

# Investigating the relationship between bedtime procrastination, psychological stress, and mental health among Saudi undergraduates

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## Abstract

This study aimed to explore the relationship between bedtime procrastination, stress, and well-being among undergraduates (N=536; 324 males, 60.4%; 212 females, 39.6%; M age = 24.27, SD = 5.62). Participants completed online questionnaires on the Bedtime Procrastination Scale, Stress Scale, and Mental Health Continuum-Short Form. Results showed that the Non-stressed were higher well-being more than the Stressed group. Furthermore, bedtime procrastination was correlated positively with stress, negatively with mental well-being, and males were higher bedtime procrastination than females. Students who live alone are more bedtime procrastinating than ones who live with their family. These results suggest that bedtime delay is an important variable related to stress and defecting in well-being. Procrastinators have risk-taking behaviors that can be included psychological problems.

## Keywords

Bedtime, procrastination, Psychological stress, Mental health

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## Introduction

In today's world, the most popular feature is the decrease in sleep hours, and procrastination is one of the reasons for that (Türkarlan, Okay, Çevrim, & Bozo, 2020). Procrastination, including bedtime procrastination, which involves a gap between intentions and behavior (Kadzikowska-Wrzosek, 2020), may be described as a regular failure to do what needs to be done to reach goals (Lay, 1986), whereas (Ferrari & Tice, 2000) are reported it as a self-regulation style that includes a postponement in the start of a task (Ferrari & Tice, 2000). A procrastinator is described by Popoola (2005) as who knows what, how to do, but still does not do it (Popoola, 2005). Procrastination is defined as the willing delay in an intended work when the delay is expected to perform worst (Steel, 2007). Altogether, more researchers have suggested that delaying bedtime may be a form of a specific type of procrastination, referred to as bedtime procrastination (Kadzikowska-Wrzosek, 2020), or a type of health behavior procrastination that has been related to sleep habits (Kroese, Evers, Adriaanse, & Ridder, 2014). Hence, it can be defined, as "failing to go to bed at the intended time while no external circumstances prevent a person from doing so" (Ma, Meng, Zhu, Xu et al., 2020). Procrastination is plausibly related to prevention life behaviors (F. M. Sirois, 2007; F. M. Sirois, Melia-Gordon, & Pychyl, 2003). However, the relationship between procrastination and sleep has been slightly explored (Li, Buxton, Kim, Haneuse et al., 2020). Good sufficient sleep is very important to good health, well-being, and effective performance (Herzog-Krzywoszanska & Krzywoszanski, 2019; Ma et al., 2020). Most people are aware of the importance of sleep for their health and well-being, however, bedtime delay is a universal phenomenon (Basch, Basch, Ruggles, & Rajan, 2014; Kroese, Evers, et al., 2014; Steel, 2007). So, procrastination is a phenomenon that leads students to postpone their sleeping time and to resist going to bed (Kroese, De Ridder, Evers, & Adriaanse, 2014). This also seems to be true for college students who put off going to sleep because surfing involved the internet, using their smartphones, or their computer (Li et al., 2020; Nauts, Kamphorst, Sutur, Poortvliet et al., 2016). However, many studies have reported that poor sleep quality is common among college students and seriously impacts their everyday lives (Ma et al., 2020). Several factors play significant roles in receiving delayed sleep such as was procrastination, self-regulation problems, which was also a major predictor of general procrastination (Ferrari & Emmons, 1995; Heatherton & Baumeister, 1996), also, chronotype and self-control may account for bedtime procrastination (Kroese, Evers, et al., 2014), and it appears that bedtime delay is related to intentions, focusing on immediate pleasures rather than in the long-term (Nauts et al., 2016). It has been well-recognized that several physiological psychological, and external environmental factors can affect the quality of sleep of younger people such as sex (Galland, Gray, Penno, Smith et al., 2017), body weight (Krističević, Štefan, & Sporiš, 2018), stress (Alsaggaf, Wali, Merdad, & Merdad, 2016; Seun-Fadipe & Mosaku, 2017). An increasing of studies have shown the links between delayed bedtime, health behaviors, and health problems (Kadzikowska-Wrzosek, 2020; F. M. Sirois, 2004; F. M. Sirois et al., 2003). There isn't much research on the effect of procrastination on sleep quality (F. M. Sirois, van Eerde, & Argiropoulou, 2015). In general, procrastination is related to our behaviors, particularly mental health and personality (Eerde, 2004; Steel, 2007). If procrastination is seen as a failure of self-control, then bedtime procrastination was recently recognized as an important factor in lack of sleep in the general population (Herzog-Krzywoszanska & Krzywoszanski, 2019).

