, to teach them and universities how to contribute to stress-related growth rather than allowing stress to become gruelling and overwhelming. Understanding factors that facilitate stress-related growth can assist universities and educators in promoting student resilience, enhancing well-being, and optimising academic performance. The results of the current investigation also hold implications for the broader field of psychology. This study can advance our understanding of mechanisms underpinning personal growth and resilience by examining stress-related growth in the context of everyday stressors. The research may provide insights applicable to various life areas outside the student population, shedding light on how people deal with stress and adapt to it. Further investigation into the elements and procedures that support personal growth in the face of ongoing stressors may be stimulated by this work, serving as a bias for future research on daily stress-related growth. This paper wants to contribute to the current state of research and aims to answer the research question *To what extent is daily stress-related growth associated with sleep quality and social support in students?* Thus, the goal of this study is to investigate the relationship between the variables of daily stress-related growth, sleep quality, and social support. Accordingly, the following hypotheses were formulated:

(H1) *Social support is expected to have a positive relationship with daily stress-related growth.*

Since social support is an effective coping strategy, as has already been evaluated above (Geckova, 2003; Goodwin et al., 2004; Lam, 2018; Park et al., 2004; Swickert & Hittner, 2009), it can be concluded that higher social support may be a predictor of the processing of stressful daily events and subsequently, it could also be more likely that stress-related growth happens.

(H2) *It is expected that social support (positively) moderates the relationship between sleep quality and daily stress-related growth.*

Hypothesis two is based on the study whose participants were paramedics, as it was found that the lower the social support was, the more the sleep quality decreased while high stressors occurred at work (Pow et al., 2017). Furthermore, in the study by Van Schalkwijk et al. (2015), social support was found to be a moderator that reduced the negative effect of stress on the sleep quality of their participants. This suggests that social support, if it reduces the stressors, may also increase the chances of stress-related growth, as social support can have a mitigating effect on a stressful event, increasing the likelihood that a person's coping mechanisms will be enhanced to achieve stress-related growth (Lam, 2018).

Method

Design

A quantitative between-subjects longitudinal experience sampling study was conducted to test the two hypotheses. The hypotheses suggest that daily stress-related growth is the dependent variable, whereas sleep quality and social support are the independent ones, as the possible effects of both on stress-related growth were investigated. The whole study will be conducted for about three weeks. However, participation for one volunteer takes seven days, and participants can choose a timeframe within those three weeks. The variables' questionnaires are displayed in an application that has to be downloaded by the participants. There were two measurements per day, in the morning, the sleep quality was assessed, and in the evening, the other questionnaires that measured social support and stress-related growth had to be filled out. Lastly, this study is part of a more extensive study, and other variables of other researchers are part of the design as well, which are not used in the context of the study.

Participants

Participants were recruited via convenience and snowball sampling. The study is based on a sample of initially 69 participants who are at least 18-year-old university students. They agreed to the informed consent and are proficient in English. They were allowed to withdraw from the study at any given time without giving a reason. The participants were enrolled in a time frame of three weeks. It was possible to sign up for the study through the University of Twente (UT) Sona system or via social media, namely Instagram and WhatsApp. UT students who registered for the study via the Sona system received credits for participation. After deleting invalid data, 63 participants remained in the dataset, of whom 38 identified as female (60.32%) and 25 as male (39.68%). Participants who did not complete at least one day with all

the three measured variables of the seven days were excluded from the analysis and considered invalid, as were participants who completed the same answers for more than two days. In total, there were 290 observations left after data cleaning. The remaining participants ranged between 18 and 27 years, of which a mean age of 22.49 can be calculated. 69.64% of the participants were German, 23.81% were Dutch, and 6.53% had another nationality, i.e. Ukrainian, American, Russian, or Hungarian. Psychology students were the most common, making up around one-third of the sample (36.51%). Hence, 11.11% studied International Business Management, 9.52% studied in the field of the natural sciences, further 9.52% in education and language. In total more than 10 study fields were present.

Materials

TIIM. TIIM is the short version for Twente Intervention and Interaction Machine, an application platform of the UT BMS Lab (The BMS Lab, 2023). It is designed to depict a given study and to collect the participants' responses to the used questionnaire and demographic data via their smartphones to make it as convenient as possible for participants to complete a study. The app creates a dataset the researcher can use to analyse the findings. It has been used in various research papers and in previous bachelor theses (Lentferink et al., 2023; Schlichter, N.L., 2022). TIIM displayed the entire questionnaire and notified participants of the completion of the selected questionnaire at a specific time of the day.

