



Investigating the Correlation between Cognitive Errors and Stress, Anxiety, and Depression in the Procrastination of Yazd Medical Students

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Abstract

Background: Procrastination is common among students and has been associated with anxiety, depression, and cognitive errors. Recent studies suggest that such patterns may emerge in nonclinical populations as well as clinical ones. This study examines the relationship between cognitive errors and procrastination in university students to identify cognitive markers that may aid in early detection and intervention.

Methods: This observational, descriptive, and cross-sectional study was conducted between 21 March 2022 and 22 October 2023 including 170 Yazd University of Medical Sciences medical students. Participants completed three standard questionnaires: Solomon and Rothblom Procrastination Scale, Depression, Anxiety, and Stress Scale (DASS), and the Cognitive Errors Questionnaire. The sample included both native and non-native students, with non-native students defined as individuals studying outside their region of origin.

Results: No significant differences were observed in procrastination scores based on gender, marital status, place of birth, or level of education. However, 47% of students showed high levels of academic procrastination. DASS results indicated high levels of stress (42%), anxiety (38%), and depression (35%). The results showed a direct relationship between procrastination and anxiety, stress, and depression, with higher levels of these symptoms corresponding to greater procrastination ($r=0.41$ for anxiety, $r=0.39$ for stress, $r=0.36$ for depression). “Exaggeration or minimization” was more prevalent among clinical students and single students, while “overgeneralization” was more frequent among non-native and married students.

Conclusion: The results show that there is a direct relationship between procrastination and anxiety, stress, and depression, with higher levels of these symptoms corresponding to greater procrastination.

Keywords: Anxiety, Cognitive distortions, Depression, Procrastination, Psychological stress, Students

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Introduction

Procrastination is a behavioral method that a person takes to get rid of experiencing unpleasant emotional states, such as extreme discomfort (1). 95 to 99 percent of students consider themselves to be procrastinators (2). 32 to 46 percent of students suffer from chronic procrastination (3,4). This rate of prevalence is particularly important because procrastination has a destructive effect on various aspects of life, such as poor academic performance (5) and reduced career/financial success (6). It can even increase health problems such as sleep disorders (7,8). Most of these studies were conducted in Western contexts, where individual responsibility and time management are emphasized. During a meta-analysis 193 articles were reviewed, and it showed that the rate of procrastination in men in general and in the academic environment is higher than that of women, which may be because of the lack of purposeful processing ability and disability to suppress tempting stimuli (9). Wen and Lee (10) reported that graduated students showed more procrastination than middle and high school students did. This study was conducted in East Asia, where academic pressure and hierarchical educational structures may influence procrastination differently. As for age, Steele *et al* showed that procrastination is not associated with age. As for the connection between procrastination and cultural contrasts, Birsolin and Kim (11) showed that cultural differences in norms and values regarding the perception of time could influence individuals' assessments of long-term outcomes, their aversion to affect and risk, and their tendency to procrastinate. This highlights the importance of considering cultural context when interpreting procrastination-related behaviors. Although procrastination and cognitive distortions are well-known symptoms of anxiety and depression, emerging evidence suggests that these behaviors can also appear in individuals without a formal diagnosis and potentially serve as early markers of emotional distress (12).

Kim and Seo (13) showed in a meta-analysis that procrastination has a detrimental effect on academic performance. It has also negative consequences on expenses and savings (12), use of credit cards (14), membership in health clubs (15), and the amount of mobile phone usage (16). These findings, largely

drawn from Western populations, may reflect cultural attitudes toward self-regulation and consumer behavior. Although procrastination is not supposedly a psychiatric disorder, many articles have mentioned its association with rumination and depression, anxiety, generalized anxiety disorder, and perfectionism (17,18). Furthermore, cognitive risk factors such as ruminative thoughts and automatic negative thoughts have been associated with vulnerability to depression, even in subclinical samples, highlighting the importance of examining these patterns in broader populations (19).