(F. M. Sirois, 2007; F. M. Sirois et al., 2003) have provided the procrastination-health model. According to this model, procrastination may have both direct and indirect effects on one's wellbeing (Li et al., 2020). The direct pathway is related to the high levels of stress that chronic procrastinators often encounter as a result of rushing to complete tasks at the last minute or from failing to reach deadlines (F. M. Sirois et al., 2015). The indirect pathway concerns behavioral routes: procrastinators can participate in unhealthy behaviors that provide immediate gratification while delaying health-protective behaviors that involve immediate costs and effort (F. M. Sirois, 2007; F. M. Sirois et al., 2003). However, sleep is necessary and can be influenced by stress, regardless of how sleep procrastination is perceived as a fitness consequence or a health response (C. Lund, 2010). The current study explores how sleep procrastination negatively impacts mental health and higher stress by validating Sirois and colleagues' (F. M. Sirois, 2007; F. M. Sirois et al., 2003). In college student samples, a model of procrastination-psychological health was developed. So, this study offers some suggestions that the link between bedtime procrastination and poor well-being may be explained by perceived stress.

In recent years, it has been observed that the widespread use of information technology not only in communications and entertainment (for example, social networks, smartphones, computers, and television) but also in education, particularly distance education in the time of the Covid-19 pandemic, has made many students delay bedtime. The procrastination prevalence remains high among undergraduate and graduate students (Li et al., 2020). Numerous difficulties appear to be related to procrastination such as anxiety, depression, higher stress, low self-esteem, and depression (Hussain & Sultan, 2010; Kadzikowska-Wrzosek, 2020), and negatively impacted the well-being health of students (Joubert, 2015). One of the most important areas associated with procrastination is health behavior, just as stress is one of the most important influences on a feeling of mental health (Tice & Baumeister, 1997). The procrastination–health model had interpreted the routes through which procrastination may provide poor health-related outcomes such as sleep quality (F. M. Sirois et al., 2015). Thus, having insufficient sleep is a very common problem that has both physical and psychological consequences (Türkarşlan et al., 2020). Depression and stress were significantly and positively associated with short sleep duration in university students and adults (Bernecker & Job, 2020a; J. Guo, D. Meng, X. Ma, L. Zhu et al., 2020). Previous studies have shown that sleep delay is related to negative responses in emotion regulation (Yoo, Gujar, Hu, Jolesz et al., 2007), decision making (Harrison & Horne, 2000) accident risk (Komada, Inoue, Hayashida, Nakajima et al., 2008). Of course, bedtime procrastinating can increase feelings of stress, and thus reduce mental health. Bedtime procrastination, in particular, is a relatively recent form of procrastination linked to health behavior (Zhang & Wu, 2020).

The current study aims to determine the prevalence of stress among students of Umm Alqura University and to see how bedtime procrastination influences stress levels in these students. In this exploratory study, we also want to see if bedtime delay is a new phenomenon that adds to the literature on procrastination in sleep among Saudi Arabian students. We also aim to understand some of the variables that affect bedtime delays, such as demographic characteristics, and how bedtime delay is associated with feelings of stress and poor mental health, which may help identify students at risk of mental disorders and provide an opportunity to prevent sleep procrastination and early intervention in stress management. Thus, having delay sleep is a very common problem that has both physical psychological consequences, as a consequence, it's important to look into the factors that lead to bedtime procrastination, with stress being one of the most risks.

## Method

This is a cross-sectional study was designed to investigate finding out the prevalence of stress and bedtime procrastination problems in the undergraduate population's well-being. The authors gaining permission from the Deanship of Scientific Research at Umm Alqura University. The study was conducted in February and March 2020 with the participation of a sample of Umm Alqura University students in Saudi Arabia, (N=536; 324 males, 60.4%; 212 females, 39.6%; M<sub>age</sub> = 24.27, SD = 5.62). Of the total sample, 281 or 52.4 % of them studied applied sciences such as medicine, engineering, and information systems; and 255 or 47.6% of them studied theoretical subjects (e.g., education, humanities, and administration). The procrastination, negative emotional symptoms, and well-being questionnaires were completed online.