Sleeping Quality. The Pittsburgh Sleep Quality Index (PSQI) was chosen to measure the sleep quality variable (Buysse et al., 1989). It was initially a 10-item questionnaire, but only the first seven items were selected for this study as the information obtained for items eight, nine, and ten was not necessary for this study context. These ask whether participants are taking medication to fall asleep, whether they generally have trouble staying awake during the day, and whether they are lacking the enthusiasm to get things done. The PSQI then has a single-factor structure, and all questions can be answered with “yes” or “no”; however, a Likert scale version also exists. Accordingly, a maximum score of 7 and a minimum score of 0 can be achieved. A high score of 7 denotes poor sleep quality, and a score of 0 indicates satisfactory sleeping quality. The questionnaire can be found in Appendix B. The PSQI's reliability achieved an acceptable internal consistency of α = .73 in a study by Krističević et al. (2018) and Raniti et al. (2018).

Social Support. To assess the variable social support, the Brief-Coping Orientation Problems Experienced Inventory (Brief-COPE) questionnaire was used (Carver, 1997). It comprises 28 items, but those not intended to measure the coping mechanism of social support were excluded. In this case, the questionnaire is left with two subscales, instrumental support

and emotional support, with four remaining items, resulting in a bifactorial structure. Nonetheless, they are summarised as social support used for this study. The answers range on a Likert scale from one to four ("I haven't been doing this at all" to "I've been doing this a lot"), resulting in a maximum score of 16 and a minimum score of 4. The four items can be found in Appendix C. Research on these subscales indicated acceptable reliability with an α = .64 for instrumental support and an α = .71 for emotional support (Yusoff et al., 2010).

Stress-related Growth. For the stress-related growth variable, the Stress-Related Growth Scale Short Form (SRGS-SF) was used (De Oliveira et al., 2021). It is a 15-item questionnaire with responses ranging from zero to two, with zero meaning "not at all", with one meaning "a bit", and with two meaning "a lot". The single-factor structure leads to a minimum score of 0 to a maximum score of 30. The higher the score, the higher the growth measured. The entire questionnaire can be found in Appendix A. The SRGS-SF has a very high internal consistency reliability of α = .90 in a study by Caserta et al. (2009).

Procedure

The study was approved by the Ethics Committee of the UT Faculty for Behavioural Management and Social Science (BMS). After receiving approval, the sampling of the participants and gathering of data could begin. Data collection was scheduled for approximately three weeks and began on the 23rd of April. Consequently, the last day to sign up for the study was the 4th of May, so participants had one week to finish the seven days of participation. Once the participants signed up via the app, social media, or joining from the Sona system, the researchers had to manually assign them to the study for the next day as their first day of participation. On Sona and social media, a short informational text introduced the study, explained the purpose and participation, the inclusion and exclusion criteria, and provided a link to download the TIIM app where the questionnaires are displayed. Participation was possible on all devices; however, it was recommended to use the phone as the most convenient input device for the participants. More convenience was created due to the selectable timeframe within three weeks for seven days. There were two measurement times a day. In the morning, the sleep quality would be assessed, and in the evening, the other questionnaires measuring stress-related growth and social support had to be filled out.

On the first day, the students received a notification on their mobile phone at 6 pm ("Hey! It's time to start with the first questionnaire :-)"), as well as a reminder notification at 9 pm ("Have you already filled out the first questionnaire? :-)"), in the case the questionnaire had not been completed yet. The initial questionnaire consisted of the information form (Appendix D), informed consent form (Appendix E), and questions on demographic data, followed by

questions on all the variables measured daily. The daily questionnaire only continued for the participants after they had agreed to the informed consent form.

In the following six days, the participants were reminded twice to fill out the corresponding questionnaires. In the morning, at 8 am, they were asked about their sleeping quality ("Good morning :-) Did you sleep well? Tell us about it!") (Appendix B). If they had not yet completed the questionnaire, they received a reminder message at 11 am ("Hey, don't forget to tell us about how you slept last night :-)"). At 6 pm the second notification of the day arrived ("Hey :-) Did you experience stress today? Let us know!") to ask the participants to fill in the second part of the daily questionnaire, which asked about their social support and stress-related growth (Appendix A, Appendix C), as well as the other daily variables measured by the other researchers as mentioned earlier. Again, a reminder function was set up for 9 pm in case the questionnaire had not yet been completed ("Did you already fill out our daily survey? :-)").

Data analysis

To start working on the data analysis invalid data was removed first. 8.70% of the participants had to be excluded based on the criteria mentioned (in the Participants section). The data was then transferred to RStudio for further analysis.

Descriptive Statistics. Descriptive statistics such as the means, standard deviations, and interquartile ranges will be calculated to get an overview of the nature of the gathered data.

Normality Testing. A normality test was performed to determine if the data were normally distributed to be able to generalise the results to a larger population.

For this purpose, a bar plot was created to determine whether the sample responses conform to a normal distribution concerning the PSQI, Brief-Cope, and SRGS-SF. A normal distribution was desirable.

