Self-Regulation, Bedtime Procrastination And Sleep Quality Among Adults: A Meditational Model

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ABSTRACT

Objective: With the rapid advancements in technology, people are delaying their bedtime because the allure of readily available entertainment outweighs their self-control, as such the phenomenon of bedtime procrastination is slowly becoming of great relevance. Bedtime procrastination is a significant contributing element to sleep inadequacy that has been acknowledged as a genuine medical problem. Delayed sleep can have some profoundly serious consequences for people, especially adults. The present study aimed to establish bedtime procrastination as a self-regulation problem which leads to poor sleep quality.

Method: A cross-sectional research design was adopted on a sample of 500 adults. The sample was divided into two categories: young adulthood (18-45) and middle adulthood (46-60). Data was collected employing three self-report measures: Bedtime Procrastination Scale (BPS), Brief Self-controlScale (BSCS) and Sleep Quality scale (SQS).

Results: The findings suggested a significant correlation between the three variables i.e., when self-control is high, sleep quality is better with lower Bedtime Procrastination and when Bedtime Procrastination is high, sleep quality is lower, and self-control is worse. Secondarily females were found to be more likely to have slightly higher Bedtime Procrastination and much worse Sleep Quality when compared to males. Moreover, it was revealed that Bedtime procrastination partially mediated the relationship between Self-regulation and Sleep Quality.

Conclusion: In conclusion bedtime procrastination can be a significant variable which can lead to

significant issues in sleep quality while can cause problems with self-control.

Keywords: Bedtime, Procrastination, Self-Regulation, Sleep Quality, Adulthood

Introduction

Sleep deprivation has become a prevalent concern in today's society (Harrington, 2017). People generally disregards sleep due to their round-the-clock lifestyle, work commitments, and psychological stressors (Molero Jurado et al., 2019). As People go to bed late, their performance decreases which means they often end up falling behind on a lot of work (Okano et al., 2019) (Firat et al., 2019). Delayed work leads to late nights to catch up to delayed schedules (H.-H. Chang & Lin, 2019), however this often proves to be challenging and can lead to even moresleep deprivation (Nauts et al., 2016) which causes a host of other illnesses; both mental and physical(Bishir et al., 2020; Conklin et al., 2018; Khalil et al., 2020; Manchanda et al., 2018; Skjåkødegård et al., 2021; Tomaso et al., 2021; Zhang & Wu, 2020) especially during the COVID-19 pandemic, sleep problems appear to have increased and as a result might be increasing psychological distress (Alimoradi et al., 2021). Sleep is a physiological need that helps people shake off the exhaustion of the day (Nag & Pradhan, 2012); (Rosa et al., 2018). Great sleep quality is essential for a healthy and an enhanced quality of life(Chang & Chang, 2019; Freeman et al., 2017; Kabrita et al., 2014; Knufinke et al., 2018). Poor sleep habits that result in insufficient sleep for "normal people" were first identified as a self-regulation failure by (Loft & Cameron, 2013).

Self-regulation is a systematic process that involves conscious effort to influence behaviors to achieve a goal (Borgatti et al., 2018; Cavicchioli et al., 2019). When people fail to self-regulate, there is an inconsistency between their goals and actions. This so- called intention-behavior gap explains why not all people follow through on their intentions (Liu & Aungsuroch, 2019; Sheeran & Webb, 2016). Sleep deficit can thus be treated as a symptom of a behavioral problem. (Preety et al., 2018)

Bedtime procrastination is defined as a self-regulation failure in the current context, in the sense that people have the intention to go to bed but do not demonstrate the actual behavior. Bedtime procrastination, like general procrastination, has been conceptualized as a type of self- regulatory disappointment (Kadzikowska-Wrzosek, 2018; Williams et al., 2017). It is characterized as neglecting to go to bed at the expected time, missing any outer conditions that keep an individual from doing as such (Kroese & de Ridder, 2016). Failure to self-regulate increases the desire for instant gratification especially media-related and increases sensitivity to temptation, and impairs attention, which delays bedtime (Ciroth, 2020; Exelmans & Van den Bulck, 2021).