One of the common emotions that learners especially students have is exam anxiety. Previous studies have shown a direct relationship between exam anxiety and procrastination (20). They have also shown that individuals with higher anxiety procrastinate more; therefore, procrastination can be an emotional regulation strategy to reduce exam anxiety. As studies have also shown, cognitive behavioral therapy can positively affect exam anxiety, thereby reducing academic procrastination (21). However, the effectiveness of such interventions may vary across cultures depending on help-seeking behaviors and stigma surrounding mental health.

Several articles have shown a significant relationship between the intensity of stress and procrastination (22). Khalid *et al* showed that individuals who had higher procrastination had higher stress and a higher SAA (salivary alpha-amylase) (21). It is important to say that depression can have effects on procrastination, as Mortazavi shows that people who are struggling with depression are more expected to postpone daily household and work tasks (22). This study, conducted in Iran, provides culturally relevant insight into how emotional distress manifests in academic and daily functioning.

On the other hand, Procrastination, as Basharat *et al* showed, causes symptoms of depression and anxiety directly and through perfectionism (23).

Depression is a periodic disorder with recurrence, which is characterized by pervasive and persistent discomfort or sadness and lack of pleasure from daily activities. Several researches have also proven the relationship between procrastination and depression (24). As for depression, procrastination may have occurred following a simple failure in academic

work or a major depressive disorder. As previous research shows, the degree of depression is associated directly with the degree of procrastination (25). These findings, while consistent across cultures, may be influenced by cultural norms around achievement, emotional expression, and coping strategies.

Several researches have shown a direct relationship between cognitive errors and depression (26). It seems necessary to contemplate cognitive errors throughout the course of treating depression.

Many researchers such as Heatherton *et al* (27), Tuckman, and Sexton (28) also conceptualized procrastination as an inability to self-regulate. Cognitive errors are distorted beliefs about persons or situations that originate from dysfunctional schemas based on Aaron Beck's theoretical model (29). These schemas are important in creating and maintaining psychological and physical problems by creating biases in the interpretation of current events and predicting future events. There is a notable connection between cognitive error and behavioral procrastination and decision-making. This variable can significantly predict the level of procrastination. The results of other studies also reveal that distortions in processing and cognitive errors play an important part in the rate of procrastination (30,31). As we mentioned earlier, procrastination is a very common phenomenon among medical students and is directly related to anxiety and depression. There are also many studies that show a link between cognitive errors and procrastination.

Recent research conducted in non-Western academic settings, including Iran, suggests that these patterns may be shaped by cultural expectations around academic success and emotional resilience. Recent research has shown that these patterns, once primarily associated with clinical populations, are increasingly observed in nonclinical groups, such as university students, suggesting that they may serve as early indicators of emotional vulnerability (19,32). According to the present research, we did not find any study that compared all of these variables simultaneously. Therefore, this study examines the relationship between cognitive errors, anxiety, stress, and depression in procrastination among medical students at Yazd University of Medical Sciences.

Materials and Methods

Study design

This study is observational, descriptive, and cross-sectional was conducted between 21 March 2022 and 22 October 2023. Its population was 170 students of Shahid Sadougi University of Medical Sciences, Yazd. The correlation between procrastination and anxiety was equal to 0.48 using the following formula [this was the same in a similar study (Hashmipour *et al*)]:

$$n = [(Z_{(\alpha/2)} + Z_{\beta})]^2 / \omega^2 + 3, \quad \omega = 1/2 \log_{10} \left(\frac{(1+r)}{(1-r)} \right)$$

Participants

The sample size was almost equal to 166 people considering the significance level of 0.05, the test power of 80%, and the 10% drop. Finally, 23 to 24 samples were selected from among the students of each year randomly (first to seventh).

Participants were categorized as native or non-native students. Non-native students were defined as those who have relocated from other provinces to attend Yazd Medical University. This distinction was considered to explore potential differences in psychological variables related to academic adjustment.