Reliability Analysis. Cronbach's alpha was calculated for the internal reliability of the questionnaires. A Cronbach's alpha above .6 is accepted, however, a more desirable value would be .7. Since the PSQI has a dichotomous response structure, the KR-21 was also tested to allow comparison with a better-fitting analysis.

Correlation Matrix. In order to answer H1 (*Social support is expected to have a positive relationship with daily stress-related growth.*), a correlation matrix was performed to see if a correlation between the Brief-Cope and SRGS-SF can be confirmed. Furthermore, the table provides an overview of all correlations between the variables. The following moderation analysis can further confirm or reject the potential relationship between social support and stress-related growth.

Moderation Analysis. To be able to answer H2 (*It is expected that social support (positively) moderates the relationship between sleep quality and daily stress-related growth.),* a moderation analysis was conducted using a linear mixed-effects model to investigate whether the relationship between stress-related growth and sleep quality is moderated by social support. A linear mixed effects model was chosen due to repeated measurements per participant and including Participant ID as a random intercept. The average connections between the predictor variables sleep, and the fixed effects represent social support and the outcome variable stress-related growth across all participants. The random effects capture the outcome variable stress-related growth variability that is unique to each level of the grouping variable (Participant ID). This model was tested for the Assumptions of Normality, Linearity, Homoscedasticity, and Multicollinearity.

Results

Descriptive Statistics

Descriptive statistics were calculated for the variables of interest. Table 1 displays the total mean values of all seven days, standard deviations, interquartile ranges (IQR) and Cronbach's alphas for the variables.

Table 1

Total means, standard deviations, interquartile ranges, and Cronbach's alphas

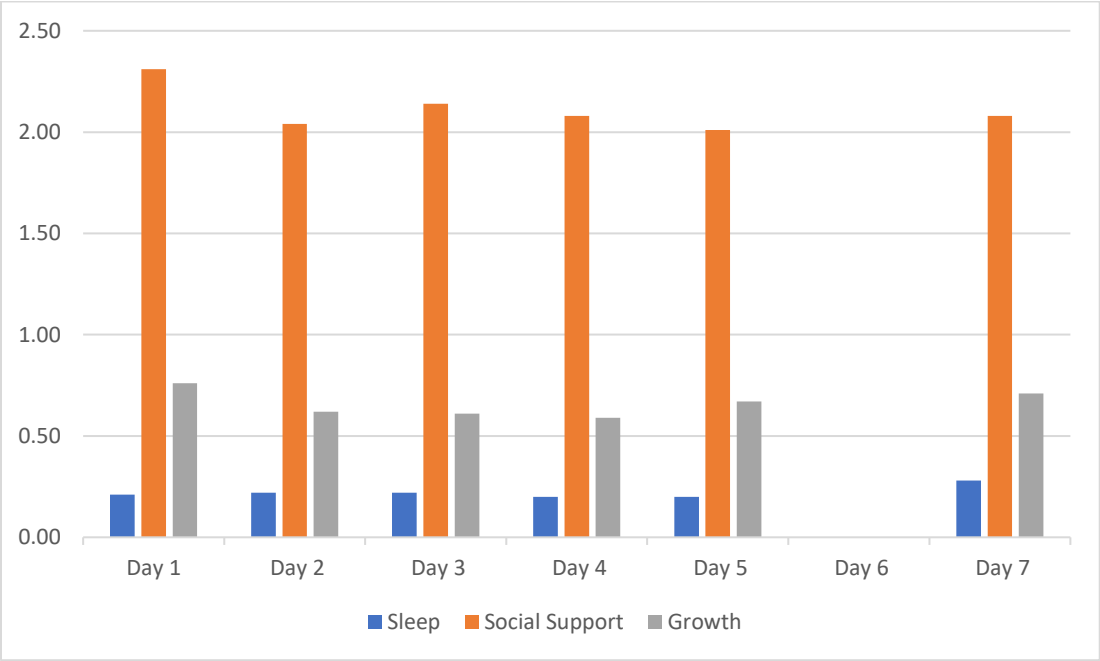
Variables	*M*	*SD*	*IQR*	*α*
Sleep Quality	.22	.22	0	.46
Social Support	2.13	1.01	2	.92
Stress-related Growth	.65	.47	1	.91

N = 63

Furthermore, to get an overview of the specific means per day, a bar chart displayed in Figure 1 was created to see the variables in relation to one another. The participants generally scored very low in terms of sleep quality, and social support was used to a moderate degree. Day 6 was lost due to technical difficulties in the TIIM app.

Figure 1

Means per day



Normality Testing

The normality testing via the creation of bar plots of the means of every variable showed that the data were not normally distributed for the three variables sleep quality, social support, and stress-related growth; instead, they were skewed to the left. Therefore, the sample scored above average in terms of sleep quality, below average in terms of social support, and below average in stress-related growth.

