The Influence of Academic Stress and Revenge Bedtime Procrastination on the Academic Performance of University Students

Beatrice Helena Gänzler

S3930866

Department of Psychology, University of Groningen

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Group 22

Supervisor: Dr. Nanxi Yan

Second evaluator: (prof.) (dr(s).) First name Last name

In collaboration with: Sophia Linke, Galina Tittler and Carmen Labee.

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Abstract

Revenge Bedtime Procrastination (RBP) describes the deliberate delay of sleep to regain time and control, despite negative consequences such as decreased or insufficient sleep. Based on the transactional theory of stress and coping (Lazarus & Folkman, 1984), RBP can be interpreted as a coping mechanism in response to stress. Insufficient sleep and heightened levels of stress outline the experience of many students involved in higher education, both negatively affecting their academic performance. Therefore, the present research places RBP into an educational context and aims to answer the question of how university students engage in this behavior and its consequences on performance. In a correlational study (N = 109), Perceived Academic Stress (PAS) is proposed to predict poorer Subjective Academic Performance (SAP). RBP is investigated on its mediating role in this relationship. Lastly, Online Education (OE), a source of increased stress, is assessed for moderation of the association between PAS and RBP. The outcomes suggest that PAS is predictive of poorer SAP, as well as an increased engagement in RBP. Despite this, no evidence was found for a mediating and moderating role of respectively RBP and OE. The qualitative data allows for an insight into the variety of reasons and content of RBP.

Keywords: revenge bedtime procrastination, higher education, academic stress, academic performance, sleep, coping mechanism

The Influence of Academic Stress and Revenge Bedtime Procrastination on the Academic Performance of University Students

Sleep is critical for both our physical and mental well-being (Banks & Dinges, 2007). It has a restorative function for the brain and is particularly influential in learning and memory processes (Euston & Steenland, 2014). According to Diekelmann and Born (2010), it promotes the consolidation of declarative as well as procedural and emotional memories in a wide variety of tasks. Although deviations might still be considered appropriate, between seven and nine hours of sleep are advised for adults by the National Sleep Foundation (Hirshkowitz et al., 2015). Experiencing less, and thus sleep deprivation (SD), may have significant short- and long-term consequences. In terms of health, sustained SD is associated with an impaired immune system, an increased risk of diabetes type 2, obesity and heart disease (Buxton and Marcelli, 2010; Colten et al., 2006; Orzeł-Gryglewska, 2010; Sabanayagam and Shankar, 2010). Furthermore, it correlates to cognitive impairment, memory lapses or loss, and overall poorer mental health (Colten et al., 2006; Orzeł-Gryglewska, 2010; Ram et al., 2010).

Approximately 35% of American adults experience less than the recommended minimum duration of seven hours, whilst among high school students close to 70% fall below the age-appropriate recommendation (Centers for Disease Control and Prevention, 2017). In a representative study, 43% of Dutch adults reported insufficient sleep and 32% a general sleep disturbance (Kerkhof, 2017). This makes SD and its consequences a persistent issue in our society. Considering the importance of sleep for learning and memory processes, it is not surprising that an inadequacy thereof precipitates a decline in academic achievement. In their research on Dutch undergraduates, van der Heijden and colleagues found chronic sleep reduction to be “a significant predictor of lower grades” and impaired concentration (2017).

Coherently, overall learning may be compromised and the risk of academic failure increases (Hershner & Chevrin, 2014).

In light of the importance of adequate sleep and the prevalence of SD, this study aims to investigate Revenge Bedtime Procrastination (RBP) in the context of higher education. RBP describes a behavior that individuals may engage in, who are preoccupied and experience stress during the day. Going to sleep is consciously delayed to regain control over personal time, despite disadvantages such as insufficient sleep (Magalhães et al., 2020, Suni, 2021). The framework of higher education was chosen because the experience of university students corresponds with the description of individuals engaging in RBP. A majority of university students experiences high levels of stress, pressure to perform, and insufficient sleep (Jiang et al., 2015; Regehr et al., 2013; Saleh et al., 2017; Zeek et al., 2015). Additionally, these factors are predictive of poorer academic performance (Frazier et al., 2019; Hershner & Chevrin, 2014; Schlarb et al., 2017). Therefore, the research question in this current study is: Why do university students engage in RBP and what consequences does it entail regarding their educational success? This research is built on Lazarus and Folkman's transactional theory of stress and coping (1984). Depending on the reason for engaging in RBP, it can be viewed as a form of both problem- and emotion-focused coping. Besides providing quantitative data on RBP, the focal point of this research is the relationship between academic stress and RBP and the impact on academic performance. Furthermore, the influence of online teaching on the relationship between academic stress and RBP is assessed in an extension to this.

The prevalence of stress, sleep-related issues amongst university students, and the consequences on their performance emphasize the relevance of this research. It serves as a contribution to the yet limited research on Revenge Bedtime Procrastination and places it into

the context of modern education. Lastly, the qualitative data on RBP sheds light on practical implications.

Literature Review

Bedtime Procrastination

Depending on the individual, the reasons for sleep deprivation may be interactive and multifactorial (Banks & Dinges, 2007). Causes range from respective disorders to external influences, such as one's occupation or private situation (Colten et al., 2006). Besides this, a subset of people also opts to stay awake longer than intended in exchange for following compromised functioning and discomfort (Nauts et al., 2018). This behavior is defined as bedtime procrastination and "a prevalent cause of sleep deprivation" (Chung et al., 2020; Nauts et al., 2018, p.1; Kroese et al., 2016). The term was introduced as a novel phenomenon by Kroese and colleagues and has gained increasing recognition over the past years (2016). In their research, slightly more than half of adult participants engaged in bedtime procrastination "on 2 or more days per week" - indicating its significant extent (Kroese et al., 2016, p.856).