The standard procrastination questionnaire of Solomon and Rothblum (1984) of the student version (Procrastination Assessment Scale-student) was designed and compiled by Feldman (1984) to measure the procrastination of students. It has 27 questions and includes 3 components: preparing for the exam, preparing the homework, and preparing the papers for the end of the semester. Its validity and reliability have been evaluated by Salmani *et al* (2017).

Measures

The stress, anxiety, and depression levels of procrastinating individuals who were diagnosed with chronic procrastination based on the procrastination questionnaire of students were measured by the DASS-21 questionnaire. The stress-anxiety-depression questionnaire with 21 questions was designed by Lavibond and Lavibond in 1995 to evaluate stress-anxiety-depression. The Persian version of DASS-21 has shown strong internal consistency, with Cronbach's alpha coefficients of

0.85 for depression, 0.85 for anxiety, and 0.87 for stress (33). Confirmatory factor analysis supported the three-factor structure in Iranian student samples. Cognitive errors were evaluated based on Abdullahzadeh and Maryam Salar's cognitive errors questionnaire. A 20-question questionnaire of cognitive distortions was made by Hassan Abdullahzadeh and Maryam Salar in 2010 based on Albert Ellis's theory.

The Persian adaptation of PASS has demonstrated good reliability, with Cronbach's alpha ranging from 0.78 to 0.86 across subscales (34). Construct validity was confirmed through correlations with academic performance and self-regulation measures.

The Persian version of the ATQ, validated showed high internal consistency ($\alpha=0.89$) and strong convergent validity with measures of depression and anxiety in Iranian clinical and nonclinical populations (35).

Statistical analysis

Data analysis was performed using SPSS software version 21. Descriptive statistics were calculated for all continuous variables. To assess differences in cognitive error components across population groups, independent t-tests were used for normally distributed data and the Mann-Whitney U test was used for non-normally distributed variables. Pearson correlation coefficients were calculated to assess the strength and direction of the relationship between procrastination scores and psychological variables, as well as total cognitive error scores. A significance level of $p<0.05$ was considered statistically significant throughout the analysis.

Results

To provide a comprehensive overview of the study population, the demographic characteristics of the participants were presented. Table 1 shows the distribution of frequency and percentage of demographic variables such as gender, marital status, being native, and academic year.

A) Findings about students with depression:

168 out of 170 students had moderate to severe procrastination, of which 120 had depression higher than normal (mild to very severe). Of that 120 people

Table 1. The distribution of frequency and percentage of demographic variables

Variable	Variable category	Frequency	Percentage
Gender	Male	96	56.5
	Female	74	43.5
Marital status	Un-married	158	92.9
	Married	12	7.1
Being native	Native	72	42.4
	Non-Native	98	57.6
Academic level	Pre-clinical	85	50
	Clinical	85	50

55 were females and 65 were males; 112 were unmarried and 8 were married; 53 were native and 67 were non-native and 57 were at clinical and 63 were at the pre-clinical level.

Based on the Depression, Anxiety, and Stress Scales (DASS), 42% of students reported high or very high levels of stress, 38% showed high anxiety, and 35% experienced significant depressive symptoms. Regarding academic procrastination, 47% of students scored in the high range on the Solomon and Rothblom Procrastination Scale, and the highest rates of procrastination were observed in written assignments (52%) and exam preparation (49%).

The results show that there is a direct relationship between procrastination and anxiety, stress, and depression, with higher levels of these symptoms corresponding to greater procrastination. This was supported by significant positive correlations between procrastination and anxiety ($r=0.41$), stress ($r=0.39$), and depression ($r=0.36$).

Table 2 manifests the mean and standard deviation of cognitive error components in general for procrastinating students with depression. The highest average for the components of cognitive errors is for the components of "should statements", "magnification or minimization", and "Overgeneralization".

