

**The Moderation Effect of a Deep Study Strategy on the Relationship between Stress and
Mental Well-Being in Students**

Lynn Paula Heuken (s2722186)

Department of Psychology, University of Twente

M12 BSc Thesis PSY (2023-2A)

Bachelor Thesis PCPT

1st supervisor supervisor: Erik Taal

2nd supervisor: Merlijn Koch

June 27, 2024

Abstract

In academia, students experience various stressors that are shown to diminish their mental well-being strongly. A deep study approach includes organizational skills, engagement, and academic improvement and is associated with differences in stress perception and well-being. Hence, this study aimed to explore the moderating effect of a deep study approach on the relationship between perceived stress and well-being in students. A cohort of 109 students compiled the sample. They completed an online questionnaire including the scales: the Student Life Challenges scale, the Mental Health Continuum, and the Study Approach Inventory, which measured the variables of stress, mental well-being, and deep study style. Fundamental support was found for the correlation between stress and well-being ($r=.42, p<0.01$), the deep study approach and stress ($r=.24, p<0.05$), and study style and well-being ($r=.24, p<0.05$). However, the moderation analysis revealed no significant findings for an interaction effect of stress and a deep study approach on well-being ($estimate=0.03, SE= 0.30, p=.92$). Besides this lack of evidence, a deep study style can nevertheless be associated with reduced stress and enhanced well-being. Therefore, students may benefit from reflecting on their current learning strategies. However, further research is needed to clarify the exact effect of study styles.

Keywords: Stress, Well-Being, Learning Strategies, Deep Study Approach, Moderation

Introduction

In the world of academia, stress seems inevitable, while its effect on well-being is extensively researched. Many factors are established that relate to this connection, especially in the academic context of students. Nevertheless, it remains unclear how the different learning styles of students can affect their stress perception and well-being. Therefore, this study aims to explore the relationships between stress and students' well-being, while investigating the deep study strategy.

Stress is a complex yet precarious concept. There are many definitions established, however the classical description of Walter Canon from 1935 holds still. He defines stress as an interruption to "homeostasis", a balanced innate state. This disruption occurs when the demands of a situation as experienced by an individual exceed their available and perceived resources (Canon, 1935, as cited in Kopin, 1995). It was shown that short-term stress can have an adaptive function (Dhabhar, 2014). However, if it surpasses a certain individual's coping capacity, homeostasis can no longer be maintained, and stress is perceived as enduring and overwhelming (Kopin, 1995). Many studies have found various effects of persistent stress. Biologically, there are many hormonal responses, mainly initiated by the hypothalamic-pituitary-adrenal-axes (Kopin, 1995). Furthermore, stress generates less adaptive behavioral responses, such as avoidance (Kopin, 1995). Lastly, there are psychological consequences. A decrease in attention, memory deterioration, and even mental and neurocognitive disorders can all stem from strain (Calvo & Gutiérrez-García, 2016). Hence, the extensive body of research available indicates that not only is the biological homeostasis interrupted by stress but especially the psychological equilibrium.

Due to the established consequences of stress on health, mental well-being is increasingly receiving attention in current research. The psychological term is a rather broad concept including mainly positive and symptom-free aspects (Keyes, 2002). Keyes (1998) defined mental well-being with three components. According to him, there is a psychological, emotional, and social element (Keyes, 2002). While Keyes furthermore acknowledges the physical aspect of well-being, it is deemed rather irrelevant to the scope of this study. The psychological dimension encompasses intrapersonal adjustments and attitudes toward life. The emotional component involves the experience of positive affect and the absence of negative feelings. Lastly, the social aspect pertains to how an individual functions on an interpersonal level within their environment. Hence, keeping the stress definition and its consequences in

mind, mental well-being is a health concept of which the components can be easily influenced by stress, but also straightforwardly amendable with different techniques and resources.

Particularly in student life stress is often unavoidable. Academic pursuit is characterized by a constant state of change which may result in a variety of stress-inducing encounters (Gall et al., 2000). Numerous studies articulate the correlation between stress and student life. Slimmen et al. (2022) emphasized that just as academic pressure, also family, student employment, and financial pressure pose extensive sources of stress. The pressure to excel in academic careers and fulfill social expectations while maintaining social relationships and relative financial stability contributes significantly to students' stress perception (Slimmen et al., 2022). Clearly, stress accompanies and affects especially students in their everyday lives.

After establishing the sources of academic stress, it is important to explore how it impacts student's health. Stress in undergraduates has been shown to reduce especially psychological and emotional well-being while generating risk factors for mental disorders (He et al., 2018; Ishikawa & Furuyashiki, 2022). Ibrahim and colleagues (2024) found a strong positive correlation between anxiety disorders and perceived stress in students. They revealed that 29.1 % of medical students showed a risk for general anxiety disorder due to experiencing extensive academic stress. Additionally, stress impacts the emotional stability of students and their quality of life (Riberio et al., 2018). Experiencing emotional exhaustion is caused by stress in students who feel overwhelmed with their studies (Jacobs & Dodd, 2003). As Riberio et al. (2018) suggested, besides anxiety disorders, even insomnia and in general poor sleep quality are associated with stress. There are a lot of dangerous consequences for students' well-being when suffering continuous academic stress.

Just as stress is fundamental in undergrads' lives, the chosen study strategy is central to coping with academic demands. Although the topic of study style affecting stress and well-being is relatively unexplored, existing studies demonstrate the effect of study style on academic performance (Matthews, 1991). It is worth mentioning that achievements in the university context are associated with increased happiness of students, while failure is linked to heightened experiences of negative affect, hence reduced well-being (Ajjawi et al., 2020; Moussa & Ali, 2022). Moreover, the relation between stress and performance is bidirectional. Stress can impact performance greatly while academic examinations can cause stress (Sohail, 2013). Ultimately, finding factors that improve performance, such as study style, is essential for identifying influences on the relationship between stress and well-being.