Revenge Bedtime Procrastination

"報復性熬夜" is a phrase originating from China and can be translated to 'revenge staying up late'. The scientific term for this is 'Revenge Bedtime Procrastination' (RBP) and it resembles a specific form of bedtime procrastination. It describes the deliberate sacrificing of sleep 'for leisure time', commonly in the evening or at night (Suni, 2021). In 2020, this concept increasingly gained attention through various media outlets (Lee, 2020; Liang, 2020; Mateo, 2021). Here it is central that individuals engage in RBP because they otherwise cannot incorporate personal time, choices and interests into their stressful days. Three elements are important for this. Per night, RBP must reduce the overall sleep time (Suni, 2021). The delay has to be deliberate, and lastly the individual is aware of the negative consequences; thus, a

voluntary delay of going to bed, regardless of its disadvantages. The behavior is described as distinct from mindless procrastination or strategic delay (Nauts et al., 2018). RBP has been associated with insufficient sleep and disrupted sleeping patterns. Individuals engaging in this behavior postpone their sleeping time and consequentially may have issues with getting up the following morning.

Theoretical Framework

Lazarus and Folkman's transactional theory of stress and coping is suitable for illustrating Revenge Bedtime Procrastination (RBP) in an academic context. "According to [their] perspective, stress is defined as exposure to stimuli appraised as harmful, threatening, or challenging, that exceeds the individual's capacity to cope" (Biggs et al., 2017, p.352). Academic stress conforms to this definition and is composed of pressure to perform, workload, time restraints and academic self-perception (Bedewy & Gabriel, 2015). The dual coping taxonomy in Lazarus and Folkman's theory describes two manners of dealing with stressful stimuli (Biggs et al., 2017; Lazarus & Folkman, 1984). RBP can be viewed as both the problem-focused as well as the emotion-focused coping mechanism towards academic stress. Problem-focused coping serves to manage the stressor (Biggs et al., 2017). In the context of RBP, the external pressure and lack of control over one's time during the day, resulting from academic stress, can be viewed source of the problem. In order to resolve this, individuals take action and choose to delay going to sleep to reclaim control over their time (Suni, 2021). Emotion-focused coping aims to alter the aversive feelings that develop in response to the stressor, not the stressor itself. Through academic stress individuals may experience low self-esteem, feelings of depression, anxiety or general nervousness (Akgun & Ciarrochi, 2003; Bedewy & Gabriel, 2015). To cope with these negative emotions RBP can serve as a distraction or avoidance, dependent on the action chosen by the individual engaging in it.

Academic Stress and Academic Performance

According to Regehr and colleagues (2013), “approximately 50% of the student body experiences significant levels of stress in the form of anxiety and/or depression” (p.2). Supportive of this, an elevated degree of psychological distress was found in the majority of undergraduates (Saleh et al., 2017). Next to physical, social and emotional influences, circumstances within education are responsible for the greater part of the stress experienced by university students (Bedewy & Gabriel, 2015; Kerkhof, 2017). Whilst a healthy level of stress can improve performance, an excess thereof inhibits concentration and the preparation for performance - ultimately leading to poorer achievement (Sohail, 2013).

Based on this, the first hypothesis of the present study is formulated: An increase in Perceived Academic Stress (PAS) is negatively related to Subjective Academic Performance (SAP; Figure 1). PAS focuses on the pressure experienced by university students through their involvement and efforts in higher education (Bedewy & Gabriel, 2015). SAP describes the own estimation of academic success (Stadler et al., 2021). In line with the ethical guidelines of the University of Groningen, it was not possible to measure objective academic performance analogous to van der Heijden and colleagues (2017).

The Function and Consequences of RBP

Alongside heightened levels of stress, sleep deprivation and insomnia are also frequently found among university students (Jiang et al., 2015; Zeek et al., 2015). Insufficient sleep is experienced by 60% to 70% and consequently, half of these students encounter daytime sleepiness (Hershner & Chevrin, 2014; Schlarb et al., 2017). Both of these issues are reported to negatively impact concentration and learning capacity, consecutively resulting in poorer grades and an increased risk of academic failure (Hershner & Chevrin, 2014; van der Heijden, 2017). Revenge Bedtime Procrastination (RBP) is commonly associated with preoccupied and working individuals, however, the concept and its description may also be

applicable to university students. Stress, lack of leisure time, insufficient sleep or a deprivation thereof considerably outline the experiences of students within academia and simultaneously comprise the main criteria of RBP (Bedewy & Gabriel, 2015; van der Heijden, 2017; Hershner & Chevrin, 2014; Magalhães et al., 2020; Suni, 2021).

The second hypothesis of the current study aims to integrate stress, sleep and performance: RBP mediates the negative effect of PAS on SAP (Figure 1). Conforming to Lazarus and Folkman's transactional theory of stress and coping, individuals may engage in RBP to manage the circumstances or pressure experienced within education (Biggs et al., 2017; Lazarus & Folkman, 1984). Both the stimulus academic stress and the coping response RBP may negatively influence academic performance (Akgun & Ciarrochi, 2003; Bedewy & Gabriel, 2015; van der Heijden, 2017; Hershner & Chevrin, 2014). Similar to Kroese and colleagues (2016), the variable RBP only refers to the quantity of engagement in nights per week. The participants' duration and sufficiency of sleep were also assessed.