The *Bedtime Procrastination Scale (BPS)* was developed by Kroese, De Ridder, et al. (2014) to measure bedtime delay. BPS has 9 items, e.g., going to bed early if necessary, doing other things at bedtime. BPS items were answered on a 5-point Likert scale (1 = almost never to 5 =almost always) (Kroese, De Ridder, et al., 2014). The higher values express more delay of bedtime The validation of the English version has proven to be reliable, with Cronbach's alpha value being 0.79 (Jing Guo, Dexin Meng, Xiaohan Ma, Liwei Zhu et al., 2020). In the present study, Cronbach alpha was .61, although it is not high, it can be trusted, as BPS showed a significant association with IPS ( $r = .40$ )  $p < .001$ . The internal consistency of items BPS were good where the correlations ranged between ( $r = .14$  and  $r = .45$ )  $p < .001$ .

The *Stress Scale (SS)* one of the dimensions of the negative emotions scale; Depression, Anxiety, and Stress Scales (DASS). DASS was established by Lovibond and Lovibond (1995), consists of 42 items to use in the diagnosis of negative emotional symptoms; depression, anxiety, and stress (Antony, Bieling, Cox, Enns et al., 1998; Norton, 2007). The DASS has two forms, the full form contains 42 items and the short form has 21 items that reflect the same properties as the full form.



Participants completed online of the DASS-21; they are reporting symptoms of the past month are requested. The DASS-21 has high psychometric characteristics and it was used in many cross-culture studies (Dahm, Wong, & Ponsford, 2013; Jun, Johnston, Kim, & O'Leary, 2018; Norton, 2007; Tran, Tran, & Fisher, 2013). The DASS-21 has higher internal consistency. The alpha values were ranged from .83 to .87 (Henry & Crawford, 2005; Osman, Wong, Bagge, Freedenthal et al., 2012; Sinclair, Siefert, Slavin-Mulford, Stein et al., 2012). In the present study alpha reliability was .87 for depression; .89 for anxiety; .86 for stress; and .90 for the total DASS-21 respectively. The psychometric properties of DASS-21 were good. Internal consistency of depression' items ranged between ( $r = .65$  and  $r = .84$ )  $p < .001$ ; anxiety' items ranged between ( $r = .52$  and  $r = .84$ )  $p < .001$ ; stress' items ranged between ( $r = .56$  and  $r = .82$ )  $p < .001$ ; and (total DASS-21) ranged between ( $r = .57$  and  $r = .83$ )  $p < .001$ .

The *Mental Health Continuum-Short Form (MHC-SF)* was established by Keyes (2005). The MHC-SF has 14 items. It measures Social Well-Being (SWB), Psychological Well-Being (PWB), and Emotional Well-Being (EWB), as described in Keyes's (Antony et al., 1998) model of SWB and in (Carol D Ryff, 1989) model. The MHC-SF scale has high internal consistency alphas ranging from .81 to .91 for three subscales, which represents the subscales' good validity (Luijten, Kuppens, Bongardt, & Nieboer, 2019; Carol D. Ryff & Keyes, 1995). In the present sample, the Cronbach's alpha reliability indices were .82 for EWB, .89 for SWB, .87 for PWB, and .89 for the total MHC-SF respectively. These results support the MHC-SF's good construct validity. The internal consistency correlations of the items of EWB extended from  $r = .63$  to  $r = .71$  with  $p < .001$ , those of SWB extended from  $r = .63$  to  $r = .73$  with  $p < .001$ . those of PWB extended from  $r = .63$  to  $r = .74$  with  $p < .001$ , and those of the total MHC-SF extended from  $r = .85$  to  $r = .91$  with  $p < .001$ .