For this purpose, a theory defining and comparing study styles and their impact on success is crucial. Students' Approach to Learning Theory (SAL) defines two different categories of study styles. It explains that studying using a deep approach is connected to greater academic success, compared to a surface approach (Duff & McKinstry, 2007; Marton & Säljö, 1976). In other words, working superficially with the study material poses a disadvantage in success since in the surface approach, students rather aim to memorize and pass than to understand and connect the material. This strategy is often incorporated when faced with a high workload and is, therefore, directly related to high-stress circumstances (Duff & McKinstry, 2007). However, a deeper study approach involves actually seeking meaning, motivational aspects, and understanding relations and ideas. Academic performance is especially improved when students use self-testing methods and time management (West & Sadoski, 2011), aspects connected to an invested study style such as the deep approach. Enhancing the way students prioritize and manage their study time as well as educating them to anticipate, formulate, and respond to their own questions when studying may help them perform better overall (West & Sadoski, 2011). By employing a deep approach, characterized by enhanced material engagement, intrinsic motivation, comprehension, and self-monitoring, performance improves. Hence, the beneficial potential of performance on stress and well-being might be extended to the study style.

A primary comparison between the two different study styles of the SAL already revealed that there is a beneficial effect on performance for the deep approach. However, there are many more noteworthy dimensions to this comparison that can be connected to students' well-being and stress perception. The students differ in factors such as motivation and study orientation (Ramsden, 2003 as cited in Duff & McKinstry, 2007). A deep study style is associated with dedication and interest in the material. Students with this strategy feel more satisfied with taking time to study, whereas surface learners do not share this engagement and try to memorize rather than understand (Duff & McKinstry, 2007). This dedication can be categorized as fulfillment in Maslow's hierarchical motivation theory and can be identified as a fundamental need to accomplish mental well-being (Maslow, 1943, as cited in Ivztan et al., 2013). Hence, a different mental well-being can be expected between the study styles.

Besides motivational aspects, also different executive functions of the individual are related to the study style and show effects on stress perception. While highly deep learners use self-regulated learning more frequently and organize their study time more efficiently, surface learners show a lack of self-regulation (Heikkilä & Lonka, 2006). Regulating one's learning is

a crucial aspect, particularly when considering its potential for stress management (Durand-Bush et al., 2015). Studies show that self-regulated learning has positive effects on mental health while serving as a buffer for stress perception (Durand-Bush et al., 2015; Tavakolizadeh et al., 2012). The enhanced self-efficacy, that deep and self-regulated learners experience compared to surface learners, might have an explanatory role here (Yildiz et al., 2018). According to Varghese et al. (2015), their self-efficacy not only explains the increased goal orientation but is crucial for coping with stress and can, therefore, function as a buffer. Comparing these characteristics underlines once more the different effects a deep strategy can have in contrast to surface learners while emphasizing its potential advantages for the relationship between stress and well-being.

After establishing that the learning style can impact students differently, it becomes compelling to explore whether and how their learning choices can directly alter the relationship between stress perception and well-being. As far as known, there are no studies that investigated the direct relationships between a deep study approach and the perception of stress and mental well-being in students. This new perspective can contribute to an improved understanding of the stress and well-being research field. Additionally, extending the available research on this field might apply to university advisors and students affected by major stress and health implications. Subsequently, the following research question arises: “*To what extent does the deep study strategy of students moderate the relationship between perceived stress and mental well-being?*”. To address this, two research questions are stated based on previous literature. The foundation of this study lies in the relationship between stress and well-being, and although this was a well-established correlation in past research, verifying it remains fundamental to this study. Regarding this purpose the primary research question is formulated as follows: *Is stress negatively correlated with students’ mental well-being?* Moreover, as aforementioned, the SAL theory hypothesizes about the features and impact of the deep approach compared to surface learners with regards to performance, motivation, and self-regulation (Duff & McKinstry, 2007; Marton & Säljö, 1976). However, it is captivating to explore whether employing a deep strategy has a direct and beneficial impact on the relationship between stress and well-being in students. Therefore, the secondary research question is articulated as outlined: *Does the deep study approach have a positive moderating effect on the relationship between stress and mental well-being?*

Methods

Research Design

To answer the research question: “*To what extent does the deep study strategy of students moderate the relationship between perceived stress and mental well-being?*” a quantitative cross-sectional survey study has been designed.

Participants

Inclusion criteria for this study were being a student over 18 years old and currently enrolled in a university program. After excluding participants who did not finish the survey or did not meet the inclusion criteria, a total of 109 students contributed to the study. The sample was assembled of mainly female participants (see Table 1), while the ages ranged from 18 to 49 years. A wide range of academic disciplines are found, for example: psychology, applied physics, architecture, biology, medicine, cognitive neuropsychology, and many more. However, from most subjects, only one participant was obtained and, therefore, are not worth mentioning. Consequently, Table 1 lists only study types with more than one participating student, while revealing that the majority attends a psychology degree. Moreover, many different study years are represented in the student sample. Nevertheless, most of the students were in their third year of university (see Table 1).

Table 1*Sample Characteristics*

	n	%
Gender		
Female	78	71.6
Male	25	22.9
Other	6	5.5
Nationality		
German	76	69.7
Dutch	26	23.9
Other	7	6.4
Age (mean, SD)	22.06	1.93
Study Years		
First Year	27	24.8
Second Year	22	20.2
Third Year	35	32.1
Master	17	15.6
Other	8	7.3
Study Type		
Psychology	43	39.4
Interaction Technology	3	2.8
International Business	3	2.8
Communication Science	3	2.8
Design-& Project management	3	2.8
Informatics	2	1.8
Computer Science	2	1.8
Others (one participant each)	50	45.8

Procedure

After receiving ethical approval with the approval number 240232 from the University of Twente's ethics committee, the data collection started. Students were defined as the target group. They were reached out to via Sona, a system for students to earn credits, and via social media posts (Instagram). Therefore, opportunity sampling created the sample of the student population. Furthermore, reaching out to students via snowball sampling was employed to maximize the number of participants in this study. The questionnaire was designed in Qualtrics, a website for survey development. The participants were asked to give informed consent and to fill out the survey. The participating students filled out 96 questions, from which 63 investigated the research variables of this study. Besides demographic items and study status questions, the following scales were filled out by the participants: Student Life Challenges, Mental Health Continuum, Approach to Study Inventory, General Academic Self-efficacy Scale, and Brief Cope Scale, while the last two are irrelevant for the variables of interest of this study. The data collection was scheduled from the 22nd of March 2024 till the 12th of April 2024.

Measures

Different existing scales were used to measure the variables of interest to ensure validity and reliability. Besides these scales, demographic questions were employed about the gender, nationality, attaining discipline, university, study start year, and current study year of the students.

