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**Bedtime Procrastination, Sleep Disturbance, Fatigue and Mental Health in Female University Students: Mediation Analysis**Nimra Yasin<sup>1</sup>, Rehana Mushtaq<sup>2</sup>, Anum Karamat<sup>3\*</sup>**Abstract**

This research aimed to explore the association between bedtime procrastination, sleep disturbance, fatigue, and mental health problems among female university students. The researchers employed a correlational methodology. A sample consisting of 182 female university students 59% (108 undergraduate) and 41% (74 postgraduate students) with age ranging from 18 to 26 years old ( $M=21.98$ ,  $SD=2.17$ ) from public and private universities through convenient sampling were asked to complete demographic Performa, Fatigue Severity Scale (FSS), Pittsburgh Sleep Quality Index (PSQI), Bed Time Procrastination Scale (BTPS), and Depression Anxiety Stress Scale-21 (DASS-21). Correlation analysis depicted a significant positive association among bedtime procrastination, sleep disturbance, fatigue, and mental health problems. Regression analysis revealed that bedtime procrastination, sleep disturbance, and fatigue were significant predictors of mental health problems. The findings of the Mediation analysis indicated that sleep disturbance and fatigue fully mediate the relationship between bedtime procrastination and mental health problems ( $\beta = .07$ ,  $SE = .13$ ,  $p < .227$ ,  $R^2 = .70$ ). These results can help university students who struggle with sleep deprivation, chronic exhaustion, and mental health problems. Students' lives would be better if they were more aware of the links between staying up too late, sleep disruption, and mental health issues.

**Keywords:** Bedtime Procrastination, Fatigue, Mental Health Problems, Sleep Disturbance

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**Introduction**

Female university students face a lot of psychosocial challenges during their

academic term (Karaman et al., 2019). From keeping up with studies to completing the household chores or managing their ventures, sometimes it becomes hectic to deal with the burden and the stress that follows. Female university students reported significantly higher levels of sleep disturbance, difficulty staying asleep, non-restorative sleep, and difficulty falling asleep, compared to male students (Taylor et al., 2013). Because women often experience higher levels of stress and anxiety, their sleep quality may be negatively affected. A prolonged hectic routine can result in sleep disturbance, fatigue, and mental health issues (Wuthrich et al., 2020). Excessive work can also result in procrastination due to which the work keeps on piling up hence increasing the procrastination in return. This procrastination can also be seen as bedtime procrastination (Hu et al., 2022). Shukla and Andrade (2023)

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indicated that 20% of female university students did bedtime procrastination. Bedtime procrastination refers to deliberate delay in going to bed (Kroese et al., 2016). This happens when a person fails to spend time during the day as per their wish and delays their sleep time in the form of revenge to complete their leisure activities i.e., spending time on the phone (Tyagi, 2022). To engage in such procrastination behavior, one must first delay (as in, go to bed later than anticipated), then have no good excuse for the delay (such as being unwell), and finally be aware that engaging in such activity will have unfavorable outcomes (Sirois & Pychyl, 2016). The average American adult sleeps for only 6 hours per night.

This can cause severe problems in maintaining their routine that could have serious social, psychological, and physical consequences in the long run. Bedtime Procrastination is a reflection of a lack of self-control and is, thus, strongly linked to other personality traits like impulsiveness and low decisiveness (Steel, 2007). Bedtime procrastination can cause disturbance in sleep as a person sleeping late and waking up early may face sleep deprivation that can hinder their mental health. Fatigue makes it harder to control your emotions, leading to irritation, resulting in depression and anxiety, among other mental illnesses. It was also supported by the Emotion-Regulation Theory, people procrastinate because they value their immediate happiness more than the satisfaction, they get from accomplishing their long-term goals and improving their quality of life. Lack of sleep negatively affects health, increasing the risk of cardiovascular disease and metabolic illnesses like diabetes (Suni & Dimitriu, 2021). It is evident from the literature that bedtime procrastination has a close relationship with sleep disturbance, fatigue, and mental health problems as a vicious cycle

and research indicates females are affected more by this than men (Li et al., 2020).

Basic dispositional traits variables, like self-esteem, locus of control, are related to sleep quality (Kim et al., 2015). Existing literature suggests that bedtime procrastination, characterized by delaying sleep despite having the opportunity, is associated with disrupted sleep patterns and increased levels of fatigue. These factors significantly impact mental health outcomes, potentially leading to heightened stress, anxiety, and depressive symptoms (Nauts et al., 2019).