The original measures of the BPS, SS, and MHCSF in English were translated into Arabic by the authors of the present study, and then the two native Arabic speakers who were fluent in English translated the English measures into Arabic. Inconsistencies in the initial translations were resolved with the help of a third independent translator. The Arabic versions of the BPS, SS, and MHCSF were then translated back into English by two native English-speaking language specialists who were blind to the original scale. The differences between the translated versions were measured and a satisfactory match with the original standards was achieved through an agreement between the translators. The finished Arabic measures were checked for cultural appropriateness by three academics from the Department of English Language at Umm Alqura University; controversial issues from the BPS, SS, and MHCSF were identified; and necessary changes were made. The updated measures were re-evaluated by the original panel of experts to finalize the Arabic measures used in this study. The language equivalence, validity, and internal consistency reliability of the scales were examined.

*Statistical analysis.* The data in our study was entered and analyzed using SPSS (V.22). The normal distribution and descriptive statistics were recorded for each variable, and the mean values of quantitative variables were compared using the t-test. Proportions were compared. Pearson's correlations between variables were calculated. Multiple linear regression with demographic characteristics, BPS scores, and stress were performed.

## Results

The variables in our study were nearly normally distributed. Table 1 shows BPS scores according to some demographic characteristics; males reported higher bedtime procrastination than females ( $t = 2.50$   $P \leq .02$ ); Older are more bedtime procrastinating than younger ( $t = 2.25$   $P \leq .02$ ); students who live alone are more bedtime procrastinating than ones who live with their family ( $t = 4.50$   $P \leq .000$ ), students who live in the countryside are more bedtime procrastinating than those who live in the city ( $t = 2.85$   $P \leq .01$ ) and married students are more bedtime procrastinate than singles ( $t = 2.66$   $P \leq .008$ ), while no significant differences in academic study, income, academic achievement, university health care, and time spent on the internet.

*The prevalence of bedtime procrastination and stress in Saudi students:* In our study, we calculated the prevalence of bedtime procrastination and stress through M and SD, for bedtime procrastination the BPS (Bartel, Gradisar, & Williamson, 2015) in Saudi students was M; SD. ( $28.31 \pm 3.82$ ), we considered a score of 32 and above is the most bedtime procrastinating was measured; 16.2% all samples; 17.9% male; 13.7% female. For stress (Bartel et al., 2015) was M; SD. ( $20.74 \pm 5.25$ ); we calculated a score of 26 and above is considered the most stressed were measured; 16% all samples; 12.7% male; 21.2% female (fig. 1).

**Table 1**

Bedtime Procrastination according to demographic characteristics

Variable		M	SD	t.	Sig.
Sex	Male	28.62	3.90	2.50	$P \leq .02$
	Female	27.84	3.67		
Age	First academic year	27.86	3.10	2.25	$P \leq .02$
	Final academic year	29.01	4.40		
Academic study	Theoretical	28.23	3.31	43.-	$P \leq .67$
	Applied	28.30	4.25		
Residential location	Countryside	28.78	3.82	2.85	$P \leq .01$
	City	27.84	3.78		
Income	High	28.83	6.06	.41	$P \leq .41$
	Low	28.09	4.13		
Academic achievement	High	27.72	3.08	.15	$P \leq .97$
	Low	28.44	3.74		
University /home housing	With family	28.14	3.58	4.50-	$P \leq .000$
	Alone	30.38	3.84		
Married	Yes	28.55	3.40	2.66	$P \leq .008$
	No	27.52	3.91		
University health care	Satisfied	28.46	3.80	1.18	$P \leq .23$
	Unsatisfied	28.06	3.87		
Time spent on the internet	$\leq 8$ hours	28.27	3.16	.24	$P \leq .81$
	$\geq 4$ hours	28.16	4.03		