Student Life Challenges

For the independent variable of perceived stress in students, the "Student Life Challenges" (SLC) by Purro et al. (2022) was used. In this study's sample, the Cronbach's alpha of the scale was excellent (Table 2). The responses were recorded on a four-point scale (totally disagree to totally agree) with a corresponding score of 1 to 4. Moreover, the scale includes six subscales: Faculty shortcomings (seven items), Worries about future (three items), Unsupportive climate (five items), High workload (three items), Low commitment (two items), and Financial concerns (two items). This scale comprises statements such as "I feel that my teachers treat me with respect." (subscale: Faculty shortcomings), "I am worried that I will not acquire all the knowledge needed for my future profession." (subscale: Worries about future), "There is a competitive attitude among students." (subscale: Unsupportive climate), "The pace

of study is too high.” (subscale: High workload), “I am satisfied with my choice of career.” (subscale: Low commitment), and “As a student, my financial situation is worrying” (subscale: Financial concerns). All items can be found in Appendix 1. The answers were calculated to one mean total score after performing a factor analysis proposing just one underlying factor. However, the low factor loadings of the sixth subscale “Financial concerns” revealed little explaining value causing the exclusion of this subscale in further analysis (see Appendix 4).

Table 2

Cronbach's Alpha and Pearson Correlation for the Subscales of the SLC

	Cronbach's Alpha
Overall	.90
Subscales	
Faculty shortcomings	.67
Worries about future	.74
Unsupportive climate	.73
High workload	.75
	Item Correlation
Low commitment	.63
Financial concerns	.41

Mental Health Continuum

To measure mental well-being the “Mental Health Continuum -Short Form” (MHC-SF) was included (Keyes, 1998). This 14-item scale has an excellent internal consistency of .90 in this research. It measures the psychological, social, and emotional aspects of mental well-being defined by Keyes in three subscales. He gave a six-point answer scale (never (0), once or twice (1), about once a week (2), 2 or 3 times a week (3), almost every day (4), every day(5)) in which participants had to reflect on experiences of the past month. Item examples are: “During the past month, how often did you feel satisfied with life” (subscale: emotional well-being), “During the past month, how often did you feel that people are basically good” (subscale: social well-being) or “During the past month, how often did you feel confident to think or express your own ideas and opinions” (subscale: psychological well-being), as

displayed in Appendix 2. The three subscales are summed into one mean score of mental well-being as proposed by Keyes (1998).

Approach to Study Inventory

The measurement of the moderating variable deep study approach is carried out with the Approach to Study Inventory (ASI) (Entwistle et al., 2000). The ASI subscale important for this study is the deep approach which includes 20 items. An excellent Cronbach's alpha was found in the sample (see Table 3). This scale includes 5 subscales (Seeking meaning, Relating ideas, Use of evidence, Interest in ideas, and Monitoring effectiveness) with four items each. Items of this scale are for example: "I usually set out to understand for myself the meaning of what we have to learn." (subscale: Seeking meaning), "I try to relate ideas I come across to those in other topics or other courses whenever possible." (subscale: Relating ideas), "I look at the evidence carefully and try to reach my own conclusion about what I'm studying." (subscale: Use of evidence), "I find that studying academic topics can be quite exciting at times." (subscale: Interest in ideas), "When I have finished a piece of work, I check it through to see if it really meets the requirements." (subscale: Monitor effectiveness), as displayed in Appendix 3. The ASI uses a five-point answer scale ranging from disagree to agree including a neutral option with corresponding scores from 1 to 5, hence deep learning students score high. After establishing only one explaining factor in the factor analysis, the mean score of all five subscales was used to compute the value for the variable: deep study approach (see Appendix 5).

Table 3*Cronbach's Alpha of the ASI Subscales*

	Cronbach's Alpha
Overall	.85
Subscales	
Seeking meaning	.56
Relating ideas	.61
Use of evidence	.68
Interest in ideas (Motivational aspect)	.74
Monitoring effectiveness	.64

Data Analysis Plan

All responses were made anonymous by removing any identifying information, like email addresses. A deductive approach was adopted since this study looked at the predicted moderating effect of a deep study approach on stress and well-being. All responses were gathered in Qualtrics and then imported into RStudio, version 4.3.3, an analysis tool for large-scale data sets. The questions about age, nationality, gender, study year, study type, and university and those pertaining to stress, mental well-being, and deep study approach comprised the entirety of the data set used for this paper. Moreover, the scores on the items: 1,3,5,7,19, and 20 of the SLC were reversed. To ensure the validity and reliability of the data, a factor analysis and Cronbach's alpha were computed, as mentioned above. The distribution of the data, including means, standard deviations, percentages, frequencies, and correlations, was examined using descriptive statistical analysis with the variables gender, nationality, study year, stress, well-being, deep study approach, and university. The scores of stress were compared to the findings of Puuro et al. (2022), mental well-being scores to the findings of De Beurs et al. (2024), and deep study style scores to Sadler-Smith (1996). In the inferential statistics, the four parametric assumptions of linearity, independence, homogeneity of variance, and normality were checked with scatterplots and a histogram (see Appendix 6). Since these seemed approximately acceptable, further analysis was undertaken. Primary Pearson correlations between stress, mental well-being, and deep study approach were investigated. With the PROCESS package of RStudio by Hayes (2013), the moderation analysis of the deep study approach on stress and well-being was performed. To prevent multicollinearity the predictor and moderator, stress, and deep study approach, were centered. In this multiple linear

regression, the dependent variable of mental well-being was investigated with an interaction of stress and deep study approach while using bootstrapping to ensure appropriate inferences about the sample.

Results

Descriptive Statistics of Stress, Well-Being, and Deep Study Approach

The average score on the Student Life Challenges indicates a moderate stress level, yet slightly below the mean score of Porru et al. (2022) which was 2.4. While the highest average score was found for the “Worries about the future” subscale, the lowest challenge in the SLC was the subscale of “Low commitment”. All scores are shown in Table 4. Moreover, a rather average level of mental well-being was found in the sample compared to the mean score findings of De Beurs et al. (2024) of 2.98 ($SD=0.85$). Lastly, on average the sample somewhat agreed with employing a deep study strategy in their academic context, therefore, indicating slightly more use compared to the average found by Sadler-Smith (1996) ($m=3.01$). While the ASI subscale “Interest in ideas” has the highest, the subscale “Seeking meaning” has the lowest mean score. However, all five subscales have similarly moderate means (see Table 4).