The capacity to resist and overcome modern temptation is essential for achieving the goalof going to bed at a specific hour (Brunborg et al., 2011; Cui et al., 2021; Nauts et al., 2019) Unfortunately, an extensive review of literature suggests that Bedtime procrastination is an issue that is especially liable to happen in a state where individuals have minimal mental energy, or self-control (self-

regulation), especially in light of the fact that the choice to go to the bed is intrinsically made toward the day's end when discretion is regularly more vulnerable (Exelmans & Van den Bulck, 2021). In accordance with this thought, we expect that individuals' accomplishment in going to bed at their planned bedtime is likewise identified by how much self-control individuals can gather in the crucial points in time; whether to go to the bed or to procrastinate. Studies support that a lack of self-regulation is often the cause for bedtime procrastination (Bernecker & Job, 2020). Additionally, self-reported bedtime procrastination was identified with general reports of inadequate sleep (Ma et al., 2020).

Bedtime procrastination may mediate between a lack of self-control in regard to bad habits and resultant poor sleep (You et al., 2021; Zhang & Wu, 2020). Similarly improving self-regulation leads to better outcomes in terms of both bedtime procrastination and sleep quality (Kühnel et al., 2018; Valshtein et al., 2020). Researchers like Kroese (2014) have investigated bedtime procrastination impacts sleep quality, lack of self-regulation contributes to bedtime procrastination, self-regulation training could help reduce it (Exelmans & Van den Bulck, 2016; Zhang & Wu, 2020). Hitting the bed later than expected because of procrastination fundamentally predicts poor sleep quality (Wang et al., 2019) by messing with your circadian sleep cycle (Chen & Gau, 2016), Bedtime procrastination surfaces as a key factor linking poor self-regulation and poor sleep quality (Kroese & de Ridder, 2016; Nauts et al., 2019). The procrastination wellbeing model proposes that procrastination is a significant danger factor for poor sleep quality (Sirois, 2007), a perspective upheld by different empirical investigations ((Błachnio & Przepiorka, 2019). Studies also show that bedtime procrastination stays a critical contributing element to sleep inadequacy (Kadzikowska-Wrzosek, 2018).

Temporal Motivation Theory (Steel & König, 2006) proposes that people postpone tasks when they believe the task's outcome value is low in comparison to the time spent doing it. People often neglect long-term benefits of sleep when faced with tempting quick gratification from easily accessible entertainment, this causes their self-control to waver even though they areaware of the consequences of their actions, this lack of self-regulation frequently results in bedtime procrastination which not only delays the onset of sleep, but also adds to poor sleep habits, resulting in poor sleep quality (Beyens & Nathanson, 2019; Brunborg et al., 2011; Jahan et al., 2019). Theory of Planned Behavior also explains it as lack of self-regulation ability (Scholer et al., 2018). People who lack the skills to control emotions, impulses, and behavior aremore easily drawn by environmental cues. The benefits of staying up a little later are evaluated against the potential consequences in this self-regulatory dilemma (Kroese et al., 2014).

Majority of research has traditionally concentrated on medical causes of sleep insufficiency e.g., sleep apnea, insomnia etc. (Ballesio et al., 2018, 2019) but considering thatthe most prevalent cause for sleep problems is a lack of sleep (Bandyopadhyay & Sigua, 2019), less attention is paid to sleep difficulties that occur in the general population because of lifestyle and improper sleep habits (Kroese et al., 2016).

Study Aim

The present study was conducted to study the impact of self-regulation on bedtime procrastination and sleep quality among adulthood. The objectives of the study are given below:

Objectives

1. To investigate the relationship between Self-Regulation, Bedtime Procrastination, and Sleep Quality among adults.
2. To investigate the mediating role of Bedtime Procrastination on the relationship between Self-Regulation and Sleep Quality.
3. To investigate the demographic difference on study variables among adults.

Hypotheses

1. There will be a negative relationship between Self-Regulation and Bedtime Procrastination.
2. There will be a positive relationship between Bedtime Procrastination and poor Sleep Quality.
3. There will be a negative relationship between Self-regulation and poor Sleep quality.
4. Bedtime procrastination mediates the relationship between Self-Regulation and Sleep Quality.
5. There will be gender differences among bedtime procrastination, self-regulation, and sleep quality.

METHODOLOGY

Research Design

Cross-sectional research design with purposive convenient sampling technique was used investigate the relationship between study variables by using a questionnaire-based surveymethod.