When it was identified a complex interplay between bedtime procrastination, and mental health problems and its association with sleep patterns and negative consequences on female university students, the consequences of bedtime procrastination in some collectivistic cultures as female university students, bearing domestic responsibilities and balancing household chores and other demands, they have limited time for sleep and relaxation. Being a woman, she may always think about her responsibilities, have sleep problems, and feel fatigue which leads to mental health problems. Secondly, the ratio of female students nowadays is more than male students in universities in Pakistan (Pakistan Bureau of Statistics, 2016). It was found that mobile phone addiction has impact bedtime procrastination and fatigue in Chinese school students (Feng & Sun, 2023). The current research study explores the relationship between sleep disturbance, sleep disruption, exhaustion, and mental health issues among female university students.

H1: There is a significant positive correlation between bedtime procrastination, sleep disturbance, fatigue, and mental health in female students.

H2: Sleep disturbance and fatigue mediate the association between bedtime procrastination and mental health problems in female university students.

## Method

The research design was correlational to explore the relationship among bedtime procrastination, sleep disturbance, fatigue, and mental health problems among female university students.

## Sample

The sample included 182 female university students 59% (108 undergraduate) and 41% (74 postgraduate students) with age ranging from 18 to 26 years old ( $M=21.98$ ,  $SD=2.17$ ) from private universities and government universities through convenient sampling.

## Measures

### Demographic Information Sheet

The demographics form included participant's age, education, family system, urban and rural.

### Bedtime Procrastination Scale (BPS)

This scale evaluates the likelihood that an individual would procrastinate going to bed without a good reason and contains nine items, on a 5-point Likert scale including 5 (*almost always*) and 1 (*almost never*). Score on this scale was between 9 to 45. A higher score on this scale means higher procrastination. Reverse-scored items are 2, 3, 7, and 9. The reliability of the original scale is  $\alpha=.92$  (Kroese et al., 2014) and the reliability of this scale in this study is  $\alpha=.74$ .

### The Pittsburgh Sleep Quality Index (PSQI)

It assesses how well or poorly you slept, sleep quality, and sleep characteristics. It consists of nineteen items and seven components: *subjective sleep quality*, *sleep disruptions*, *usage of sleeping medicine*, *sleep latency*, *sleep length*, *daytime dysfunction*, and *habitual sleep efficiency* on a 4-point Likert Scale (0-3) and score low rating indicated good sleep. The reliability of the original scale is  $\alpha=.92$  and the reliability of this scale in the current study is  $\alpha=.76$  (Buysse et al., 1989).

### Fatigue Severity Scale (FSS)

Krupp et al. (1989) developed FSS to assess fatigue as a variety of symptoms of different conditions that effect daily functioning., it contains 9 items rated on a seven-point Likert scale i.e., 1 to 7, 1 7(*strongly agree*), and (*strongly disagree*). The high score on the scale showed a higher level of fatigue. The score on this scale was between 7 to 63. The reliability of the scale is  $\alpha=.91$  (Krupp et al., 1989). The reliability of this scale in the current study is  $\alpha=.83$ .

### Depression Anxiety Stress Scale-21 (DASS-21)

Lovibond and Lovibond (1995) developed it for measuring anxiety, depression, and stress, a self-administered scale that includes 21 items, three subscales of *depression*, *anxiety*, and *stress* on a four-point Likert scale ranging from 3 (*applied to me very much*) and 0 (*did not apply to me at all*). The score on the scale was between 0 to 63. High scores mean individuals have more mental health problems. The reliability of the original scale is  $\alpha=.88$  (Henry & Crawford, 2005). The reliability of this scale in the current study is  $\alpha=.90$ .

## Procedure

The departmental research committee approved the research topic. After this permission was taken from the concerned department for data collection. Participants were briefed about the study, took consent to participate in the research, and asked to complete the questionnaires. Participants were reassured about the confidentiality. Data was collected from 182 female university students 18 Performa were discarded due to incomplete information. The researcher entered the data in SPSS and it was assured the data entry from another research.

## Results

The sample characteristics comprised of education, family system, and place of residence. The sample consists of 59% (108 undergraduate) and 41% (74 postgraduate

students) aged ranging from 18 to 26 years old ( $M=21.98$ ,  $SD=2.17$ ). The more female university were students from urban areas (66%) than from rural areas (44%) and more participants were from the nuclear family system (66%) than student's joint family system (44%). This research aimed to find out the relationship among bedtime procrastination, sleep disturbance, fatigue,

and mental health problems in female university students. SPSS was used for correlation analysis and PROCESS was used for mediation analysis. The association among bedtime procrastination, sleep disturbance, fatigue and mental health problems in female university students was analyzed through Pearson Product Moment Correlation.