Table 4

Mean and SD of all the Subscales of SLC, ASI, and the MHC Scale

	M (SD)
SLC	2.20 (0.43)
Subscales	
Faculty shortcomings	2.29 (0.48)
Worries about future	2.60 (0.78)
Unsupportive climate	1.90 (0.60)
High workload	2.44 (0.79)
Low commitment	1.69 (0.68)
MHC-SF	2.79 (0.88)
ASI (deep approach)	3.72 (0.57)
Seeking meaning	3.63 (0.69)
Relating ideas	3.72 (0.72)
Use of evidence	3.68 (0.78)
Interest in ideas (Motivational aspect)	3.80 (0.85)
Monitoring effectiveness	3.76 (0.82)

Note. Means (M), Standard Deviations (SD), Student Life Challenges (SLC), Mental Health Continuum -Short Form (MHC-SF), Approach to Study Inventory (ASI).

Correlation Analysis

Correlating the variables Stress, Well-being, and Deep Study Approach revealed low to moderate correlations (see Table 5, Figure 1). The strongest negative correlation was found between stress and mental well-being, supporting the first research question: *Is stress negatively correlated with students' mental well-being?* Although all correlations are rather small, they all are significant. Interestingly, the deep study approach was negatively correlated with stress, yet positively with mental well-being. This means that students with better mental well-being also have a deeper study approach when learning, while students with high levels of stress are applying a less deep study approach.

Table 5

Correlation of Age, Gender, Nationality, Autonomy and Frequency of Technology Use

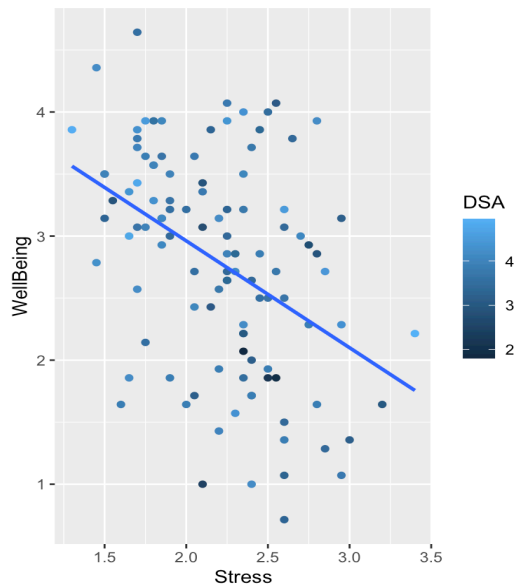
Variables	Mean	SD	Correlations		
			[95% Confidence Interval]		
			1	2	3
1. Stress	2.20	0.43	-	-	-
2. Well-Being	2.79	0.88	-.42**		
			[-0.56, -0.24]	-	
3. Deep Study Approach	3.72	0.57	-.24*	.24*	
			[-0.41, -0.06]	[0.06, 0.41]	-

Note. Means, Standard Deviations, and Bivariate Correlations.

* $p < .05$. ** $p < .01$.

Figure 1

Colored Scatterplot of Stress, Mental Well-being, and Deep Study Approach



Note. Deep Study Approach (DSA)

Moderation analysis

The moderation model reveals that about 19.8% of the variance of well-being in the data is explained by the predictors: deep study approach and stress. Although, the model is overall significantly fitting, only the predictor coefficient of stress was significant ($p < .01$) (see Table 6). The estimate of the significant stress predictor indicates a negative impact on mental well-being, additionally supporting the first research question: *Is stress negatively correlated with students' mental well-being?* The interaction effect is statistically insignificant, therefore, the deep study approach does not indicate any moderating effect on the stress and mental well-being relation. Hence no support was found for the second research question: *Does the deep study approach have a positive moderating effect on the relationship between stress and mental well-being?*

Table 6*Results of the Moderation Analysis*

Effect	Estimate	SE	95% CI		p
			LL	UL	
Intercept	2.79	0.08	2.63	2.94	.00
Stress	-0.79	0.19	-1.18	-0.4	.00
Deep Study Approach	0.23	0.14	-0.04	0.47	.11
Stress x Deep Study Approach	0.03	0.30	-0.43	0.51	.92

Note. Estimates, Standard Errors (SE), 95% Confidence Intervals (CI), and P-value.

$F=8.65$, $df1=3$, $df2=105$, $p<0.001$, $Rsquared=.198$

Bootstrapped 95% Confidence Intervals

Discussion

This study aimed to investigate whether a deep study approach has a moderating effect on the relationship between stress and mental well-being. Therefore, primarily a look at the relationship of stress and mental well-being was undertaken, revealing what previous literature already suggested. The findings of the negative, moderate correlation between stress perception and mental well-being confirm what was reported earlier by He et al. (2018) and Ishikawa & Furuyashiki (2022). Hence, the foundation of this study remains verified.

Furthermore, it was investigated whether a deep study strategy has a moderating effect on the aforementioned connection between stress and mental well-being. Although the main analysis, the moderation, does not yield significant results, the low to moderate correlations between the variables of interest still provide insight into their underlying dynamic. They reveal that there is a connection between study style, stress, and mental well-being, even though it does not appear to be from a moderating nature. This study primarily unveiled that adopting a deep study approach might have beneficial effects on students' stress and mental well-being perception. The correlation results provide valuable insight and suggest further exploration.

Primary, the low but positive correlation between a deep approach and mental well-being proposes that studying deeply is slightly associated with higher mental well-being. These findings are in line with what previous literature already suggested. The relationship might rise due to underlying performance improvements, and motivational and fulfilling aspects of deep learners. Again, the SAL proposes that a deep study style can influence academic performance greatly (Duff & McKinstry, 2007), while success in academia has the potential to increase the mental well-being of students (Moussa & Ali, 2022). This interpretation hints at a potential mediating effect of academic performance on the relationship between a deep study approach and mental well-being, which could be undertaken in future research to highlight essential insight into students' mental well-being. As ascribed earlier too, dedication and motivation play an essential fulfillment role in the hierarchical motivation theory of Maslow (Maslow, 1943, as cited in Ivztan et al., 2013). This is further supported when looking at the motivational subscale score of the ASI, as the "Interest in ideas" subscale obtained to highest scores (Table 4). Here, the student's expression of interest might reflect their dedication and fulfillment with their study. Hence adding the performance and motivation potentials for mental well-being, the slightly positive correlation between a deep approach and mental well-being seems coherent.