Sleep Quality

The mean value of sleep quality resulted in good sleep quality for the sample. Beyond this, the standard deviation suggested low variability in sleep quality scores among participants, and the *IQR* score indicated a narrow dispersion. Finally, Cronbach's alpha of $\alpha = .46$ indicated that the items measuring sleep quality may not be strongly correlated with each other. This must be interpreted with caution as KR-21, as well as the Guttmann test (to give it another try), would have been better suited to calculate internal consistency, probably because of the skewed dataset, which could not be performed.

Social Support

For social support, the mean indicated a moderate level of social support, and the standard deviation reflected notable variability in social support scores within the sample. The *IQR* represented a moderate dispersion of scores, and a good internal consistency of $\alpha = .92$ (,

α = .87 for emotional support and α = .86 for instrumental support) was shown based on Cronbach's alpha concerning the Brief-Cope.

Stress-related Growth

An average score of .65 for stress-related growth was recorded, indicating a moderate amount of growth brought on by stress. The standard deviation indicated some variation in participants' stress-related growth scores. A considerable degree of score dispersion was indicated by the *IQR*. As well, a very good internal consistency of α = .91 was given.

Correlation Table

A correlation table was printed to accept or reject H1, which is visible in Table 2. The observed correlation suggests a meaningful positive relationship with a magnitude of .52 between the two variables, social support and stress-related growth. H1 is therefore accepted.

Table 2

Correlation matrix for the mean scores of the variables Sleep Quality, Social Support, and Stress-related Growth (Growth)

	Sleep Quality	Social Support	Growth
Sleep Quality	_		
Social Support	.00	_	
Growth	.04*	.52*	_

* = important values context wise

Moderation Analysis

The moderation analysis was performed to either accept or reject H2 and to further confirm or reject H1. The assumptions of Normality, Linearity, Homoscedasticity, and Multicollinearity were met.

The relationship between social support and stress-related growth could be further confirmed (β = .17, *SE* = .03, t = 5.49, $p < .05$). No main effect was found between sleep quality and stress-related growth solely (β = .38, *SE* = .21, t = 1.68, $p > .05$). Furthermore, social support did not seem to have a moderating influence on the relationship between sleep quality and stress-related growth, as indicated by the lack of significance in the interaction term (β = -.10, *SE* = .09, t = -1.13, $p > .05$) as also visualised in Table 3.

Table 3

Moderation analysis findings

	β	*SE*	*t*	*p*
Main effect of Sleep Quality and Growth	.38	.21	1.68	> .05
Main effect of Social Support and Growth	.17	.03	5.49	< .05
Moderation of Social Support on S and Growth	-.10	.09	-1.13	> .05

N = 63

Discussion

This study examined the relationship between sleep quality and social support in students. Only an association between social support and stress-related growth has been found. The normality testing and the mean score of the responses gathered from the PSQI indicated high sleeping quality, below-average use of social support, and below-average stress-related growth. It is striking is that although (Dutch) students seem to show high levels of stress with partly high levels of sleeping problems (Du et al., 2020, Robotham, 2008; Stoliker & Lafreniere, 2015). The current study sample did not appear to have any severe difficulties with the quality of their sleep or even any trouble sleeping at all, making it furthermore difficult to investigate the effect of sleep quality on stress-related growth. The low reliability coefficient is likely rooted in the low variability of answers in the current study's sample for sleep quality affecting Cronbach's alpha which is generally considered a worse fit for calculating the reliability of dichotomous answer structures.

Lam (2018), as well as Swickert & Hittner (2009), demonstrated that social support helps with overcoming stressors with more ease. However, they were referring to overcoming stress in general and not specifically stress-related growth. Their findings align with our results in a sense, indicating that social support plays a crucial role not only in processing stressors but also in facilitating stress-related growth. Social support seems to be an effective coping mechanism for dealing with daily stress, as the current study suggests, and moreover, it makes the individual more resilient in coping with future stressors with greater ease (Geckova, 2003).

The results imply that social support is a valuable resource and acts as a crucial factor in facilitating personal development and resilience when individuals face daily stressful

situations, which influences not only the immediate experience of stress but also the long-term outcomes associated with stress-related growth. Social support enhances students' capacity to adapt, learn, and develop through stressful experiences, which provides a framework for understanding how social support contributes to individuals' overall well-being and growth.

To reduce the perception of stress in university students, it is crucial for them to actively engage with their social environment and seek opportunities for social support. This can help to maintain resilience and thus increase the possibility of not only stress-related growth, as shown in this study and previous research. Universities and educational institutions can implement interventions and programs that encourage the formation of robust and resilient support systems by recognising the importance of social support and by promoting an atmosphere favourable to human growth and well-being. Students who actively participate in social support networks might not only cope better with daily challenges but also unlock their potential for personal growth and resilience, making them more successful, satisfied, and capable rather than drained by university. This could prevent study results such as those of Charles et al., 2013, Parrish et al., 2011 and Schönfeld et al. 2018, who featured many drained students in their samples.