Sample

Sample of present research was consisted of adults with age range from 18 to 60 years which is divided into two categories young adulthood (18-45), and middle adulthood (46-60). Total size of sample was 500 adults. Sample was consisted of equal halves of males (n=250) and females (n=250).

Instrument

Bedtime Procrastination

Bedtime Procrastination developed by (Kroese; 2016) was 09 item scale, designed to assess participants' susceptibility for extending their bedtimes needlessly. Responses are on a five-point Likert scale ranging from almost never (1) to almost always (5). Negatively worded items (2, 3, 7, 9) had to be inverted to create a bedtime procrastination score (e.g., 1 (never) = 5 (always)). Higher scores indicate a higher level of procrastination before bedtime and vice versa with Cronbach Alpha reliability of.88.

Brief Self-Control

The Brief Self-Control Scale (Tangney et al., 2004; Cronbach's alpha =.79) was used to assess it. The scale consists of 13 items that were rated on a scale of 1 (not at all like me) to 5 (very much like me). Negatively worded items (2, 3, 4, 5, 7, 9, 10, 12, and 13) should be reverse scored.

Sleep Quality

The SQS is a questionnaire that was created by (Yi et al., 2006). Daytime dysfunction, recuperation after sleep, difficulty going asleep, difficulty getting up, contentment with sleep, and difficulty maintaining sleep are among the 28 items and six categories on the scale. It's a four-point Likert scale with (1) rarely, (2) sometimes, (3) often, and (4) almost always. Before all of the scores are added together, the scores on items in factors 2 and 5 must be reversed. The score ranges from 0 to 84, with a higher number suggesting a poorer quality of sleep. Cronbach's alpha coefficient for the Sleep Quality Scale is 0.92

Demographic sheet

A demographic sheet will be created with information about the participants' gender, age, level of education, and marital status.

Procedure

The sample of the current study was collected from the adult population of Rawalpindi and Islamabad; divided into two categories, Young Adulthood (age ranging from 18-45) and Middle Adulthood (age ranging from 46-60). Total 500 participants took part in this study (250-Males, 250-Females). Researcher kept all the ethical standards in mind while collecting data. The questionnaire was published on the Google form and participants got there by clicking on the link they received from the researcher. On the website, they first were informed about the aim of the research and their right to withdraw from it at any time. By clicking "OK", the participants agreed to the informed consent and proceeded with the first questions. The questionnaire started with a demographic sheet. Afterward, the participants filled out three standardized questionnaires in total. The total questionnaire took the participants approximately 20 to 25 minutes to complete. Then all the collected data was coded and entered in SPSS v26 for analysis.

Ethical Considerations

Before the initiation of the study process, a brief permission letter was presented to the Institutional Review Board (IRB) of Ethical Considerations of Department of Applied Psychology, National University of Modern Languages (NUML). After reviewing the study plan and process, IRB granted the permission to start the study process.

RESULTS

Table 1 shows the frequency, percentage standard deviation and mean of the demographic variables in the study. The sample size was 500, The average adult participant was 18-45-year-old.

96.7% fell intothe range of 18-45, 44.7% of the participants were males while 55.3% were females. The participants were required to fill a demographic sheet; according to the responses 11.3% of the participants were married while 88.7% of the participants were unmarried.

Table No: 1. Descriptive of study variables (N=500)

	f	%
Age		
18-45	145	96.7
46-60	5	3.3
Gender		
Male	67	44.7
Female	83	55.3
Marital Status		
Married	17	11.3
Unmarried	133	88.7

Table No. 2 shows the correlations between Bedtime Procrastination, Self-Control, and Sleep Quality. Bedtime Procrastination has significant negative correlation with Self-Control (r= -.276, p=.001) and has significant positive correlation with Sleep Quality (r=.168, p=.040). Brief Self Control is negatively correlated with Sleep Quality (r=-.105, p=.199).