**Table 1**

*Summary of inter Correlation Bedtime Procrastination Sleep Disturbance, Fatigue, and Mental Health (N = 182)*

| Variables                 | M     | SD    | 1      | 2      | 3      | 4 |
|---------------------------|-------|-------|--------|--------|--------|---|
| 1 Bedtime Procrastination | 27.99 | 5.04  | -      | -      | -      | - |
| 2 Sleep Disturbance       | 47.18 | 10.82 | .18*   | -      | -      | - |
| 3 Fatigue                 | 36.75 | 11.12 | .39*** | .29*** | -      | - |
| 4 Mental Health Problems  | 30.35 | 11.54 | .26**  | .67*** | .40*** | - |

Note.  $M$ =Mean,  $SD$  = Standard deviation

\*\*\* $p<.001$ , \*\* $p<.01$ , \* $p<.05$

According to Table 1, a significant positive correlation was found among bedtime procrastination, sleep disturbance, fatigue, and mental health in female university students. The mediation of sleep disturbance and fatigue in the association between

bedtime procrastination and mental health problems was carried out through PROCESS 4.2 by Hayes and Rockwood (2020) bootstrapping approach and model 4 was used.

**Table 2**

*Regression Coefficient, Standard Error, and Model Summary Information for Bedtime Procrastination, Sleep Disturbance, Fatigue, and Mental Health Problems among Female University Students (N = 182)*

| Antecedents | Consequent              |       |     |      |                          |       |     |      |                          |         |      |      |
|-------------|-------------------------|-------|-----|------|--------------------------|-------|-----|------|--------------------------|---------|------|------|
|             | M1(SD)                  |       |     |      | M2(F)                    |       |     |      | Y(MHP)                   |         |      |      |
|             | $\beta$                 | SE    | $p$ |      | $\beta$                  | SE    | $p$ |      | $\beta$                  | SE      | $p$  |      |
| X(BTP)      | $a^1$                   | .18   | .16 | .015 | $a^2$                    | .39   | .15 | .001 | $c'$                     | .07     | .13  | .227 |
| M1(SD)      |                         |       |     |      |                          |       |     |      | $b^1$                    | .60     | .06  | .000 |
| M2(F)       |                         |       |     |      |                          |       |     |      | $b^2$                    | .20     | .06  | .001 |
| Constant    | $i$                     | 36.42 | 4.5 | .004 | $i$                      | 36.42 | 4.5 | .000 | $i$                      | -.11.77 | 4.05 | .004 |
|             | $R^2=.18$               |       |     |      | $R^2=.39$                |       |     |      | $R^2=.70$                |         |      |      |
|             | $F(1,180)=5.97, p=.015$ |       |     |      | $F(1,180)=32.82, p=.000$ |       |     |      | $F(3,178)=58.33, p=.000$ |         |      |      |

Note. Bedtime Procrastination (BTP), SD=Sleep Disturbance, MHP=Mental Health Problems, F=Fatigue.

**Figure 1**

*Mediation Path Framework of Procrastination, Sleep Disturbance, Fatigue and Mental Health Problems*

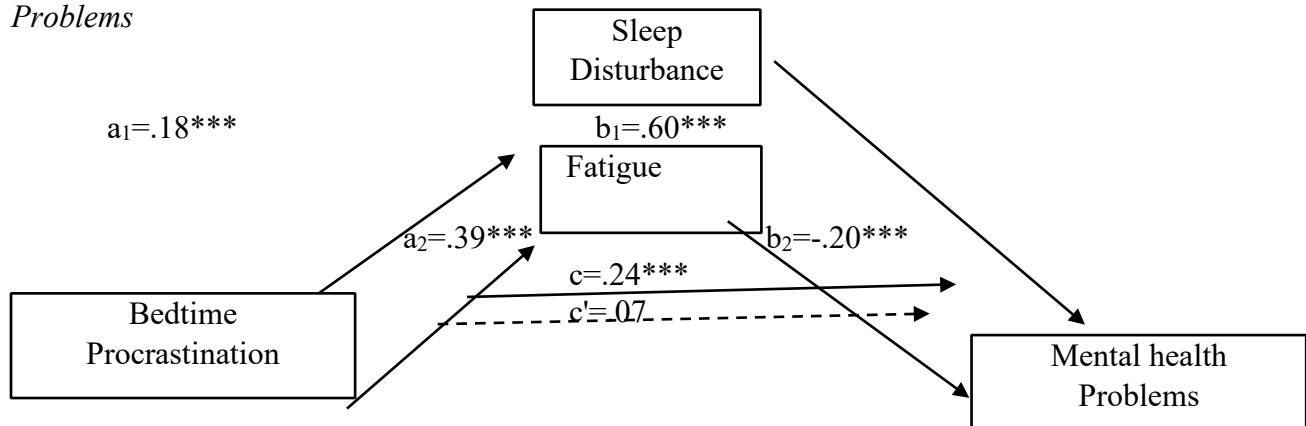


Figure 1 & Table 2 show the mediating role of sleep disturbance and fatigue in the relationship between bedtime procrastination and mental health problems. The total effect of the X (bedtime procrastination) on Y (mental health problems) ( $\beta = .25$ ,  $SE = .16$ ,  $p < .001$ ,  $R^2 = .25$ ) was significant. Moreover, the direct effect of bedtime procrastination on sleep disturbance ( $\beta = .18$ ,  $SE = .16$ ,  $p < .015$ ,  $R^2 = .18$ ) and the direct effect of bedtime procrastination on fatigue ( $\beta = .39$ ,  $SE = .15$ ,  $p < .001$ ,  $R^2 = .39$ ) were significant. In contrast, the direct effects of mediating variables on mental health problems showed