As mentioned in the introduction, lack of sleep among study participants can lead to stressors being rated as more severe compared to someone who is well-rested (Almojali et al., 2017). The low use of social support and the associated low stress-related growth in the current sample could be a sign of a less severe stress rating of the experienced stressors, which did not affect sleep quality. In the end, the students did use social support, even if below average, leading to the significant main effect of social support on growth. In terms of sleep quality, however, the current sample is most likely too uniform to conclude any effects. This could have reduced the ability to observe any patterns statistically with the responses of the PSQI.

Limitations and Strengths

First, convenience and snowball sampling may not serve the variety that could have been achieved. As mentioned above, the sample, mainly in terms of sleep quality, was too uniform. Additionally, the collaboration with other researchers, as mentioned in 'Methods', could bias the accuracy of the participant's responses, as they had to complete more questionnaires necessary for the present study. Some were even longer than the ones used for this purpose. The large size of the questionnaires as a whole might be a tiresome task that could lead to a lack of accuracy in answers.

Second, the low reliability coefficient for the PSQI was a significant limitation for the whole results part, making it unlikely to find an effect of sleep quality on stress-related growth in any way.

Third, time pressure forced learning-by-doing when working in the TIIM app. Therefore, it could not be assured that the first day of measuring sleep occurred in the morning. Assessing sleep in the morning would have been an essential factor in ensuring a correct recollection of the previous day's sleep. In the beginning, it was assumed that when people signed up, they can start directly with the questionnaire, which would have made it nearly impossible to measure sleep in the morning on the first day. It could not be assured that they will indeed start with the study in the morning. They could also have started at any other time of the day. It turned out later that the researchers were able to instruct the participants to begin with the study on the day after they signed up, thus assuring a start the following morning, which could not be altered anymore. However, on the other days, it could be assured. The sixth day of data collection was completely lost due to several technical difficulties beyond the control of the researchers, as no participant was able to complete a questionnaire on that day. In addition, some but not all participants were unable to continue with their seventh day of data collection.

While considering the strengths, it can be said that the current study approach in terms of a longitudinal experience sampling design for measuring daily stress-related growth in students is well suited to ensure changes in their experiences when considering an increased duration of data collection. TIIM, the mobile application, enhances the studies´ convenience, thus making participation more probable in comparison to completing a survey on a laptop or PC several times a day.

Implications for Future Research

For future quantitative longitudinal research, it would be necessary to conduct the study for a longer period of time with a more diverse sample, especially in terms of sleep quality, in order to gain more insights into potential effects and relationships between sleep quality and stress-related growth in students. This would also assure to find a possible moderating effect of social support on sleep quality and stress-related growth. The latter could be assured by choosing a different sampling method. Additionally, to dive deeper into the mechanism that may link the given constructs by exploring existing theoretical models and research that might assist the possible mechanism through which poor sleep quality might affect the development of stress-related growth.

Regarding social support, the development of theoretical models that explain how social support operates as personal growth outcomes and the conditions under which social support may have a stronger or weaker impact on stress-related growth could be investigated. For sleep, this could comprise cognitive, emotional, and physiological processes involved in sleep and daily stress-related growth. By including questions that ask about the perceived severity of the daily stressors, it could have been discovered if the severity and type of the stressor make a difference in later stress-related growth. It would be valuable to explore other individually different factors, such as personality traits, coping strategies, and general mental as well as physical well-being, and contextual factors, such as study field, gender, and university culture, to contribute to a more throughout theoretical comprehension of the related processes. Moreover, it would be interesting to include the severity and meaningfulness of the daily stressor. This could help to explore changes in stress-related growth and to explore if the individual rating of the meaningfulness of the stressful situation can influence engagement with social support and stress-related growth.

Conclusion

The present study findings gained valuable insights into a significant associative relationship between social support and subsequent daily stress-related growth. It still leaves the question of whether an effect on sleep quality and growth would have been expected if some people in the sample had shown signs of sleep deprivation. Hence, it remains open whether social support moderates the relationship between sleep quality and stress-related growth. Future research is needed to evaluate possible effects and relationships between sleep quality on daily stress-related growth with a sample that had greater variety in sleep quality.

This study adds to the existing knowledge by highlighting the positive association between social support and the ability to grow and develop from daily stressful experiences, making it more likely to manage similar situations with more ease in the future. An understanding was gained through the implementation of practical implications for promoting the well-being of students by fostering a supportive environment.