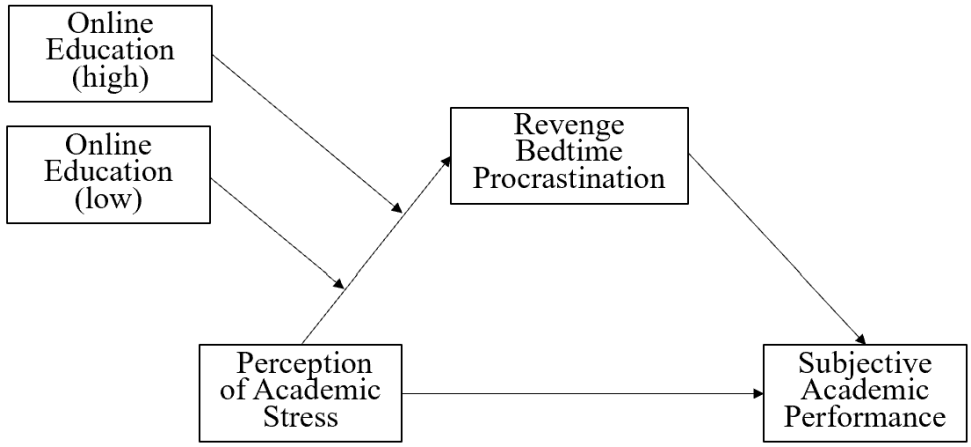
Online Education

With technological advancements, online access to educational resources has progressively expanded in the past decade (Seaman et al., 2018). In 2020, the onset of the COVID-19 pandemic forcibly accelerated this process (WHO, 2020). As "every aspect of human life including education" was disrupted, academia was confronted with a global shift from standard in-person to online education (Paudel, 2021, p. 70; WHO, 2020). This posed a significant challenge institutions and students had to adapt to (Chandra, 2020). Wang and colleagues (2020) report that more than 70% of their undergraduate sample experienced an increase in stress and anxiety whilst participating in virtual classes. Stress-related to academics contributed the most to the growth in psychological pressure. Although Online Education (OE) implies benefits, such as increased schedule flexibility or saving time through not having to commute, its consequences are considerable. Wang and colleagues report that a

majority of their student participants experienced an increase in workload and difficulty, problems concentrating, concerns for academic progress and performance (2020). By nature, OE leads to more time spent in front of a display. A negative association has been found between screen time and sleep duration, as well as the delay of sleep time (Hale & Guan, 2015). Taking prior literature into account, the third hypothesis of the current study presents Online Education (OE) as a moderator of the relationship between PAS and RBP (Figure 1).

Figure 1

Research Model containing all Hypotheses



Note. Hypothesis 1: Perception of Academic Stress (PAS), Subjective Academic Performance (SAP). Hypothesis 2: PAS, Revenge Bedtime Procrastination (RBP), SAP. Hypothesis 3: PAS, Online Education (OE), RBP.

Methods

Participants

An a priori power analysis based on G*Power was conducted (Faul et al., 2008). To yield a medium effect size and a power of .80%, 55 participants were necessary. In total 320 responses were recorded, but the final sample consisted of 116 individuals. After giving informed consent, participants were eligible if they currently are students in higher education, such as a university or comparable institutions. For the purpose of this study, other

occupations were excluded from the sample. Moreover, data was discarded if responses were incomplete. Female respondents made up 67.9% of the sample, 21.1% were male and 5.5% identified as other. The age of the participants averaged at 23.37 years and ranged from 18 to 47 (*SD* = 4.74). A majority of 60.6% signified currently residing in the Netherlands, and respectively 11%, 10.1% and 4.6% in Germany, the United States and the United Kingdom. Other locations were Argentina, Australia, Belgium, Canada, Peru and Portugal. The largest proportion is currently pursuing a bachelor's degree or similar (67%), whilst 15.6% are pursuing a master's degree or similar. A doctoral degree was followed by 6.4% of the participants. Another 5.5% indicated following another type of degree, such as a premaster. The academic program Psychology (Bachelor) was the most prevalent (34.9%). A broad variety of other programs were followed by singular individuals, ranging from Marine Biology to Computer Science. The length of program participation averaged at 2.60 semesters (*SD* = 1.28) of each six months.

Materials

For the assessment, an extensive online survey was compiled. Besides an informed consent form and demographic questions, the survey included two scales and descriptive questions regarding sleeping behavior and Online Education (OE). The language of assessment was English and all participants received the same questionnaire.

Perception of Academic Stress

To measure the stress experienced by students following their engagement in education (PAS), a 17-item scale developed by D. Bedewy and A. Gabriel was used (2015; see Appendix A). This Perception of Academic Stress Scale (PASS) has a Cronbach's alpha of 0.70, suggesting acceptable internal consistency (Gliem, 2005). It includes statements such as "Examination times are very stressful to me" and "I fear failing courses this year", which

respondents have to rate on a five-point Likert-type scale (1 = *strongly disagree,* 5 = *strongly agree*; Boone & Boone, 2012).

Subjective Academic Performance

Participants' academic performance (SAP) was assessed through the Subjective Academic Achievement Scale (SAAS), created by Stadler and colleagues (2021; see Appendix B). It consists of five items, such as "I progress adequately fast in my studies" and "I am satisfied with my grades at the university", which again are rated on a five-point Likert-type scale as mentioned above (Boone & Boone, 2012). The SASS has a Cronbach's alpha of 0.82 indicating good internal consistency (Gliem, 2005).