Besides these findings, another correlational effect was found, namely between stress and a deep study approach. The small negative relation reveals that the application of deeper learning strategies seems to be linked with a reduction in perceived stress. Many factors could explain such a relation, however looking at the SAL theory and its definition of a deep approach students using this strategy seem to have a more adaptive attitude towards learning, meaning that they like to invest more time in the material because they genuinely find the topics interesting (Duff & McKinstry, 2007). This becomes evident once more with the correlating subscale “Interest in ideas” and its aforementioned score. Deep learners adopt this approach because they are engaged in learning about the topic, hence having a more positive attitude that helps them to cope with stress. Students adopting a deep approach could see their studies as less stressful since they enjoy learning and do not suffer from high workload demands (Duff & McKinstry, 2007). This could be further explained by the fact that productive stress management is associated with maintaining a positive attitude (Yadav, 2012). Moreover, drawing back to the correlation between deep approaches and self-regulated learning, students organize and plan their study time more effectively when they make use of self-regulated learning or a deep study style (Heikkilä & Lonka, 2006). Lastly, the buffer due to enhanced self-efficacy should not be left out in the interpretation of this negative correlation. Feeling more able to cope with the material and stress might explain the reduced perception of stress (Varghese et al., 2015; Yildiz et al., 2018). Hence, the characteristics of a deep study style act as buffers in stress management and explain the negative correlation between stress and a deep study style.

To shed further light on these mechanisms, an elaboration of its contrary might be helpful. In contrast to a deep approach, Duff and McKinstry (2007) state that the attitude of surface learners increases feelings of anxiety and resentment which might exacerbate or be generated from stress perception. These feelings could be due to the situation in which students tend to apply a surface approach. Using a surface approach would be automatically associated with stress since it is often adapted due to high workload perception (Duff & McKinstry, 2007). This could result in a different conceptualization and management of the study and the stress along with it compared to a deep approach. Moreover, the aspect of workload further interprets the correlation found between stress and a deep approach. When more workload is experienced, higher stress is perceived (Slimmen et al., 2022). Then, according to Duff and McKinstry (2007), students tend to apply less deep and more surface strategies. These aspects of a surface

learning approach emphasize the contrary justification for the relation between reduced stress and the increased deep approach application.

Finally, combining the interpretations of the correlational results and the lack of significance of the moderation may inspire further exploration with an alternative type of analysis in future research. Instead of the study style being a moderator, stress could be seen as a (partial) mediator for the positive relationship between study style and well-being, since a deep study style correlates with less perceived stress, and reduced stress perception suggests increased mental well-being.

Strength and Limitation

A clear support this study has for its reliable findings is the measurements included to investigate the variables of interest. Primary, since they were pre-established scales, they demonstrated their efficiency in many other studies before. These findings were substantiated by high levels of internal consistency, as evidenced by the determined Cronbach's Alpha. Its scores of all scales incorporated to examine the variables of interest exceed .84 in this sample. Similarly, many other recent studies have found high Cronbach's Alpha for the scales, such as .85 by Purro et al. (2022) for the SLC or .72 for the ASI by Obiaje and Iwahet al. (2022). Lastly, the MCH-SF remains indisputable as a holistic and reliable measure of mental well-being (Lamers et al., 2010), especially when looking at its numerous applications in the field of (clinical) psychology and academia. Given the excellent reliability and applicability of the scales, the insights this study provides about stress, mental well-being, and study styles are bolstered.

It is, nevertheless, necessary to reflect on the holistic inside the scales offer. Although the measurement of study style might be reliable, it is very restricted. The limited scope of this study resulted in a partial measurement of study style. While exclusively focusing on the deep approach and integrating only its subscale of the ASI as the measurement for study style, insights about a rather superficial learning approach, for example, remain unexplored. Due to the pre-established benefits, such as performance and hypothesized fulfillment, a narrow focus on the deep approach is justified, however, a holistic comprehension of the study style and its capabilities cannot be drawn solely from this study. Although it is evident that the surface approach is associated with negative attitudes, lack of self-regulation, and high workload, no explicit connection seems to have yet been established between this specific approach, stress,

and mental well-being in university students. Hence, research on broader consequences of the application of surface learning might reveal further promising and helpful results for students.

Another difficult aspect of the validity of this study is its limited generalizability. By employing a convenient sampling technique many students were reached and a fast participant collection was possible, however, the sample's diversity is questionable. It may contain students from different study disciplines, but the majority studies psychology. Hence the findings do not offer insight to a broad spectrum of students but reflect mostly the dynamics of psychology students. Additionally, a gender bias appears in the sample. With most participation coming from female students, inferences of the results can only be drawn limited about men in academia. These sample biases should be taken into consideration when reflecting on the results.

A final limitation is the interpretation of causal chains in the data. Since the research question was primarily investigated with a momentary measurement in a survey the resulting interpretations cannot be drawn upon causality. Therefore, an interpretation of whether study style reduces perceived stress or causes improvement in well-being would be unreliable. Additionally, multiple other inferences can be hypothesized on the basis of the study's results. Examples could be that the workload and potential consequences of high stress, such as attention and memory deterioration as aforementioned (Calvo & Gutiérrez-García, 2016), lead to a reduction of in-depth learning or that high well-being encourages and motivates the student to learn more profoundly. Hence, this study cannot provide information about causal effects, emphasizing the further need for future studies that take causal relations into account. However, this study provides novel empirical evidence on the topic of academic stress and well-being in students and paves the way for future research endeavors and institutional interventions.

Implication

Considering the results, the strengths, and especially the limitations, multiple approaches for future implications can be suggested. Primary, even without significant findings of the moderation, the results of the correlations call for action. It was once more demonstrated, that students suffer under stress and diminished well-being. Hence, these concerns should be addressed further in the academic context. Given the potential impact, however small, of the deep study style, it might be advisable to not only investigate here further but even consider incorporating it in possible future interventions for students. Universities could, for instance, foster the emphasis on adopting and reflecting on the study style their students choose.

Promoting a more intense and deep approach when studying the material might result in health and academic benefits. In addition, it could be considered when holding lectures, providing captivating material, and offering space and time for intensive study sessions.