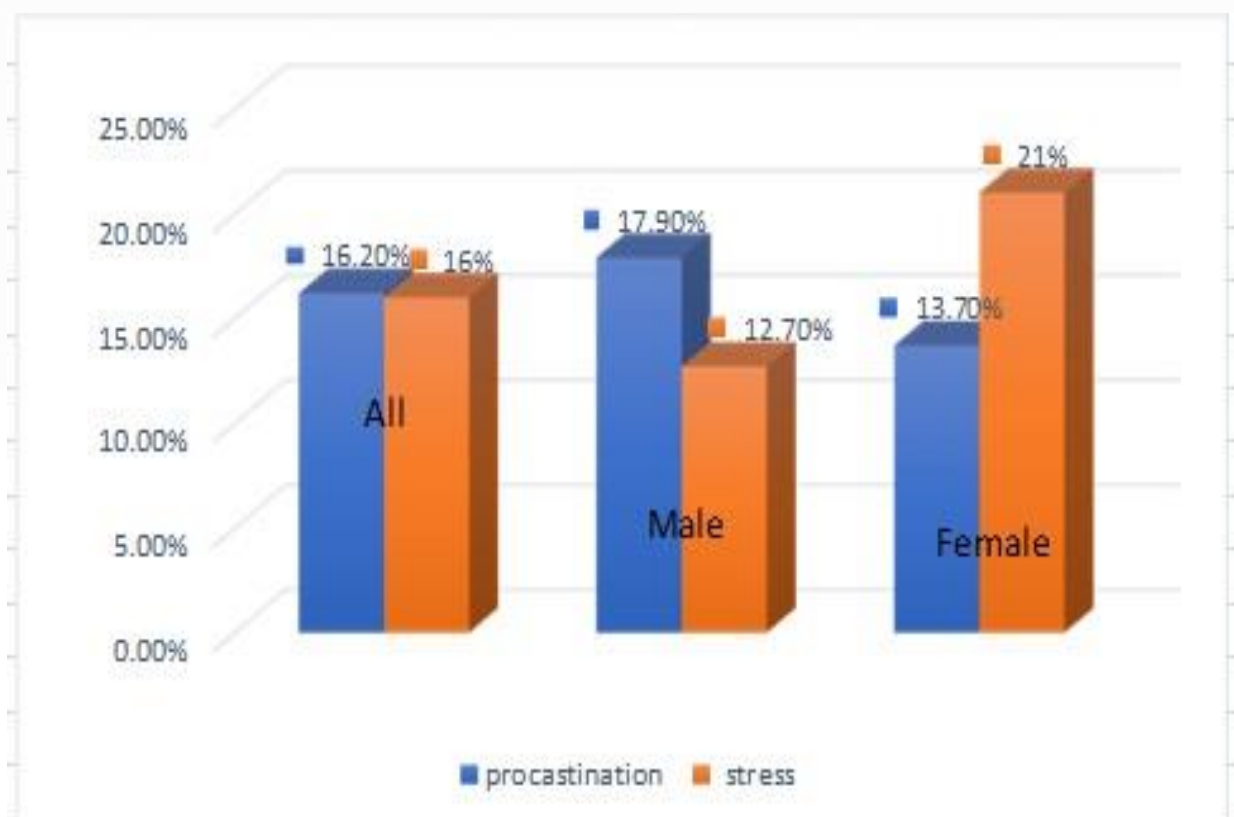
**Fig 1.** The prevalence of bedtime procrastination and stress in Saudi students

Table 2. shows significant differences were found in BPS items scores (1; 3; 4; 5; 6; 8; 9 and BPS total) for the stressed group, while significant differences were found in BPS items scores (2; 7); and dimensions of mental health (EWB, AWB, PWB, and MHCSF total) for the non-stressed group.

**Table 2**

Bedtime procrastination and dimensions of mental health between non-stressed and stressed groups.

Variables	Non-Stressed		Stressed		t,t	Sig.
	M	SD	M	SD		
Item 1 Going to bed later than intended	3.05	1.17	3.44	1.16	2.91	.004
Item 2 Going to bed early if necessary	3.80	1.10	3.36	1.07	3.53	.000
Item 3 Turning off the lights immediately at bedtime	3.16	1.02	2.42	1.22	5.74	.000
Item 4 Doing other things at bedtime	3.36	1.27	3.90	1.15	3.85	.000
Item 5 Easily distracted before going to bed	2.59	1.06	3.51	1.13	7.27	.000
Item 6 Does not go to bed on time	2.33	1.24	3.12	1.15	5.74	.000
Item 7 Keeping regular bedtimes	3.66	1.14	2.71	1.15	7.18	.000
Item 8 Unable to go to bed on time as expected	2.85	1.11	3.21	1.19	2.78	.006
Item 9 Easily stopping activities at bedtime	3.42	1.18	2.85	1.22	4.10	.000
BPS Total	27.53	4.16	29.27	3.94	3.72	.000
Emotional wellbeing (EWB)	12.83	2.17	10.50	2.84	7.97	.000
Social well-being (SWB)	18.82	3.76	16.20	4.35	5.60	.000
Psychological well-being (PWB)	22.56	3.69	19.29	4.29	7.10	.000
Well-being (Bartel et al., 2015)	46.01	9.99	45.22	8.65	7.64	.000