Online Education

The proportion of Online Education (OE) was assessed through two direct questions. Here participants could indicate the percentage of their current online participation in their study program. The ratio of in-person and OE is measured and responses are divided into high and low proportions of OE. Virtual participation of more than 50% is considered 'high' (OEh), whilst less than 50% is regarded as 'low' (OEl).

Sleeping and Bedtime Behaviours

After giving a concise description of the phenomenon Revenge Bedtime Procrastination (RBP), RBP was assessed through three questions. These measured general engagement in this behavior (1), the quantity per week (2) and the respondent's personal reasons for RBP (3; see Appendix C). Additionally, the participant's general sleeping experience was measured through three questions. On a scale ranging from zero to twelve hours, participants could indicate how much on average they sleep during the week (4) and weekend nights (5). Perceived sleep sufficiency was again measured on a five-point Likert-type scale (6; 1 = *not at all sufficient*, 5 = *largely sufficient*; Boone & Boone, 2012).

Design

The present research is correlational and a within-subjects design. The model assessing the first hypothesis consists of the independent and dependent variables Perceived Academic Stress (PAS) and Subjective Academic Performance (SAP). By adding Revenge Bedtime Procrastination (RBP) as the mediating variable, the second hypothesis is assessed. The moderator Online Education (OE) is assessed on its influence on the relationship between PAS and RBP, investigating the third hypothesis. All measures are continuous variables. For additional analysis, sleep and demographic data were included.

Procedure

The data collection took place from May 12th, 2022 to May 24th, 2022 and was managed by a group of students conducting research for and pursuing their Bachelor's degree. A convenience and self-selection method were used to distribute the research questionnaire (Morling, 2018). An online link to the questionnaire with a short description of the project was allocated by each researcher to known people, fellow students and on social media platforms. To avoid response bias, the exact hypotheses investigated were not shared with the participants. However, an adequate amount of information and the opportunity to pose questions was provided. All respondents received the same version of the questionnaire and an informed consent form regarding research purpose, further information and data confidentiality. Furthermore, the required age and estimated duration of participation were stated. Lastly, it was declared that participation is voluntary and one can end the questionnaire at any given moment without repercussions. No monetary or other form of compensation was provided for the participation in this research. All of the aforementioned was in accordance with the informed consent necessary to conduct the study. The present research adheres to the ethical guidelines of the University of Groningen.

Results

For the following statistical procedures, the software SPSS Statistics 28 and a cleaned data file were used. A total of 320 responses were recorded. However, 211 individuals were excluded due to insufficient responding. The remaining sample consists of 109 participants. Outliers of the variables Perceived Academic Stress (PAS), Subjective Academic Performance (SAP), RBP and Online Education (OE) were included because conscious estimations within given scales were demanded. No unreasonable patterns were found. Additionally, outliers for "age" were included as given responses were within a reasonable context and above 18 years of age. The average duration for questionnaire completion was 122.79 minutes (*SD* = 500.48 min). Reliability analyses were conducted for the PASS and SASS (17 items, $\alpha = .80$; 5 items, $\alpha = .41$), indicating respectively good and poor internal consistency (Gliem, 2005). This is partially in accordance with the original reported Cronbach's alpha values for these scales ($\alpha = .70$, $\alpha = .82$), with the SASS resulting in a significantly lower reliability in the present research.

PAS (*M* = 2.87, *SD* = .58) and SAP (*M* = 3.48, *SD* = .65) are significantly correlated (Table 1). The relationship is negative and can be considered moderate (Cohen, 1992). The association between PAS and RBP (*M* = 3.52, *SD* = 1.85) is significant, positive and moderate to large (Table 1). The relationship between RBP and SAP is small and insignificant, but in the predicted negative direction. Lastly, only a high proportion of OE (OEh; *M* = 78.00, *SD* = 14.96) was significantly and moderately correlated to SAP (Table 1). The association is positive and against the predicted direction. The relation between a low proportion of OE (OEl, *M* = 15.73, *SD* = 14.66) and PAS as well as RBP is not statistically significant. The demographic variable Age (*M* = 23.37, *SD* = 4.74) has a significant and positive correlation with OEh, which is moderate.

Hypotheses Testing

Main Effect

To assess the main effect described in the first hypothesis a simple linear regression was conducted (Table 2). The assumptions of normality, homoscedasticity and the absence of multicollinearity were met (James et al., 2013). Based on Perceived Academic Performance (PAS), Subjective Academic Performance (SAP) was predicted. A significant main effect for PAS was found (b = -.31, t = -2.97, p < .01). PAS explains 7.7% of the variance in SAP (R^2 = .08, F (1,106) = 8.79, p < .01). This outcome is supportive of the first hypothesis, as an increase in PAS is predictive of poorer SAP.

Table 1

Correlations of Variables and Demographics

	PAS	SAP	RBP	OEl	OEh	SW	SWE	SS
SAP	-.28**							
RBP	.43***	-.13						
OEl	-.12	-.04	-.06					
OEh	-.08	.26*	.01	-				
SW	-.35**	-.04	-.28**	-.10	-.08			
SWE	.03	.02	.15	-.19	-.18	.34**		
SS	-.33**	.03	-.24*	-.29	-.18	.49**	.12	
Age	.01	.11	.17	-.15	.35**	.30**	-.08	-.14

Note: SW: Sleep Week, SWE: Sleep Weekend, SS: Sleep Sufficiency. * p < .05. ** p < .01. *** p < .001.