Table No: 2. Pearson Correlation between Bedtime Procrastination, Self-Control, and Sleep Quality (N=500)

| Scales	BTP	BSC	SQS
BTP	-		
SC	-.276**	-	
SQ	.168*	-.105	-

Table 3 showed that Regression analysis (PROCESS macro) was performed to assess the mediating role of Bedtime procrastination (Table 3). Initial test revealed that self-regulation had a significant effect (a = .19, p < .001) on bedtime procrastination and the R^2 value of .09 revealed that the predictor i.e. self-regulation, explained 9% variance in the outcome variable (sleep quality) with $F_{(2,147)}$ = 13.89, p < .001. Output shows the results of the regression of sleep quality predicted from both how self-regulation and bedtime procrastination directly impact sleep quality. According to analysis, bedtime procrastination predicts sleep quality (b =.402, p=.031), furthermore, it was also observed that the direct effect of self-regulation on sleep quality was statically significant (c'=.401, p=.001) and the R^2 value of .128 revealed that the predictors

explained 12.8% variance in the outcome variable with $F_{(2,147)} = 10.809$ $p < .001$. A 95% bias corrected confidence interval based on 5,000 bootstrap samples signified that the indirect effect ab =.0755 was entirely above zero (.007 and .16). However, the Sobel test was non-significant, thus indicating a partial mediation. RIT analysis suggests that around 16% of the effect of self-regulation on sleep quality among adults was being mediated by bedtime procrastination.

Table 3. Mediating role of bedtime procrastination between self-regulation and sleep quality among adults (N=500)

Variable	ß	95% CI		S.E ß	t	R^2
		LL	UL			
Step 1						.09
Constant	20.74	16.8	24.68	2.01	10.25	
Self-Regulation	.19	.09	.29	.05	3.72	
Step 2						.128
Constant	39.43	27.67	51.19	6.06	6.505	
Self-Regulation	.401	.167	.636	.12	3.323	
Bedtime procrastination	.402	.037	.767	.19	2.13	

Note. ß = unstandardized regression coefficient, CI = confidence interval, S.E = standard error, UL = upper limit, LL = lower limit, p<.05*
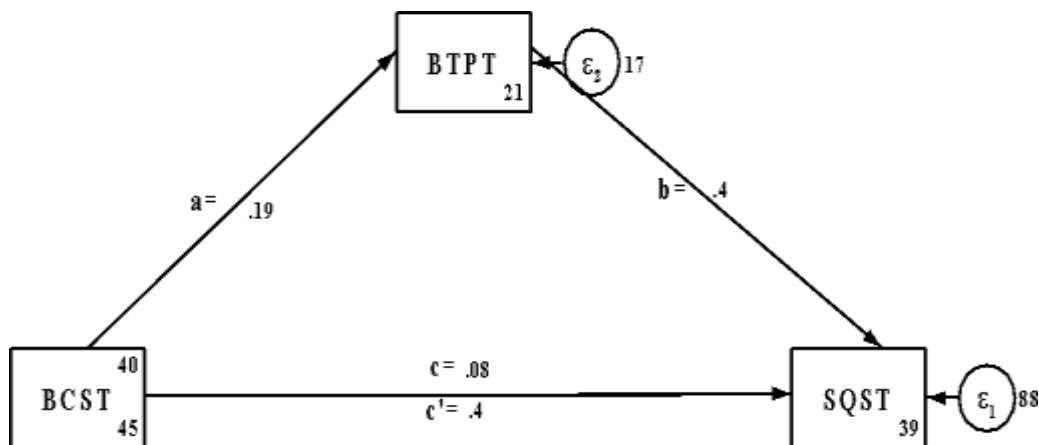
(Figure 1. Mediating role of bedtime procrastination between self-regulation and sleep quality among adults)

Table No. 4 shows the reliability of research scales that is derived through Alpha reliability. The

reliability of the Bedtime Procrastination scale is .694, the reliability of the Self-Control scale is .650,and the reliability of the Sleep Quality scale is .757. All three of the scales have shown acceptable internal consistency and reliability within the present study.

Table No: 4. Cronbach's Alpha reliability of respondents scores on Bedtime Procrastination, Self-Control, and Sleep Quality (N=500)

Scales	No. of items	Cronbach's Alpha
Bedtime Procrastination	9	.694
Self-Control	13	.650
Sleep Quality	28	.757