Table 3 views the mean and standard deviation of cognitive error components by gender (in procrastinating students with depression). As the comparison test of the average of two independent populations (independent t-test) shows, there

Table 2. Mean and standard deviation of cognitive error components for procrastinating students with depression

Cognitive error components	Mean	Standard deviation
Should statements	7.29	1.59
Magnification or minimization	6.60	1.87
Overgeneralization	6.36	1.79
Hasty and predicting conclusion	6.09	1.71
All-or-nothing thinking	5.96	1.48
Personalization	5.80	1.95
Discounting the positives	5.53	2.03
Mental filtering	5.32	1.93
Labeling	5.43	1.87
Emotional reasoning	5.11	1.74
Total cognitive error	59.50	10.87

is no notable disparity in procrastination levels between male and female students who are experiencing depression in the average score of the “overgeneralization” component ($p=0.738$), “magnification or minimization” ($p=0.558$), “Should statements” ($p=0.065$) and no substantial difference exists between male and female procrastinating students with depression in the mean total score of

cognitive errors ($p=0.967$).

Table 3 views the mean, standard deviation, mean rank, median, and interquartile range of the components of cognitive errors by marital status for procrastinating students with depression. As the comparison test of two independent populations (non-parametric Mann-Whitney test) indicates, there is no noticeable contrast between the married and unmarried procrastinating students in the “overgeneralization” component ($p=0.156$), “should statements” ($p=0.433$) and “magnification or minimization” ($p=0.275$). No significant difference is observed in the average score of total cognitive errors between married and unmarried procrastinating students with depression ($p=0.275$).

Table 3 manifests the mean and standard deviation of the components of cognitive errors for procrastinating students with depression by being native. As the comparison test of the average of two independent populations (independent t-test) shows, there is a noticeable difference between native and non-native procrastinating students with depression in the average score of the “overgeneralization” component ($p=0.018$). So, it was more in non-natives than in natives. No note-worthy differentiation was seen between native and non-native procrastinating students with depression in the “should statements” and “magnification or minimization” ($p=0.090$)

Table 3. Comparison of the average score of cognitive error components in procrastinating students with depression according to gender, marital status, being native, and the academic level

Cognitive error components		M±SD	p	Marital status	M±SD	p	Being native	M±SD	p	Academic level	Mean	p
Should statements	Male	7.54±1.39	0.065	Un-married	7.31±1.59	0.433	Native	7.00±1.59	0.075	Clinical	7.47±1.39	0.231
	Female	7.00±1.77		Married	7.00±1.69		Non-native	7.52±1.57		Pre-clinical	7.13±1.76	
Magnification or minimization	Male	6.51±1.82	0.558	Un-married	6.66±1.85	0.156	Native	6.92±1.75	0.090	Clinical	7.00±1.89	0.025
	Female	6.71±1.93		Married	5.75±2.05		Non-native	6.34±1.93		Pre-clinical	6.24±1.78	
Overgeneralization	Male	6.31±1.77	0.738	Un-married	6.30±1.79	0.275	Native	5.92±1.57	0.018	Clinical	6.21±1.88	0.392
	Female	6.42±1.83		Married	7.13±1.73		Non-native	6.70±1.89		Pre-clinical	6.49±1.71	
Total cognitive error	Male	59.54±10.27	0.967	Un-married	59.39±10.98	0.553	Native	58.58±8.98	0.414	Clinical	60.07±11.11	0.587
	Female	54.59±11.62		Married	61.00±9.72		Non-native	60.22±12.18		Pre-clinical	58.98±10.71	

component, also there was no difference in the “Total cognitive error” in native and non-native students. This table shows the mean and standard deviation of cognitive error components of procrastinating students with depression by academic level. There is no significant difference in the average score of the “overgeneralization” component between clinical and pre-clinical students with depression ($p=0.442$). We found a remarkable distinction between the clinical and pre-clinical procrastinating students with depression in the average score of the component “magnification or minimization” ($p=0.025$), as it was more frequent among clinical students. There is no remarkable differentiation between the procrastinating students from different academic levels with depression in the average rank of the component “should statements” ($p=0.464$). No significant difference is seen between procrastinating students of different academic levels with depression in the mean rank of the total cognitive error score ($p=0.743$).