Mediation Analysis

For the mediation analysis, the PROCESS macro model by A.F. Hayes was used (2022). In specific, model 4 and the statistical method of bootstrapping are applied, with 5000 resamples and 95% confidence intervals of the effects. This analysis investigates the second hypothesis, considering RBP as a mediator in the relationship between PAS and SAP. The

direct effect of PAS on SAP, as well as the indirect effect through RBP were assessed (Figure 2).

Table 2

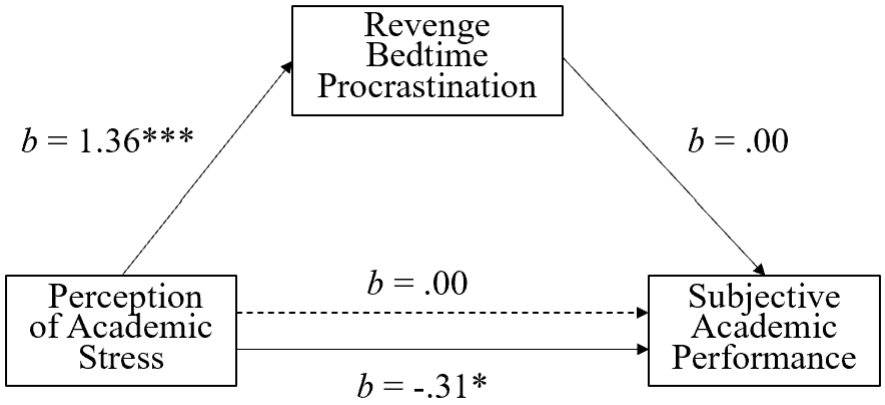
Testing for the Negative Effect of PAS on SAP

Model	*Unstandardized Coefficients*		*t*	*p*	95% CI	
	B	SE			LB	UB
Constant	4.37	.31	14.29***	<.001	3.77	4.98
PAS	-.31	.11	-2.97**	.004	-.52	-.10

Note: N = 108. * $p < .05$. ** $p < .01$. *** $p < .001$.

Figure 2

Mediation Model with Effect Sizes



Note. The dotted line illustrates the indirect effect between Perception of Academic Stress and Subjective Academic Performance. * $p < .05$. ** $p < .01$. *** $p < .001$.

In the partial model excluding SAP, PAS significantly explains 19% of the variance in RBP ($R^2 = .19$, $F(1,106) = 24.19$, $p < .001$). In congruity with the correlation ($r = .43$, $p < .001$), higher PAS significantly predicts greater engagement in RBP ($b = 1.36$, 95% *CI* [.81, 1.90], $t = 4.92$, $p < .001$). In the full model (Table 3), the predictors PAS and RBP explain 8% of the variance in SAP which also is significant ($R^2 = .08$, $F(2,105) = 4.36$, $p < .05$). Higher

PAS is predictive of poorer academic performance (b = -.31, t = -2.63, p < .05). RBP is not predictive of SAP (b = -.00, t = -.09, p = n.s.). The total effect of PAS on SAP is -.31 (*SE* = .11, t = -2.97, p < .01, 95% *CI* [-.52, -.10]) and the direct effect is -.31 (*SE* = .12, t = -2.63, p < .05, 95% *CI* [-.54, -.08]). The indirect effect of PAS through RBP on SAP is insignificant (*SE* = .06, 95% *CI* [-.13, .10]). No interaction between PAS and RBP was found (F(1,104) = .24, p = n.s.). RBP does not possess mediating properties in the relationship between PAS and SAP, but the relationship between PAS and RBP is significant. Hypothesis 2 is therefore only partially supported by these results.

Table 3

Testing the Mediation Effect of RBP in the Relationship between PAS and SAP

Predictors	*b*	*t*	*SE*	95% CI
Constant	4.37	14.20***	.31	3.76 ~ 4.98
PAS	-.31	-2.63*	.12	-.54 ~ -.08
RBP	-.00	-.09	.04	-.08 ~ .07
R^2			.08	
F			4.36	

Note: N = 108. * p < .05. ** p < .01. *** p < .001.

Moderation Analysis

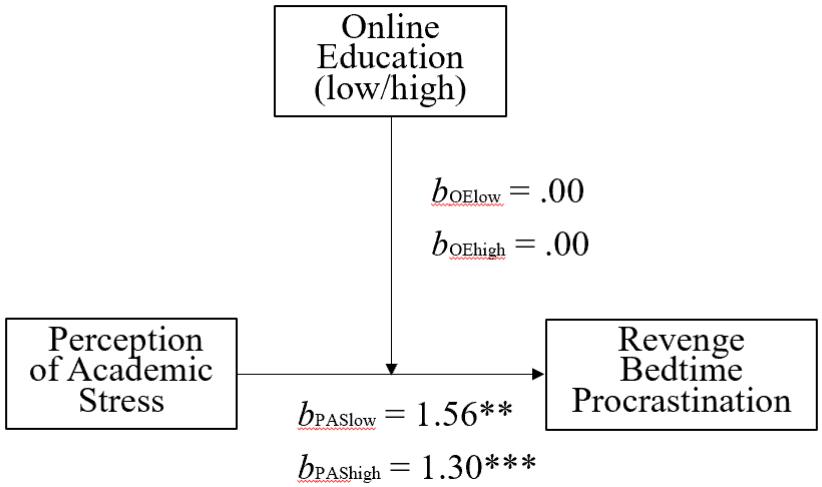
To investigate the third hypothesis, again the PROCESS macro model by A.F. Hayes was used (2022). Model 1 was applied with the previous bootstrapping settings. A moderation analysis was conducted to assess the moderating properties of Online Education (OE) on the relationship between PAS and RBP. OE was split up into two moderators, which were separately tested, namely OE high (OEh) and OE low (OEl; Figure 3).