Pearson's correlations were performed in Table 3. as expected, BPS was positively related to stress ( $r = 0.29, P \leq .01$ ); negatively with SWB ( $r = -.26, P \leq .01$ ) and total MHCSF ( $r = -.26, P \leq .01$ ). Also, stress was negatively related to total EWB, SWB, PWB, and MHCSF. All the significant positive relationships were established in the variables of well-being.

**Table 3**

Correlations among stress, BPS, and MHCSF

Variables	1	2	3	4	5	6
1. BPS (Bartel et al., 2015)	-					
2. Stress	.29*	-				
3. Emotional well-being (EWB)	-.06	-.32*	-			
4. Social well-being (SWB)	-.26*	-.29*	.64*	-		
5. Psychological well-being (PWB)	-.04	-.25*	.69*	.67*	-	
6. Well-being (Bartel et al., 2015)	-.26*	-.27*	.84*	.89*	.90*	-

\*Correlations significant at  $p < 0.01$ .

In the non-stressed group, marrying, BPS Item2, and BPS Item 4 were predictive of stress in a multivariate analysis, explaining 18% of the variance. Not significant in the stepwise linear regression analysis: sex, age, academic study, residential location, academic achievement, university housing, university health care, and the period spent on the internet. In a stressed group, income, marrying, BPS Item1, BPS Item4, and EWB were predictive of stress in a multivariate analysis, explaining 25% of the variance. No significance in the stepwise linear regression analysis: sex, age, academic study, residential location, academic achievement, university housing, university health care, and time spent on the internet (Table 4).

**Table. 4**

Multiple linear regression with demographic characteristics, BPS scores, and stress

Variables	Non-Stressed*			Stressed**		
	$\beta$	t	Sig.	$\beta$	T	Sig.
BPS Item 1 (Going to bed later than intended)				.48	1.96	.05
BPS Item 2(Going to bed early if necessary)	.62	2.19	.03			
BPS Item 4 (Doing other things at bedtime)	.54	2.68	.00	-.48	2.15	.03
EWB (Emotional well-being)				-.46	-2.53	.01

\*Note: Adjusted  $R^2$  .18;  $F(2.16)=10.78$ ;  $p = .007$ .

\*\* Note: Adjusted  $R^2$  .25;  $F(2.26)=17.39$ ;  $p = .003$ .

## Discussion

Our understanding of the causes of procrastination has increased over the past two decades. Studies have provided more evidence about the relationships between procrastination, stress, and mental well-being (Ferrari, 1994; Flett, Blankstein, Hewitt, & Koledin, 1992; Rice, Richardson, & Clark, 2012; Stead, Shanahan, & Neufeld, 2010). This study is the Arab first to examine the effect of bedtime procrastination on stress and well-being, the BPS scores concerning demographic characteristics are presented in (Table 1.) males showed significantly higher bedtime procrastination more than females. This result is consistent with previous studies that men generally perceived sleep as a loss of time and less important compared to other things (Beutel, Klein, Aufenanger, Brähler et al., 2016; Magalhães, Cruz, Teixeira, Fuentes et al., 2020; Meadows, Arber, Venn, & Hislop, 2008; Türkarlan et al., 2020). Also, it can be explained by the terror management theory perspective that males have a greater risk of delaying sleep more than females (Florian, Mikulincer, & Hirschberger, 2002; Greenberg, Solomon, & Pyszczynski, 1997). In contrast, the previous study report that procrastination was higher among Polish females than males (Markiewicz, Filipiak, & Ferrari, 2019). It seems that the issue requires further investigation in the light of individualism-collectivism cultures. Besides, we found that BPS scores are higher in older students (in their final academic year). This result could be explained as students in the final academic year may be heaving more professional ambitions and seeking identity (Arnett, 2000; Steger, Oishi, & Kashdan, 2009). This finding is inconsistent with some studies that have recommended that procrastination is higher in the youngest (Beutel et al., 2016).