References

Almojali, A. I., Almalki, S. A., Alothman, A. S., Masuadi, E. M., & Alaqeel, M. K. (2017). The prevalence and association of stress with sleep quality among medical students. Journal of Epidemiology and Global Health, 7(3), 169. https://doi.org/10.1016/j.jegh.2017.04.005

Buysse, D. J., Reynolds, C. F., Monk, T. H., Berman, S., & Kupfer, D. J. (1989). The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Research-neuroimaging*, *28*(2), 193–213. https://doi.org/10.1016/0165-1781(89)90047-4

Carver, C. S. (1997). You want to measure coping but your protocol' too long: Consider the brief cope. *International Journal of Behavioral Medicine*, *4*(1), 92–100. https://doi.org/10.1207/s15327558ijbm0401_6

Caserta, M. S., Lund, D. A., Utz, R. L., & De Vries, B. (2009). Stress-related growth among the recently bereaved. *Aging & Mental Health*, *13*(3), 463–476. https://doi.org/10.1080/13607860802534641

Charles, S. T., Piazza, J. R., Mogle, J., Sliwinski, M. J., & Almeida, D. M. (2013). The Wear and Tear of Daily Stressors on Mental Health. Psychological Science, 24(5), 733–741. https://doi.org/10.1177/0956797612462222

Cheng, S. H., Shih, C. C., Lee, I. H., Hou, Y. W., Chen, K. C., Chen, K. T., Yang, Y. K., & Yang, Y. C. (2012). A study on the sleep quality of incoming university students. Psychiatry Research, 197(3), 270–274. https://doi.org/10.1016/j.psychres.2011.08.011

De Oliveira, M. L. F., Guerra, M. P., Lencastre, L., Castro, S. B. E., Moutinho, S., & Park, C. L. (2021). Stress-Related Growth Scale-Short Form: A Portuguese validation for cancer patients. *International Journal of Clinical and Health Psychology*, *21*(3), 100255. https://doi.org/10.1016/j.ijchp.2021.100255

Diehl, M., Hay, E. D., & Chui, H. C. (2012). Chapter 13
 Personal Risk and Resilience Factors in the Context of Daily Stress. *Annual Review of Gerontology and Geriatrics*, *32*(1), 251–274. https://doi.org/10.1891/0198-8794.32.251

Du, C., Zan, M. C. H., Cho, M. J., Fenton, J. I., Hsiao, P. Y., Hsiao, R., Keaver, L., Lai, C., Jung, J., Ludy, M., Shen, W., Chee, W. S. S., Thrivikraman, J., Tseng, K., Tseng, W., & Tucker, R. (2020). Increased Resilience Weakens the Relationship between Perceived Stress and Anxiety on Sleep Quality: A Moderated Mediation Analysis of Higher Education Students from 7 Countries. *Clocks & Sleep*, *2*(3), 334–353. https://doi.org/10.3390/clockssleep2030025

Felman, A. (2020, March 12). *Why stress happens and how to manage it*. https://www.medicalnewstoday.com/articles/145855

Geckova, A. (2003). Influence of social support on health among gender and socio-economic groups of adolescents. The European Journal of Public Health, 13(1), 44–50. https://doi.org/10.1093/eurpub/13.1.44

Goodwin, R., Costa, P., & Adonu, J. (2004). Social support and its consequences: 'Positive' and 'deficiency' values and their implications for support and self-esteem. British Journal of Social Psychology, 43(3), 465–474. https://doi.org/10.1348/0144666042038006

Krističević, T., Štefan, L., & Sporiš, G. (2018). The Associations between Sleep Duration and Sleep Quality with Body-Mass Index in a Large Sample of Young Adults. *International Journal of Environmental Research and Public Health*, *15*(4), 758. https://doi.org/10.3390/ijerph15040758

Lam, B. H. (2018). Understanding Social Support. Social Support, Well-Being, and Teacher Development, 29–83. https://doi.org/10.1007/978-981-13-3577-8_2

Lentferink, A., Oldenhuis, H., Velthuijsen, H., & Van Gemert-Pijnen, J. E. (2023). How Reflective Automated e-Coaching Can Help Employees Improve Their Capacity for Resilience: Mixed Methods Study. *JMIR Human Factors*, *10*, e34331. https://doi.org/10.2196/34331

Li, Y., Gu, S., Wang, Z., Li, H., Xu, X., Zhu, H., Deng, S., Ma, X., Feng, G., Wang, F., & Huang, J. H. (2019). Relationship Between Stressful Life Events and Sleep Quality: Rumination as a Mediator and Resilience as a Moderator. Frontiers in Psychiatry, 10. https://doi.org/10.3389/fpsyt.2019.00348

Linley, P. A., & Joseph, S. (2004). Positive change following trauma and adversity: A review. *Journal of Traumatic Stress*, *17*(1), 11–21. https://doi.org/10.1023/b:jots.0000014671.27856.7e

LoSavio, S. T., Cohen, L. H., Laurenceau, J. P., Dasch, K. B., Parrish, B. P., & Park, C. L. (2011). Reports of Stress-Related Growth From Daily Negative Events. Journal of Social and Clinical Psychology, 30(7), 760–785. https://doi.org/10.1521/jscp.2011.30.7.760