In line with the aforementioned partial mediation model regarding PAS and RBP and the correlation between these variables, PAS had a positive effect on RBP in both the OEl and

OEh moderation model (b = 1.56, 95% *CI* [.58, 2.54], t = 3.21, p < .001; b = 1.30, 95% *CI* [.62, 1.97], t = 3.84, p < .001). Coherent with aforementioned correlations the moderating effects of both OEl and OEh were insignificant (b = .00, 95% *CI* [-.04, .04], t = -.14, p = n.s.; b = .00, 95% *CI* [-.03, .03], t = -.18, p = n.s.). Both did not possess any moderating influences on the relationship between PAS and RBP (Table 4). The interaction between OEl and PAS, as well as OEh and PAS, is also not significant (F(1,40) = 2.99, p = n.s.; F(1,57) = .83, p = n.s.). Therefore, the third hypothesis is neither supported partially nor fully. No evidence was found for OE moderating the impact of PAS on RBP.

Figure 3

Moderation Model with Effect Sizes



Note. * p < .05. ** p < .01. *** p < .001.

Revenge Bedtime Procrastination

On average participants engaged in RBP half of the evenings (M = 3.52, SD = 1.85). The amount of sleep on weeknights (SW), as well as Sleep Sufficiency (SS), are significantly negatively correlated to the engagement in RBP and PAS (Table 1). These relations are considered moderate (Cohen, 1992). RBP is predictive of SW as well as SS (b = -.18, t = -2.99, p < .01; b = -.17, t = -2.60, p < .05). Individuals slept an average of 7 hours during

weeknights (*M* = 6.94h, *SD* = 1.19h), which increased to slightly more than 8h during weekend nights (*M* = 8.25h, *SD* = 1.50h). SW is positively associated with the demographic variable age (Table 1). A majority of 39.4% perceived their sleep as "somewhat insufficient" and 4.6% as "not at all sufficient" (*M* = 3.18, *SD* = 1.28). No significant association was found between SAP and SW, SWE or SS.

Table 4

Testing the Moderation Effect of OEl and OEh in the Relationship between PAS and RBP

Predictors	OEl				OEh			
	b	*t*	*SE*	95% *CI*	*b*	*t*	*SE*	95% *CI*
Constant	3.20	11.69***	.27	2.64 ~ 3.75	3.71	18.57***	.20	3.31 ~ 4.11
PAS	1.56	3.21**	.48	.58 ~2.54	1.30	3.84***	.34	.62 ~ 1.97
OE	.00	-.14	.02	-.04 ~.04	.00	-.18	.01	-.03 ~ .03
PASxOE	-.06	-1.73	.03	-.12 ~ .01	-.02	-.91	.03	-.08 ~ .03
R^2			.24				.22	
F			4.15				5.25	

Note: N_{OEl} = 44, N_{OEh} = 61 . * $p < .05$. ** $p < .01$. *** $p < .001$.

Qualitative Analysis of RBP

A variety of reasons were given for the engagement in RBP. A common denominator was being preoccupied with work or studying during the day. One participant reasoned "I spend so much time in lectures/studying that there isn't much time to relax without staying up really late", and another stated, "I work 9-12 hours during the day, [the] night is my only free time". The answers could be divided up into individuals needing the night-time for themselves or for further obligations. For the latter, participants often reasoned with either procrastinating or 'not having done enough' during the day and therefore not allowing themselves to rest. One participant stated that they engage in RBP because they 'feel as if

[they] did not earn the right to sleep. [They] did not do enough and [they are] simply not enough to allow [themselves] to sleep (…)'. The need for time for oneself included a variety of active and passive activities. Whilst some enjoy reading or being on their phone, others delay their bedtime by meeting friends, gaming or going out. Watching movies or shows in order to relax was mentioned frequently. A subset of participants indicated engaging in RBP because they do not experience any responsibilities, expectations or judgment from others at night time. One individual responded: "At night I feel like I can finally calm down and do things without being pressured by the outside world. No one would call or text and ask about something, but you can be alone with your thoughts and can feel unwatched".

Discussion

This study aims to investigate the role of Revenge Bedtime Procrastination (RBP) in the relationship between academic stress and the coherent academic success of university students. RBP refers to the deliberate delay of bed-time, conscious of negative consequences such as insufficient sleep, in order to reclaim control over personal time (Suni, 2021). The behavior is often associated with preoccupied and working individuals. However, it may also correspond to university students who experience pressure through their involvement and efforts within higher education (Bedewy & Gabriel, 2015). The interpretation of RBP is based on the transactional theory of stress and coping, where it is viewed as a coping mechanism for academic stress (Biggs et al., 2017; Lazarus & Folkman, 1984).

Academic Stress and Academic Performance

Accumulated scientific evidence indicates the vast prevalence of stress amongst university students (Regehr et al., 2013; Saleh, 2017). Apart from other influences, pressure related to education accounts for the majority of it (Bedewy & Gabriel, 2015). This Perceived Academic Stress (PAS) is composed of pressure to perform, workload, time restraints and academic self-perception. To an extent the experience of stress may enhance performance,

however, an excess thereof inhibits this, ultimately leading to poorer achievement (Sohail, 2013). Paradoxically, this suggests that the heightened pressure, experienced through academic efforts, may reduce success.