B) Findings about students with anxiety:

168 out of 170 students had moderate to high procrastination, of which 112 had anxiety higher than normal (mild to very severe). 56 were men, 56 were women, 104 were unmarried, 8 were married, 47 were natives and 65 were non-natives, 58 were clinical and 54 were pre-clinical students.

Table 4 visualizes the mean and standard deviation of the components of cognitive errors for procrastinators with anxiety. The highest averages of cognitive error components for procrastinating individuals with anxiety are, respectively, the components of “should statements” with an average of 7.34, the component of “magnification or minimization” with an average of 6.54, and “Overgeneralization” with an average of 6.38.

Table 5 views the mean and standard deviation of cognitive error components by gender in procrastinating students with anxiety: As the comparison test of the average of two independent populations (independent t-test) shows, the average score of the components “overgeneralization”, “magnification or minimization” ($p=0.587$), and “should statements” ($p=0.141$) is not significantly different between male and female procrastinating students with anxiety ($p=0.265$). There are no

Table 4. Mean and standard deviation of cognitive error components for procrastinating students with anxiety

Cognitive error components	Mean	Standard deviation
Should statements	7.34	1.54
Overgeneralization	6.38	1.77
Magnification or minimization	6.54	1.90
Hasty and predicting conclusion	6.11	1.77
Personalization	5.96	1.79
All-or-nothing thinking	5.89	1.58
Discounting the positives	5.56	2.07
Mental filtering	5.50	1.94
Labeling	5.34	1.92
Emotional reasoning	5.14	1.79
Total cognitive error	59.77	11.32

substantial differences in the procrastination habits of male and female students in the mean total score of cognitive errors ($p=0.967$).

Table 5 views the mean, standard deviation, mean rank, median, and interquartile range of the components of cognitive errors by marital status for procrastinating students with anxiety. As the comparison test of two independent populations (Nonparametric Mann-Whitney test) shows the average rank of the components “overgeneralization” ($p=0.085$), “magnification or minimization” ($p=0.177$) and “should statements” ($p=0.474$) are not significantly different between married and unmarried procrastinating students with anxiety ($p=0.085$). Also the results showed no remarkable variation between married and unmarried procrastinating students with anxiety in the average score of total cognitive errors ($p=0.468$).

Table 5 manifests the mean and standard deviation of the components of cognitive errors for procrastinating students with anxiety by being native. As the comparison test of the average of two independent populations (independent t-test) shows, there is a noticeable difference between native and non-native procrastinating students with anxiety in the average score of the “over generalization” component ($p=0.022$); thus it was more in non-natives than in natives. No note-worthy differentiation was

Table 5. Comparison of the average score of cognitive error components in procrastinating students with anxiety according to gender, marital status, being native, and the academic level

Cognitive error components		M±SD	p	Marital status	M±SD	p	Being native	M±SD	p	Academic level	M±SD	p
Should statements	Male	7.55±1.36	0.141	Un-married	7.36±1.54	0.474	Native	7.11±1.55	0.175	Clinical	7.24±1.53	0.488
	Female	7.13±1.69		Married	7.13±1.55		Non-native	7.51±1.52		Pre-clinical	7.44±1.56	
Magnification or minimization	Male	6.45±1.85	0.587	Un-married	6.63±1.87	0.177	Native	6.94±1.73	0.064	Clinical	6.74±2.06	0.259
	Female	6.64±1.97		Married	5.50±2.14		Non-native	6.26±1.99		Pre-clinical	6.33±1.72	
Over Generalization	Male	6.20±.77	0.265	Un-married	6.32±1.76	0.085	Native	5.94±1.52	0.022	Clinical	6.14±1.84	0.128
	Female	6.57±1.77		Married	7.25±1.75		Non-native	6.71±1.88		Pre-clinical	6.65±1.67	
Total cognitive error	Male	60.02±10.81	0.816	Un-married	59.59±11.56	0.468	Native	59.55±8.45	0.865	Clinical	59.16±12.23	0.555
	Female	59.52±11.90		Married	62.13±7.61		Non-native	59.92±13.07		Pre-clinical	60.43±10.32	