Moreover, since moderation does not seem to explain a relationship between the variables of interest, different analysis models could be included in future research. As the correlation findings seem to suggest, investigating stress as a mediator might give more promising findings and application possibilities. To further capture a holistic insight into the mental well-being of students, investigating the mediating effects of performance on the relationship between a deep approach and mental well-being could guide future research efforts. Besides alternative models of analysis, a different conceptualization and design approach could additionally be considered.

This being said, multiple factors identified within the definition of a deep or surface study style yet appear to have not received direct attention in investigations within the relationship between stress and well-being. Factors such as motivational discrepancies and attitude differences might reveal additional insights that could further ensure opportunities for application, like effective interventions in the academic context. Since this study supported the fundamental connection between stress and well-being that raises concerns and calls for action, it might be helpful for students' mental well-being to further investigate this area of research with variables like engagement and attitude. More distinct research on other study styles like the surface approach might shed light on the overlooked dimensions and impacts study style offers and informs applications holistically. Eventually, reflecting on the final limitation, studies on causality are deemed important for making appropriate inferences about the variables of interest. This can be addressed by creating longitudinal or experimental studies. Hence, further focus on theoretical and practical applications of a deep approach can yield promising impacts.

Conclusion

Although the primary expectations about the moderation of the deep study approach were not met in this study, interesting results were revealed, nevertheless. For one, further investigations into the effects of study styles still seem to be intriguing since they raise the potential for informing individual and institutional improvement. This study revealed the need for action considering the moderate levels of stress and well-being in students. Here, improvement is still desirable. For enhancing the quality of students' lives, many other factors

should be considered in future research that bear the potential to reduce stress perception and heighten well-being. Factors such as self-regulated learning or different study styles for example could reveal beneficial capabilities within the students' balance of stress and well-being. Furthermore, the correlations show that there is a beneficial connection between study style, stress, and well-being. As demonstrated applying a deep study approach includes benefits for students aside from performance improvement, namely the potential to experience reduced stress and enhanced well-being. Having these results, but also the need for future research on especially causality in mind, initial considerations for interventions can be based on the findings of this research. Students and staff members of universities are advised to apply and support deep study strategies. This study gives inspiring components, like study styles, motivation, attitude formation, self-regulated learning, and more, that after further research can be useful for academic interventions that aim to help and support university students. Finally, it can be said that approaching the study material in a deeper manner can hold the potential for brighter, and especially happier students.

References

- Ajjawi, R., Dracup, M., Zacharias, N., Bennett, S., & Boud, D. (2020). Persisting students' explanations of and emotional responses to academic failure. *Higher Education Research & Development*, 39(2), 185-199. <https://doi.org/10.1080/07294360.2019.1664999>
- Calvo, M., & Gutiérrez-García, A. (2016). Cognition and stress. In *Elsevier eBooks* (pp. 139–144). <https://doi.org/10.1016/b978-0-12-800951-2.00016-9>
- De Beurs, E., Kosterman, S., Anten, S., Bohlmeijer, E. & Westerhof, G. J. (2024). *Psychometrische evaluatie van de Mental Health Continuum – Short Form (MHC-SF)*. Tijdschrift Voor Gedragstherapie. <https://www.tijdschriftgedragstherapie.nl/inhoud/tijdschrift/artikel/TG-2022-0-3/Psychometrische-evaluatie-van-de-Mental-Health-Continuum-Short-Form-MHC-SF>
- Dhabhar, F. S. (2014). Effects of stress on immune function: the good, the bad, and the beautiful. *Immunologic Research*, 58(2), 193–210. <https://doi.org/10.1007/s12026-014-8517-0>
- Duff, A., & McKinstry, S. (2007). Students' approaches to learning. *Issues in accounting education*, 22(2), 183-214. <https://doi.org/10.2308/iace.2007.22.2.183>
- Durand-Bush, N., McNeill, K., Harding, M., & Dobransky, J. (2015). Investigating Stress, Psychological Well-Being, Mental Health Functioning, and Self-Regulation Capacity among University Undergraduate Students: Is This Population Optimally Functioning? *Canadian Journal of Counselling and Psychotherapy*, 49(3), 0826-3893. <https://www.questia.com/library/journal/1P3-3845535831/investigating-stress-psychological-well-being-mental>
- Entwistle, N., Tait, H., & McCune, V. (2000). Patterns of response to an approaches to studying inventory across contrasting groups and contexts. *European Journal of Psychology of Education*, 15(1), 33–48. <https://doi.org/10.1007/bf03173165>
- Gall, T. L., Evans, D. R., & Bellerose, S. (2000). Transition to first-year university: Patterns of change in adjustment across life domains and time. *Journal of social and clinical psychology*, 19(4), 544-567. <https://doi.org/10.1521/jscp.2000.19.4.544>
- Hayes, A. F. (2013). *Introduction to Mediation, Moderation, and Conditional Process Analysis: A Regression-Based Approach*. <https://ci.nii.ac.jp/ncid/BB1323391X>
- He, F. X., Turnbull, B., Kirshbaum, M. N., Phillips, B., & Klainin-Yobas, P. (2018). Assessing stress, protective factors and psychological well-being among undergraduate nursing students. *Nurse Education Today*, 68, 4–12. <https://doi.org/10.1016/j.nedt.2018.05.013>