Özdemir, P. G., Kirli, U., & Asoglu, M. R. (2021). Investigation of the Associations between Posttraumatic Growth, Sleep Quality and Depression Symptoms in Syrian Refugees. *Eastern Journal of Medicine*, *26*(2), 265–272. https://doi.org/10.5505/ejm.2021.48108

Park, C. L., Cohen, L. H., & Murch, R. L. (1996). Assessment and Prediction of Stress-Related Growth. Journal of Personality, 64(1), 71–105. https://doi.org/10.1111/j.1467-6494.1996.tb00815.x

Park, C. L., & Fenster, J. R. (2004). Stress-Related Growth: Predictors of Occurrence and Correlates with Psychological Adjustment. Journal of Social and Clinical Psychology, 23(2), 195–215. https://doi.org/10.1521/jscp.23.2.195.31019

Parrish, B. P., Cohen, L. H., & Laurenceau, J. P. (2011). Prospective Relationship between Negative Affective Reactivity to Daily Stress and Depressive Symptoms. Journal of Social and Clinical Psychology, 30(3), 270–296. https://doi.org/10.1521/jscp.2011.30.3.270

Petersen, H., Kecklund, G., D'Onofrio, P., Nilsson, J., & Åkerstedt, T. (2012). Stress vulnerability and the effects of moderate daily stress on sleep polysomnography and subjective sleepiness. *Journal of Sleep Research*, *22*(1), 50–57. https://doi.org/10.1111/j.1365-2869.2012.01034.x

Pow, J., King, D. B., Stephenson, E., & DeLongis, A. (2017). Does social support buffer the effects of occupational stress on sleep quality among paramedics? A daily diary study. Journal of Occupational Health Psychology, 22(1), 71–85. https://doi.org/10.1037/a0040107

Raniti, M., Waloszek, J. M., Schwartz, O., Allen, N. B., & Trinder, J. (2018). Factor structure and psychometric properties of the Pittsburgh Sleep Quality Index in community-based adolescents. *Sleep*, *41*(6). https://doi.org/10.1093/sleep/zsy066

Robotham, D. (2008). Stress among higher education students: towards a research agenda. *Higher Education*, *56*(6), 735–746. https://doi.org/10.1007/s10734-008-9137-1

Roepke, A. M., & Seligman, M. E. (2014). Doors opening: A mechanism for growth after adversity. The Journal of Positive Psychology, 10(2), 107–115. https://doi.org/10.1080/17439760.2014.913669

Schlichter, N.L. (2022) *Effects of a Cognitive Bias Modification Intervention on Explicit and Implicit Social Anxiety and the Influences of Adherence, Baseline Levels and Impulsiveness: The IVY Application.* https://purl.utwente.nl/essays/92148

Schönfeld, P., Brailovskaia, J., Zhang, X. C., & Margraf, J. (2018). Self-Efficacy as a Mechanism Linking Daily Stress to Mental Health in Students: A Three-Wave Cross-Lagged Study. Psychological Reports, 122(6), 2074–2095. https://doi.org/10.1177/0033294118787496

Stoliker, B. E., & Lafreniere, K. D. (2015). The Influence of Perceived Stress, Loneliness, and Learning Burnout on University Students' Educational Experience. *College Student Journal*, *49*(1), 146–160. https://eric.ed.gov/?id=EJ1095547

Sveen, J., Arnberg, F., Arinell, H., & Johannesson, K. B. (2016). The role of personality traits in trajectories of long-term posttraumatic stress and general distress six years after the tsunami in Southeast Asia. Personality and Individual Differences, 97, 134–139. https://doi.org/10.1016/j.paid.2016.03.046

Swickert, R., & Hittner, J. (2009). Social Support Coping Mediates the Relationship between Gender and Posttraumatic Growth. Journal of Health Psychology, 14(3), 387–393. https://doi.org/10.1177/1359105308101677

Tedeschi, R. G., Park, C. L., & Calhoun, L. G. (1998). *Posttraumatic Growth: Positive Changes in the Aftermath of Crisis*. Routledge.

The BMS Lab. (2023, March 27). *Twente Intervention and Interaction Machine (TIIM) - BMS LAB — Where Technology Meets Life*. BMS LAB — Where Technology Meets Life. https://bmslab.utwente.nl/equipment-facilities-and-services/software-of-the-lab/twente-intervention-interaction-machine-tiim/

Trockel, M. T., Barnes, M. D., & Egget, D. L. (2000). Health-Related Variables and Academic Performance Among First-Year College Students: Implications for Sleep and Other Behaviors. Journal of American College Health, 49(3), 125–131. https://doi.org/10.1080/07448480009596294

Van Schalkwijk, F. J., Blessinga, A. N., Willemen, A., Van Der Werf, Y. D., & Schuengel, C. (2015). Social support moderates the effects of stress on sleep in adolescents. *Journal of Sleep Research*, *24*(4), 407–413. https://doi.org/10.1111/jsr.12298

Yusoff, N., Low, W. Y., & Yip, C. H. (2010). Reliability and validity of the Brief COPE Scale (English version) among women with breast cancer undergoing treatment of adjuvant chemotherapy: a Malaysian study. *The Medical Journal of Malaysia*, *65*(1), 41–44.