The outcome of the current research is in favour of the literature. PAS negatively predicts Subjective Academic Performance (SAP). University students who experience higher pressure reported less success within education, thus an adverse effect on their SAP. Even though this result is significant, the scope of the effect is limited. Only about 8% of the changes in SAP were explained through PAS. This implies the presence of other factors influencing SAP, which were not taken into account in the present study. Social, emotional or physical stressors, separate from academic pressure, might influence performance to a greater extent than expected. These factors may interfere with performance itself but also with the preparation thereof, such as studying for exams or creating a presentation (Sohail, 2013).

It should be taken into consideration that SAP is based on the participant's own estimation. The ethical guidelines at play did not allow for an objective measurement of participants' grade point average, similar to van der Heijden and colleagues (2017). Thus, the subjective outcomes may possess compromised reliability and validity (Elasy & Gaddy, 1998). Furthermore, the internal consistency of the scale measuring SAP was unacceptable, contrary to the good internal consistency indicated by its authors (Stadler et al., 2021).

The Function and Consequences of RBP

The second hypothesis is partially supported. No evidence was found for a mediating role of Revenge Bedtime Procrastination (RBP) in the relationship described in the first hypothesis. Again, Perceived Academic Stress (PAS) is negatively associated with reported academic success (SAP). PAS also predicts frequent engagement in Revenge Bedtime Procrastination (RBP). However, RBP does not influence SAP. The association between RBP and SAP follows the anticipated negative direction but it is insignificant.

Despite the diverging outcomes, RBP can still be placed into the context of the transactional theory of stress and coping (Biggs et al., 2017; Lazarus & Folkman, 1984). Here, PAS resembles the stressor, that is challenging and exceeding the individual's capacities. Students who experience high levels of academic stress (PAS) were more likely to engage in RBP. Conforming to Lazarus and Folkman (1984), RBP is viewed as a coping mechanism in response to PAS. In line with their dual taxonomy, the function of RBP can both be emotion- and problem-focused, dependent on the intention and content of the behavior.

During the day students are led by the pressure to perform, a heightened workload and time restraints (Bedewy & Gabriel, 2015). To manage this academic stress and to regain control over their time, they consciously choose to stay awake longer at night. Through intentionally sacrificing sleep, individuals create time for themselves, their choices and interests (Suni, 2021). As a result, leisure is sustained, however at the cost of sufficient sleep and sleep duration. In agreement with the definition given by Suni (2020), RBP is indeed associated with decreased sleep sufficiency and a shorter sleep duration throughout the week. Despite these negative consequences, the action of reclaiming control through RBP illustrates its problem-focused approach.

In response to academic stress, students may experience feelings of depression, anxiety and low self-esteem (Akgun & Ciarrochi, 2003; Bedewy & Gabriel, 2015). Individuals may engage in RBP to avoid these negative emotions, which resembles the emotion-focused approach. Here the content of RBP is relevant. The qualitative data is addressed in a subsequent section (see: Revenge Bedtime Procrastination).

The insignificant association between RBP and SAP may be explained by the unacceptable reliability of SAP. RBP is associated with decreased sleep sufficiency and duration, which in turn is a predictor of decreased academic performance (van der Heijden,

2017; Hershner & Chevrin, 2014). Interestingly and contrary to previous evidence, these sleep measurements were also not associated with SAP, suggestive of its inaccuracy.

Online Education

Building on the association between Perception of Academic Stress (PAS) and Revenge Bedtime Procrastination (RBP), Online Education (OE) was predicted to moderate this relationship. The results were not supportive of this. Coherent with the insignificant correlations between OE and PAS or RBP, the positive effect of PAS on RBP is not moderated by OE.

In disagreement with these outcomes, previous research suggests that OE may be related to academic stress and sleep difficulties. It is associated with an increase in workload and difficulty, problems concentrating, concerns for academic progress and performance (Wang et al., 2020). An explanation for this could be that students gradually have adapted to these challenges. The research by Wang and colleagues was conducted in 2020, when undergraduates were confronted with a rapid shift from standard in-person education to OE (Paudel, 2021). Now, in 2022 it resembles a widespread and contemporary part of education.

Past literature also proposes a negative association between screen time, which is conditional to OE, and sleep duration, as well as the delay of sleep time (Hale & Guan, 2015). The associations between OE and sleep measurements are insignificant but in agreement with this predicted direction. However, the influence of OE on RBP is minimal. Again, adaptation to the circumstances or simply no interaction might be possible. Further research is necessary.

RBP and its Implications

Within the transactional theory of stress and coping, Revenge Bedtime Procrastination (RBP) resembles a coping mechanism to academic stress (Biggs et al., 2017; Lazarus & Folkman, 1984). To manage the loss of control, participants reclaimed it by purposely sleeping later, addressing the problem-focused approach. One participant stated, “I spend so

much time in lectures [or] studying that there isn't much time to relax without staying up really late". RBP was engaged in as emotion-focused coping when experiencing negative feelings that resulted from academic stress. Here, avoidance or distraction through various media or activities was mentioned. The outcome suggests clearly that, apart from working individuals, university students also engage in it. Further participants indicated engaging in RBP because they do not experience any responsibilities, expectations or judgment from others at night time. One individual responded: "At night I feel like I can finally calm down and do things without being pressured by the outside world. No one would call or text and ask about something, but you can be alone with your thoughts and can feel unwatched.". These statements illustrate the aim of reclaiming control over one's time. Some participants reported postponing their sleep time for further obligations, because they were not productive enough or procrastinated during the day. Again, control is reclaimed but not for leisure time. RBP included a wide variety of actions ranging from reading and playing video games to going out with friends.