Table No. 5 shows the t-test value between two groups of Gender and shows the mean value of Bedtime.To identify gender differences within the study, a t-test was conducted. The test shows non-significant t (148) = 1.919, p = .057 differences in the level of Bedtime Procrastination for Males and females. AlthoughFemales had higher (M= 28.78, S.D=4.088) Bedtime Procrastination as compared to Males (M=27.43, S.D=4.517). The effect size for this analysis (d = 0.313) was found to be small as it was less than Cohen's (1988) convention for a medium effect (d = .50)
In terms of Self-Control, the finding revealed non-significant t (148) = .594, p = .554 mean differences for Males (M=39.21, S.D=6.554) and Female (M= 39.87, S.D= 6.910). The effect size was calculated and the value d = 0.098 shows a small to negligible degree of practical significance. According to the t-test, Gender differences with respect to Sleep Quality were revealed to be significant t (148) = 2.348, p = .020. These resultsindicate that females (M= 68.36, S.D=10.224) in the study had worse sleep quality than males (M=64.36, S.D=9.611). However, the effect size d = 0.387 was small.

Table No: 5: t-test analysis of Gender on Bedtime Procrastination, Brief Self Control and Sleep Quality. (N=500)

Scales	Groups	N	M	S.D	t	p	Cohen's d
Bedtime Procrastination	Male	250	27.43	4.517	1.919	.057	0.313
	Female	250	28.78	4.088			
Self-regulation	Male	250	39.21	6.554	.594	.554	0.098
	Female	250	39.87	6.910			
Sleep Quality	Male	250	64.36	9.611	2.348	.020	0.387
	Female	250	68.36	10.224			

Discussion

The main assumptions made in the study were partially supported by the results, as one of the objectives was todetermine that there exists a strong relationship between Self-regulation, Bedtime Procrastination and Sleep Quality, this prediction was supported by the existence of significant correlation present between study variables; as shown in table 2. This means that with increase in self-regulation, bedtime procrastination decreases, and sleep quality improves within the adult sample and vice versa. We can conclude from these findings that a lack of self-control may be the cause of increased bedtime procrastination as people with lower levels of self-regulation are more prone to be distracted by nighttime activities and delay their bedtime (Zhang & Wu, 2020) while bedtime procrastination is directly linked with decrease in sleep quality because disruptive sleep is often caused by delayed sleep and a resultant lack of sleep time. Delayed sleep caused by bedtime procrastination can also lead to a disrupted circadian rhythm among the general population which reduces sleepquality (Kadzikowska-Wrzosek, 2018). As such the three study variables are inextricably linked together. Another prediction made was that Bedtime Procrastination plays the role of a mediator between Self- Regulation and Sleep Quality.

The results of mediation analysis, however, show that Bedtime procrastination only partially mediated the relationship as bedtime procrastination explains about 16% of the effect of self-regulation on sleep qualityas shown in Table 3, this implies that other associated factors must exist i.e., mediators, moderators etc. which play an essential role in explaining the relationship between Self-Regulation and Sleep Quality these variables can be Boredom, distractibility and eveningness etc. (Broers, 2014; Teoh et al., 2021). The study scales were also assessed, and all three scales show acceptable reliability within this research. Additionally, secondary findings show that demographic differences (which were studied to see if specific traits and predispositions have any impact on the relationship between self-regulation, bedtime procrastination and sleep quality) have nosignificant impact based on marital status or age group. The reason for these findings may be because the sizeof the group having married individuals and the size of the group with individuals age ranged 46 to 60 was exceedingly small as such it was not comparable to the large groups to give significant findings. The only significant findingwas that females have worse sleep quality in comparison to males, both these groups had a large number of individuals while this finding has supportive evidence from other studies done on clinical patients that find females to have worse sleep quality in comparison to males (Basoglu & Tasbakan, 2018).

Limitations and Future Recommendations

Experimental research could be conducted to further ensure the relationship and meditational effectsof variables. Geographical area and locations can be added to get more data to generalize the results of researchwith translated questionnaires to improve understanding for the participant population. Mix method research methodology could be further selected to get and authenticate research findings.

Conclusion:

Research findings concluded that bedtime procrastination and Self-regulation have a significant effect on Sleep quality among adults whereas bedtime procrastination as mediator affect self-regulation and sleep quality. Bedtime procrastination is not the only factor which effecting sleeps quality. Self-regulation needs to be addressed as an important factor to overcome bedtime procrastination which help to improve the sleep quality among adults.

Conflict of Interest
There was no conflict of interest

Funding Sources
There was no funding approved for the study.

Data Availability Statement
The datasets generated during and/or analyzed during the current study are not publicly available due to university policy but are available from the corresponding author on reasonable request.

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