The results also observed higher BPS in the countryside students rather than students living in the city. This may be due to the slow routine life in the Saudi countryside. Although a previous study stated that BPS scores were not significantly related to the kind of place living (Herzog-Krzywoszanska & Krzywoszanski, 2019). Furthermore, the findings show that students who live alone have a higher BPS than those who live with their families. On the other hand, married students also have higher BPS than singles because of the cultural responsibilities the married students may have many activities that may delay bedtime which is inconsistent with a recent study stated that the BPS scores were not significantly related to a marriage or partner who lives with his family (Herzog-Krzywoszanska & Krzywoszanski, 2019). Also, no significant differences have been found among many demographic characteristics such as academic study, income, academic achievement, university health care, and the period spent on the internet (all  $p > 0.05$ ). It seems that the differences in BPS according to demographic variables still require much investigation.

Prevalence of the BPS and stress: The current study stated that the prevalence of bedtime procrastination was 16.2 % (17.9 % male; 13.7 % female) in Saudi students. This finding is much less than other studies among undergraduates suffering from poor sleep quality; where Hispanics and Whites did not get enough sleep where the prevalence of bedtime procrastination was 26 % (Ram, Seirawan, Kumar, & Clark, 2010); also, Chinese undergraduates suffering from poor sleep with the prevalence of bedtime procrastination equals 39.42% (Jing Guo et al., 2020). As for the pervasiveness of stress in Saudi students, it was 16% (12.7 % male; 21.2 % female), which also is less than another multiethnic study contained Arabs, South Asians, and North Americans, in which the stress due to universality of stress was high (41%) which reduced (to 30%) after examinations (Kulsoom & Afsar, 2015). The decrease in the prevalence of stress in Saudi students may be explained on basis of the collective culture nature of Saudi society, where students may receive family social support to manage stress and emotional catharsis. Overall, Stress appears to be low compared to other universal studies and we need to mention that the current study does not identify the student major such as medical or nursing students who are expected to have more stress compared to other majors (Jing Guo et al., 2020).

Comparison of BPS and well-being between students with and without stress, Table 2. Shows that BPS items scores in the stressed group (1; 3; 4; 5; 6; 8; 9 and BPS total; except for Items 2 and 7) are higher than the non-stressed group, which was also observed that higher than in the stressed group in the dimensions of mental well-being (EWB, AWB, PWB, and MHCSF total). Our finding is consistent with another study which showed bedtime procrastination was a problem in disturbance people who are suffered from poor mental well-being and declined self-regulation (Baumeister, 2002). Besides, modern theories have reported that deficiency of the ability to follow healthy methods of regulating negative emotions, is the main key in understanding



procrastination (F. Sirois & Pychyl, 2013; Tice & Bratslavsky, 2000). Individuals under stress tend to evaluate themselves in more negative emotions and try to control their self-image due to fear of failing to complete tasks on time, so their motivation to procrastinate in sleep increases and their mental health decreases more than the stressed individuals (Ko & Chang, 2018). Also, some studies have reported that bedtime procrastination is related to interpersonal problems, higher negative affective and, lower life satisfaction (Bartel et al., 2015; Woods & Scott, 2016). Thus, it is theoretically reasonable to assume that non-stressed individuals have good coping to solve problems, particularly time management and they are less likely to report bedtime procrastination.