The mean week-night and weekend-night sleep duration of the present sample were close to 7 and 8.5 hours. On the bright side, this finding matches with the advice for adults, given by the National Sleep Foundation (Hirshkowitz et al., 2015). However, it is inconsistent with the simultaneous prevalence of RBP. According to Suni (2021), a core criterium is a decreased sleep duration per night. How did the participants engage in RBP approximately every second night whilst still maintaining a healthy sleep duration? The results are not conclusive of this. Despite the inconsistency of theoretical and factual evidence, RBP was found to be predictive of shorter weeknight sleep duration and poorer sleep sufficiency. Possible explanations for the abovementioned disagreement could be that individuals reclaimed sleep-time through day-time sleeping or going to bed early on the evenings consecutive to nights they engaged in RBP. The association between RBP and weekend sleep

duration is insignificant but positive. This outcome suggests that students may engage in RBP – without facing the negative consequences. Through fewer obligations during the weekend, the deficit can be restored through sleeping in or day-time sleeping.

Limitations and Future Directions

As data on Revenge Bedtime Procrastination (RBP) is scarce, further research is necessary to investigate its consequences. A replication of the present research is recommended, targeting a more accurate measurement of academic performance and RBP. Academic performance could be re-assessed with the Subjective Academic Achievement Scale (Stadler et al., 2021) or with objective measurement, such as the grade point average (van der Heijden, 2017). Furthermore, the Bedtime Procrastination Scale introduced by Kroese and colleagues may be adapted into a structured measurement for RBP (Kroese et al., 2016).

Internet surveys are suggested to be consistent with traditional in-person questionnaires (Gosling et al., 2004). However, the outcome of this study may be prone to indifference due to its length and form of distribution (Morling, 2018). Many respondents may have found the topic RBP initially appealing. As the questionnaire also measured various other variables, this primary interest may have decreased as well as engagement. In total, almost two-thirds of individuals were excluded from the analysis due to insufficient responding. The extent of the survey also made participation a lengthy process. The average duration exceeded the predicted duration significantly. Some participants may have ended the questionnaire prematurely or paused it to return at a later point. The self-selection sampling used suggests a possible self-selection bias (Morling, 2018). Through distributing information about RBP participants were recruited, which may have found the subject personally relevant. Therefore, the sample might possess certain characteristics regarding procrastination, chronotype or sleeping habits that diverge from the population.

Due to the correlational nature of the present research, no evidence for causal relationships between PAS and SAP or RBP is provided. For example, the outcomes are supportive of PAS negatively predicting SAP. However, an inverted relationship was not assessed and cannot be excluded.

Conclusion

The aim of this study was to answer the research question "Why do university students engage in RBP and what consequences does it entail regarding their educational success?". In sum, the outcomes are only partially supportive of the hypotheses. Even though students who experience heightened academic pressure are susceptible to decreased subjective academic performance, Revenge Bedtime Procrastination (RBP) does not interfere with this. No evidence was found for a negative influence of RBP on academic success, which answers one element of the question. However, it appears to be a functional coping mechanism in response academic stress. Individuals may engage in RBP to regain control over their own time, which they insufficiently experience through the pressure during the day. Also, the activities composing RBP serve as a distraction from the negative emotions, that result from academic stress. Online Education does not influence this relationship. This answers the remaining part of the research question. In theory, RBP is a maladaptive coping mechanism through the prerequisite of insufficient or decreased sleep. This transcribes to practice, as negative associations between RBP and sleep were found. However, sleep duration remained within health-related guidelines. Future research is necessary for revisiting the consequences of RBP.

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Appendix A

Perception of Academic Stress Scale

The Perceptions of Academic Stress Scale (Bedewy & Gabriel, 2015):

1. I am confident that I will be a successful student
2. I am confident that I will be successful in my future career
3. I can make academic decisions easily
4. The time allocated to classes and academic work is enough
5. I have enough time to relax after work
6. My teachers are critical of my academic performance
7. I fear failing courses this year
8. I think that my worry about examinations is a weakness of character
9. The size of the curriculum (workload) is excessive
10. I believe that the amount of work assignments is too much
11. I am unable to catch up if getting behind with work
12. The unrealistic expectations of my parents stresses me out
13. Competition with my peers for grades is quite intense
14. The examination questions are usually difficult
15. Examination time is too short to complete the answers
16. Examination times are very stressful to me
17. Even if I pass my exams, I am worried about getting a job

Appendix B

Subjective Academic Achievement Scale

The Subjective Academic Achievement Scale (Stadler et al., 2021):

1. I am satisfied with my grades at university.
2. I am successful in my studies.
3. My grades are appropriate for my effort.
4. I progress adequately fast in my studies.
5. My fellow students study more successfully than me.

Appendix C

Assessment of Bedtime and Sleeping Behaviours

Revenge Bedtime Procrastination:

(1) Revenge Bedtime Procrastination describes the voluntary decision to delay bedtime despite being aware of the negative consequences, such as sleep deprivation and feelings of guilt. Have you ever engaged in such kind of behavior?

(2) How often do you engage in such kind of behavior?

(3) Why do you engage in such kind of behavior? Please type an answer below.

Sleep:

(4) Please indicate, on average, how many hours you usually sleep during weeknights.

(5) Please indicate, on average, how many hours you usually sleep during weekend nights.

(6) To what extent do you feel the number of hours of sleep you get is sufficient? Please indicate this on the scale.