- Heikkilä, A., & Lonka, K. (2006). Studying in higher education: students' approaches to learning, self-regulation, and cognitive strategies. *Studies in Higher Education*, 31(1), 99-117. <https://doi.org/10.1080/03075070500392433>
- Ibrahim, D., Ahmed, R. M., Mohammad, A. Z., Ibrahim, B., Mohammed, T., Mohamed, M. E., Abdelgadir, T., Mohammed, B., Ibrahim, M., & Shaaban, K. M. A. (2024). Prevalence and correlates of generalized anxiety disorder and perceived stress among Sudanese medical students. *BMC Psychiatry*, 24(1), 1–15. <https://doi.org/10.1186/s12888-024-05510-y>
- Ishikawa, Y., & Furuyashiki, T. (2022). The impact of stress on immune systems and its relevance to mental illness. *Neuroscience Research*, 175, 16-24. <https://doi.org/10.1016/j.neures.2021.09.005>
- Ivtzan, I., Gardner, H. E., Bernard, I., Sekhon, M., & Hart, R. (2013). Wellbeing through self-fulfilment: Examining developmental aspects of self-actualization. *the Humanistic Psychologist/the Humanistic Psychologist*, 41(2), 119-132 <https://doi.org/10.1080/08873267.2012.712076>
- Jacobs, S. R., & Dodd, D. (2003). Student burnout as a function of personality, social support, and workload. *Journal of college student development*, 44(3), 291-303. <https://doi.org/10.1353/csd.2003.0028>
- Keyes, C. L. M. (1998). Social Well-Being. *Social Psychology Quarterly*, 61(2), 121. <https://doi.org/10.2307/2787065>
- Keyes, C. L. M. (2002). The mental health continuum: from languishing to flourishing in life. *Journal of Health and Social Behavior/Journal of Health & Social Behavior*, 43(2), 207. <https://doi.org/10.2307/3090197>
- Kopin, I. J. (1995). Definitions of Stress and Sympathetic Neuronal Responses. *Annals of the New York Academy of Sciences*, 771(1), 19–30. <https://doi.org/10.1111/j.1749-6632.1995.tb44667.x>
- Marton, F., & Säljö, R. (1976). ON QUALITATIVE DIFFERENCES IN LEARNING: I—OUTCOME AND PROCESS*. *British Journal of Educational Psychology*, 46(1), 4–11. <https://doi.org/10.1111/j.2044-8279.1976.tb02980.x>
- Matthews, D. B. (1991). The effects of learning style on grades of first-year college students. *Research in Higher Education*, 32(3), 253–268. <https://doi.org/10.1007/bf00992891>
- Moussa, N. M., & Ali, W. F. (2022). Exploring the relationship between students' academic success and happiness levels in the higher education settings during the lockdown period of COVID-19. *Psychological reports*, 125(2), 986-1010.

<https://doi.org/10.1177/0033294121994568>

Obiaje, E. P. B., & Iwah, V. Y. (2022). *Students' locus of control and learning approaches in mixed ability physics classroom.*

<https://papers.ssrn.com/sol3/papers.cfm?abstractid=4255668>

Porru, F., Schuring, M., Bültmann, U., Portoghese, I., Burdorf, A., & Robroek, S. J. W. (2022). Associations of university student life challenges with mental health and self-rated health: A longitudinal study with 6 months follow-up. *Journal of Affective Disorders*, 296, 250–257.

<https://doi.org/10.1016/j.jad.2021.09.057>

Sadler-Smith, E. (1996). Approaches to studying: Age, gender and academic performance. *Educational Studies*, 22(3), 367-379.

<https://doi.org/10.1080/0305569960220306>

Slimmen, S., Timmermans, O., Mikolajczak-Degrauwe, K., & Oenema, A. (2022). How stress-related factors affect mental wellbeing of university students A cross-sectional study to explore the associations between stressors, perceived stress, and mental wellbeing. *PLoS One*, 17(11). <https://doi.org/10.1371/journal.pone.0275925>

Sohail, N. (2013). Stress and academic performance among medical students. *PubMed*, 23(1), 67–71. <https://pubmed.ncbi.nlm.nih.gov/23286627>

Tavakolizadeh, J., Yadollahi, H., & Poorshafei, H. (2012). The Role of Self Regulated Learning Strategies in Psychological well being Condition of Students. *Procedia: Social & Behavioral Sciences*, 69, 807–815. <https://doi.org/10.1016/j.sbspro.2012.12.002>

West, C., & Sadoski, M. (2011). Do study strategies predict academic performance in medical school? *Medical Education*, 45(7), 696–703.

<https://doi.org/10.1111/J.1365-2923.2011.03929.X>

Varghese, R., Norman, T. S., & Thavaraj, S. (2015). Perceived stress and self efficacy among college students: A Global review. *Social Science Research Network.*

<https://doi.org/10.2139/ssrn.2703908>

Yadav, V. L. (2012). STRESS IN WOMEN AND ITS MANAGEMENT BY POSITIVE ATTITUDE. In *ACADEMICIA* (Vol. 2, Issue 9, pp. 123–126) [Journal-article]. South Asian Academic Research Journals. <http://dspace.stellamariscollege.edu.in:8080/xmlui/bitstream/handle/123456789/2910/stress.pdf?sequence=1&isAllowed=y>

Yildiz, M., Şenel, E., & Can, S. (2018). The study approaches as the predictors of academic self-efficacy and teacher efficacy: A study in pedagogical formation students. *Uluslararası Spor Egzersiz Ve Antrenman Bilimi Dergisi*, 84–97. <https://doi.org/10.18826/useeabd.424565>

Appendix 1

Student Life Challenges

Faculty shortcomings

1. I feel that my teachers treat me with respect.
2. The teachers often fail to clarify the aims of the activities
3. The study stimulates my personal development.
4. As a student you are often expected to participate in situations where your role and function is unclear.
5. I am able to influence the studies or curriculum.
6. There is too much focus on passive learning of facts and too little on active seeking of knowledge and time for reflection.
7. I feel that the training is preparing me well for my future profession.

Worries about future

8. I am worried that I will not acquire all the knowledge needed for my future profession.
9. The long hours and responsibilities of my future career worry me.
10. The insight I have had into my future profession has made me worried about the stressful workload.

Unsupportive climate

11. Studying has created a climate of anonymity and isolation among the students.
12. The professional role presented in our course conflicts with my moral viewpoint.
13. There is a competitive attitude among students.
14. I feel that the studies have played a role in creating a cold and impersonal attitude among students.
15. It seems to me to be treated worse on the basis of my sex.

High workload

16. My study controls my life and I don't have a lot of time for other activities
17. The literature is too difficult and extensive.
18. The pace of study is too high.

Low commitment

19. I am satisfied with my choice of career.
20. I am proud of my future profession.

Financial concerns

21. As a student, my financial situation is worrying.
22. I am worried about my future financial situation and my ability to pay off my student loans.

Appendix 2

Table 7

MHC-SF

Please answer the following questions are about how you have been feeling during the past month. Place a check mark in the box that best represents how often you have experienced or felt the following:

During the past month, how often did you feel	Never	once or twice	about once a week	about 2 or 3 times a week	almost everyday	everyday
1. happy						
2. interested in life						
3. satisfied with life						
4. that you had something important to contribute to society						
5. that you belonged to a community (like a social group, your school, or your neighborhood)						
6. that our society is a good place, or is becoming a better place, for all people						
7. that people are basically good						
8. that the way our society works made sense to you						
9. that you liked most parts of your personality						
10. good at managing the responsibilities of your daily life						
11. that you had warm and trusting relationships with others						
12. that you had experiences that challenged you to grow and become a better person						

13. confident to think or
express your own ideas
and opinions

14. that your life has a
sense of direction or
meaning to it

Appendix 3

ASI: Deep approach to learning (20)

Seeking meaning

1. I usually set out to understand for myself the meaning of what we have to learn.
2. When I'm reading an article or book, I try to find out for myself exactly what the author means.
3. When I am reading I stop from time to time to reflect on what I am trying to learn from it.
4. Before tackling a problem or assignment, I first try to work out what lies behind it.