that direct effects of sleep disturbance on mental health problems ( $\beta = .60$ ,  $SE = .06$ ,  $p < .001$ ,  $R^2 = .70$ ) and direct effects of fatigue on mental health problems ( $\beta = .20$ ,  $SE = .06$ ,  $p < .001$ ,  $R^2 = .70$ ). The results suggest that sleep disturbance and fatigue fully mediate the association between bedtime procrastination and mental health problems as after controlling the mediating variables the direct effect of bedtime procrastination on mental health problems ( $\beta = .07$ ,  $SE = .13$ ,  $p < .227$ ,  $R^2 = .70$ ) was non-significant.

## Discussion

In this study, researcher investigate whether procrastination, sleep disruption, fatigue, and mental health issues are associated with bedtime procrastination among female university students. Furthermore, the study also examined the mediating role of sleep disturbance and fatigue in the association between bedtime procrastination and mental health problems.

As hypothesized, the results revealed a significant correlation among bedtime procrastination, Sleep disturbance, fatigue, and mental health issues. Bedtime

procrastination has a significant positive relationship with sleep disturbance, fatigue, and mental health problems. This shows that female university students who procrastinate more and delay their time in going to bed have more issues with their sleep, feeling fatigued, and general psychological health (Kroese et al, 2016; Suni & Dimitriu, 2021). Sleep disturbance and fatigue also positively correlated with mental health problems which proves our point that bedtime procrastination influences sleep problems and fatigue which contributes to mental health problems. Literature suggests

procrastinators tend to suffer from higher levels of stress and have poorer health (Tice & Baumeister, 1997).

University students who procrastinate at bedtime experience poor sleep quality and daytime sleepiness. Procrastination is also associated with shorter sleep duration and higher levels of sleep insufficiency, which can result in increased fatigue and a decline in overall physical and mental health (Hwang et al., 2022) and university students who procrastinate before going to bed may experience anxiety and despair (Rosiek et al., 2019).

It was also concluded that sleep disturbance and fatigue fully mediate the association between bedtime procrastination and mental health problems in female university students. Moreover, it was stated that a strong correlation between bedtime procrastination and sleep problems which becomes a risk factor for mental health issues (Alshammari et al., 2023). fatigue, mood swings, and disturbance in sleep become sleep habits and have an impact on the mental health of individuals (Cui et al., 2021; Kroese et al., 2016; Wuthrich et al., 2020).

### **Conclusion**

This research highlights the link between fatigue, sleep disturbances, procrastination before bed, and mental health in female students. The findings explain the correlation between these variables and supported by empirical evidence. Procrastination before bed effect as worse to fatigue and creates sleep disturbances which lead to mental health concerns. It's found a factor that contributes to mental health and sleep disorders. Given that it may have detrimental effects on sleep and mental health, this highlights the necessity of action to treat the problem.

### **Implication of the Study**

University students may benefit from mental health support and counseling services to address bedtime procrastination and its

impact on sleep, fatigue, and mental health. This research helps to promote time management skills to help students balance their personal social and academic lives. Through this research counselors/psychologists encourage healthy sleep habits and provide awareness regarding the benefits of sleep.

### **Limitations and Recommendations**

Data was collected from only female university students and one city in Punjab, limiting the generalizability. In the future research can be done on both men and women and data will be taken from the other cities of Pakistan for generalizability. The self-report measure was used in this research for future research interviews can be used for in-depth experiences of female university students. It was also proposed that a longitudinal study will be conducted in the future for an in-depth analysis of the variables and also to check the effects when prolonged.

### **Contribution of Authors**

Nimra Yasin: Conceptualization, Investigation, Methodology, Data Curation, Formal Analysis, Writing – Original Draft  
Rehana Mushtaq: Methodology, Writing - Reviewing & Editing

Anum Karamat: Conceptualization, Methodology, Writing - Reviewing & Editing, Supervision

### **Conflict of Interest**

There is no conflict of interest declared by the authors.

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### **Data Availability Statement**

The datasets of the current study are not available publicly due to ethical reasons but are available from the corresponding author [A.K.] upon the reasonable request.

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