Appendix A

answers range from 0 to 2, 0 being “not at all”, 1 being “a bit”, and 2 being “a lot”

Please examine how this statement is applicable to you.

1. I learned to be nicer to others.
2. I feel freer to make my own decisions.
3. I learned that I have something of value to teach others about life.
4. I learned to be myself and not try to be what others want me to be.
5. I learned to work through problems and not just give up.
6. I learned to find more meaning in life.
7. I learned how to reach out and help others.
8. I learned to be a more confident person.
9. I learned to listen more carefully when others talk to me.
10. I learned to be open to new information and ideas.
11. I learned to communicate more honestly with others.
12. I learned that I wanted to have some impact on the world.
13. I learned that it’s OK to ask others for help.
14. I learned to stand up for my personal rights.
15. I learned that there are more people who care about me than I thought.

Appendix B

answer possibilities are yes and no

Please report on your last night's sleep.

1. I could not get to sleep within 30 minutes.
2. I woke up in the middle of the night or early morning.
4. I had to get up to use the bathroom.
5. I coughed or snored loudly.
6. I felt too cold or too hot.
7. I had bad dreams.

Appendix C

answers range from “I haven’t been doing this at all”, “a little bit”, “a medium amount”, “I’ve been doing this a lot”

Please reflect on the following statements in regards to the stressful event of today.

I've been getting emotional support from others.

I’ve been getting help and advice from other people.

I've been getting comfort and understanding from someone.

I’ve been trying to get advice or help from other people about what to do.

Appendix D

Welcome.

You have been invited to participate in a BSc Thesis study for Psychology regarding stress-related growth (SRG). This study is conducted by Hanna Ausländer, Evrim Kayikcio, Marlyn Kolenbrander, and Pia Kronenfeld under supervision of Y. Namer (PhD.) and M. Radstaak (PhD.) from the Faculty of Behavioural, Management, and Social Sciences at the University of Twente. This study has been approved for conduction by the Ethics Committee of the Faculty of Behavioural, Management and Social Sciences at the University of Twente.

In this study, you will be filling in a daily questionnaire regarding daily stressful experiences and stress-related growth considering coping mechanisms and personality traits. This daily questionnaire will take around 10 minutes every day to complete. At the end you will also complete a survey for variables that only need to be measured once. This survey will take around 20 to 25 minutes to complete. The data that is gathered will be used and analyzed solely by the researchers mentioned above.

Your participation in this study is entirely voluntary and you are allowed to withdraw at any time during the process. However, in case of withdrawal you will not receive the SONA points as stated on the information section. To the best of our ability your provided answers will remain confidential. Therefore, the provided results and answers will be presented anonymously in the report. Personally-identifiable data will not be stored permanently.

Student and supervisor contact details for further information:

Hanna Ausländer (h.j.auslander@student.utwente.nl)

Evrim Kayikcio (e.kayikcio@student.utwente.nl)

Marlyn Kolenbrander (m.j.kolenbrander@student.utwente.nl)

Pia Kronenfeld (p.kronenfeld@student.utwente.nl)

If you provide your email below, you are interested in the research results and would like to receive these by email.

email

Student and supervisor contact details for further information:

Hanna Ausländer (h.j.auslander@student.utwente.nl)

Evrim Kayikcio (e.kayikcio@student.utwente.nl)

Marlyn Kolenbrander (m.j.kolenbrander@student.utwente.nl)

Pia Kronenfeld (p.kronenfeld@student.utwente.nl)

Appendix E

This questionnaire is conducted to gain insights into stress-related growth after daily events and the following variables; social support, quality of sleep, core beliefs, level of conscientiousness, neuroticism, and openness, and coping mechanisms. Please make sure you read and understand the following statements.

I am voluntarily filling out this questionnaire and understand that I may withdraw from this participation at any time, without any negative consequences and without providing reasons.
I agree that my answers will be stored and saved, for the purpose of the interview and research.
I understand that the answers will remain anonymous. I understand that the other researchers and their supervisor will be able to see the stored and saved answers.
I understand that my personal information will not be misused or shared beyond the study team.
I understand that data gathered from this study might be used for further research.
I give my consent to participate in the study which involves answering certain questions regarding my experience of stress-related growth in daily settings.
I understand that the daily questionnaire will take approximately 10 minutes.
I understand that the one-time questionnaire will take approximately 20 to 25 minutes.

including ‘Yes / No’ option in the end