The correlations, this study showed that BPS was related positively to stress in Saudi students. This result is the same as other studies which reported that individuals who frequently bedtime procrastinate are more likely to have negative emotions and shorter sleep duration (Chung, An, & Suh, 2020; Roberts & Duong, 2014; Zhai, Zhang, & Zhang, 2015). In particular, the pattern of the link between procrastination and stress showed in previous studies (Flett, Blankstein, & Martin, 1995; F. M. Sirois, 2014; F. M. Sirois et al., 2003; F. M. Sirois & Tosti, 2012; Tice & Baumeister, 1997), and between stress and behaviors of bedtime procrastination (H. G. Lund, Reider, Whiting, & Prichard, 2010; Morin, Rodrigue, & Ivers, 2003). Overall, Stress can not only lead to sleep procrastination but also affect its quality (F. M. Sirois et al., 2015). Regarding the relationship between BPS and MHCSF, our results showed that BPS correlated positively with total SWB and MHCSF total. It is a predictable finding and in good agreement with other studies that have reported the importance of sleep for health and well-being (Bernecker & Job, 2020b; Ferrari, 1994; Stead et al., 2010). The relationship between BPS and SWB can be interpreted in light of the collective culture in Saudi Arabia, where, when students are late to sleep they will be disabled from achieving social interaction or family support, and this may include sadness and other negative feelings. At the same time, the study revealed that there are no significant correlations of BPS with EWB and PWB, which is an unexpected result, but it can be explained in the light of the modern view of well-being as multiple concepts consisting of several dimensions (EWB, SWB, and PWB) (Ryan & Deci, 2001) and this result may need further investigation, especially in collective cultures.

We accomplished a multiple linear regression analysis to recognize the contributing variables of stress. Our results showed that stress was significantly related to BPS item 2 ( $B = .62$ ;  $p < .03$ ) and BPS item 4 ( $B = .54$ ;  $p < .00$ ), in the non-stressed group students. This explains that BPS can predict stress in this group. In contrary in stressed group, students who have BPS Item 1 ( $B = .48$ ;  $p < .05$ ), Item 4 ( $B = -.48$ ;  $p < .01$ ), and disturbance EWB ( $B = -.46$ ;  $p < .01$ ) will be more stressed. Generally, only EWB is predicted of stress, this is an expected result, but the (SWB, PWB) did not predict, this was not expected. This may be due to the nature of sleep procrastination, which includes two aspects: delaying sleep and procrastinating during sleep (Magalhães et al., 2020). Furthermore, these findings may be attributed to the collective culture's well-being structure, necessitating cross-cultural study. For BPS as a predicted measure of stress, this is expected and encourages researchers to design extension programs in the future to overcome bedtime procrastination to prevent stress in Saudi students.

In summary, stress is prevalent in Saudi students. In particular, the findings point toward a close link between stress and bedtime procrastination among college students. Interestingly, although we find that bedtime procrastination was an independent contributor to stress prevalence and increasing the severity of bedtime procrastination appeared to raise the risk of developing stress only in the non-stressed group. Regular screening and interventions for bedtime procrastination behaviors would be useful to avoid or minimize the risk of developing more stress, in ----- students. where delay sleep is a very common problem which has both physical psychological consequences and therefore, it is vital to investigate the reasons that contribute to lacking sleep, stress is one of the risks associated with procrastination Longitudinal studies are also needed to be performed to determine the causality of stress and bedtime procrastination in the different age stages. Also, sleep delay can be a sign of negative stress, depression, and anxiety symptoms (Jing Guo et al., 2020). Therefore, more research interest is justified to investigate the risks of factors causing procrastination and reducing mental health among university youth. Future research may be considering further studying the mechanisms of sleep Procrastination particularly in other life dimensions (e.g., exercise, healthy eating, and treatment-seeking) may contribute to psychologists and therapies of more interventions of procrastination behaviors.



## Conclusion

The results of our study suggest that assessing bedtime delay is related to stress and poor well-being, but it is still not a fully understood phenomenon for us. Delaying sleep is a common reality and needs more research. This study contributes to several important aspects of bedtime procrastination and well-being. Expectedly, this study will contribute to the treatment of bedtime procrastination in the future.

## Limitations

This study has some limitations that make us cautious when generalizing the results. First, since participants were limited to college students from only ----- University, our results may not be applied to the general population of Saudi Arabia. Second, other negative emotions of bedtime procrastination such as depression, anxiety, and fear of failure (Burka & Yuen, 2008; Jing Guo et al., 2020). We are not mentioned in the current study, so a larger sample in the longitudinal study is needed to elucidate the causality between bedtime procrastination and other psychological characteristics. Third, we are not sure that the stress associated with bedtime procrastination is caused by it alone or by other causes. Also, we should consider the different patterns of adolescents' sleep-related behaviors weekly.

## Conflict of interest

The authors declare that they have no conflict of interest.

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