Relating ideas

5. I try to relate ideas I come across to those in other topics or other courses whenever possible.
6. When I'm working on a new topic, I try to see in my own mind how all the ideas fit together.
7. Ideas in course books or articles often set me off on long chains of thought of my own.
8. I like to play around with ideas of my own even if they don't get me very far.

Use of evidence

9. I look at the evidence carefully and try to reach my own conclusion about what I'm studying.
10. Often I find myself questioning things I hear in lectures or read in books.
11. When I read, I examine the details carefully to see how they fit in with what's being said.
12. It's important for me to be able to follow the argument, or to see the reason behind things.

Interest in ideas (Motivational aspect)

13. Regularly I find myself thinking about ideas from lectures when I'm doing other things.
14. I find that studying academic topics can be quite exciting at times.
15. Some of the ideas I come across on the course I find really gripping.
16. I sometimes get 'hooked' on academic topics and feel I would like to keep on studying them.

Monitoring effectiveness

17. I go over the work I've done carefully to check the reasoning and that it makes sense.
18. I think about what I want to get out of this course to keep my studying well focused.
19. Before starting work on an assignment or exam question, I think first how best to tackle it.
20. When I have finished a piece of work, I check it through to see if it really meets the requirements.

Appendix 4

Factor Analysis SLC

Table 8

Kaiser-Meyer-Olkin factor adequacy

	SLC1	SLC2	SLC3	SLC4	SLC5	SLC6
MSA for each item	0.73	0.72	0.77	0.72	0.75	0.79

Note. Overall MSA: 0.74. MSA=Measure of Sampling Adequacy.

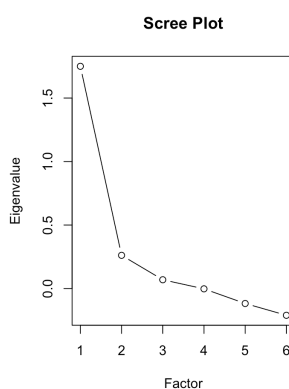
Table 9

Bartlett's Test

Chisq	101.5608
P-value:	6.597116e-15
Degree of freedom	15

Figure 2

Screen Plot for the Elbow Criteria for the Student Life Challenges Scale



Eigenvalues

1.750012033; 0.261573415; 0.069148158; -0.002393697; -0.117737666; -0.210592352

-> According to the Kaiser Criterion one factor should be used

Table 10*Factor Loadings for One Factor*

	Factor 1
SLC1	0.601
SLC2	0.557
SLC3	0.672
SLC4	0.496
SLC5	0.498
SLC6	0.365
SS loadings	1.750
Proportion Var	0.292

Note. SLC1-6 are the subscale of the Student Life Challenges.

Appendix 5

Factor Analysis ASI

Table 11

Kaiser-Meyer-Olkin factor adequacy

	ASI1	ASI2	ASI3	ASI4	ASI5
MSA for each item	0.82	0.76	0.8	0.8	0.8

Note. Overall MSA: 0.79. MSA=Measure of Sampling Adequacy.

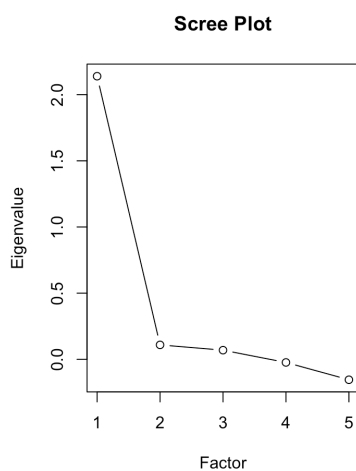
Table 12

Bartlett's Test

Chisq	139.3902
P-value	5.619232e-25
Degree of freedom	10

Figure 3

Screen Plot for the Elbow Criteria for the Approach to Study Inventory Scale



Eigenvalues

2.13931092; 0.10909574; 0.06900676; -0.02366875; -0.15443471

-> According to the Kaiser Criterion one factor should be used

Table 13*Factor Loadings for One Factor*

	Factor 1
ASI1	0.632
ASI2	0.717
ASI3	0.745
ASI4	0.621
ASI5	0.536
SS loadings	2.139
Proportion Var	0.428

Note. ASI1-6 are the subscales from the Approach to Study Inventory.

Appendix 6

Figure 4

Linear Assumptions with Stress as Predictor

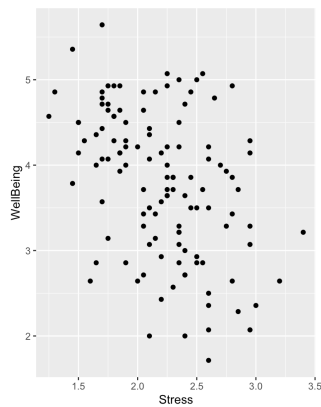


Figure 5

Linear Assumption with Interaction as Predictor

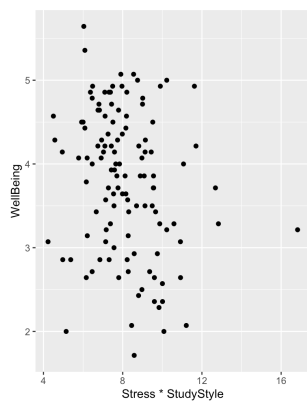


Figure 6

Independence and Homogeneity of Variance Assumptions

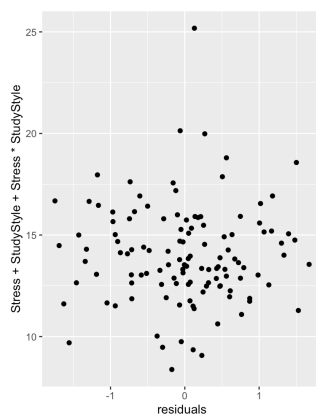


Figure 7*Normality Assumption*