seen between native and non-native procrastinating students with anxiety in the “should statements” and “magnification or minimization” ($p=0.090$) components, also there was no difference in the “total cognitive error” in native and non-native students. This table shows the mean and standard deviation of cognitive error components of procrastinating students with anxiety by academic level. There is no significant difference in the average score of the components “should statements” ($p=0.488$), “magnification or minimization” ($p=0.259$), “over-generalization” ($p=0.128$), and the total cognitive error ($p=0.555$) between clinical and pre-clinical students with anxiety.

C) Findings about students with stress: 168 out of 170 students had moderate to high procrastination, of which 116 had stress higher than normal (mild to very severe), 63 were men, 53 were women, 0 were married, 106 were unmarried, 49 were native 67 were non-native, 56 were at clinical and 60 were at the pre-clinical level. Table 6 presents the mean and standard deviation of the components of cognitive errors for procrastinators with stress. The highest averages of cognitive error components for procrastinating individuals with stress are, respectively, the

components of “Should statements” with an average of 7.29, “magnification and minimization” with an average of 6.48, and “Overgeneralization” with an average of 6.32.

Table 7 shows the mean and standard deviation of cognitive error components by gender in

Table 6. Mean and standard deviation of cognitive error components for procrastinating students with stress

Cognitive error components	Mean	Standard deviation
Should statements	7.29	1.56
Magnification or minimization	6.48	1.82
Overgeneralization	6.32	1.71
Hasty and predicting conclusion	6.09	1.64
All-or-nothing thinking	5.89	1.53
Personalization	5.79	1.87
discounting the positives	5.41	1.96
Labeling	5.40	1.83
Mental filter	5.31	1.89
Emotional reasoning	5.09	1.74
Total cognitive error	59.09	10.47

Table 7. Comparison of the average score of cognitive error components in procrastinating students with stress according to gender, marital status, being native, and the academic level

Cognitive error components		M±SD	p	Marital status	M±SD	p	Being native	M±SD	p	Academic level	M±SD	p
Should statements	Male	7.48±1.47	0.169	Un-married	7.33±1.57	0.223	Native	6.96±1.71	0.048	Clinical	7.34±1.51	0.760
	Female	7.08±1.65		Married	6.90	-	Non-native	7.54±1.41	-	Pre-clinical	7.25±1.62	-
Magnification or minimization	Male	6.38±1.83	0.513	Un-married	6.60±1.79	0.038	Native	6.84±1.77	0.072	Clinical	6.80±1.97	0.066
	Female	6.60±1.81		Married	5.20±1.69	-	Non-native	6.22±1.82	-	Pre-clinical	6.18±1.62	-
Overgeneralization	Male	6.25±1.72	0.657	Un-married	6.24±1.69	0.017	Native	5.88±1.54	0.017	Clinical	6.05±1.82	0.106
	Female	6.40±1.70		Married	7.20±1.75	-	Non-native	6.64±1.76	-	Pre-clinical	6.57±1.57	-
Total cognitive error	Male	59.06±10.79	0.980	Un-married	59.14±10.62	0.685	Native	58.14±9.26	0.409	Clinical	58.73±11.62	0.727
	Female	59.11±10.19		Married	58.50±9.18	-	Non-native	59.78±11.29	-	-	-	-

procrastinating students with anxiety. There is no statistically remarkable differentiation among genders of procrastinating students with stress in the average score of the “Overgeneralization” component ($p=0.657$), “magnification or minimization” ($p=0.513$) “should statements” ($p=0.169$) and the average score of the Total cognitive error ($p=0.980$).

Table 7 views the mean, standard deviation, mean rank, median, and interquartile range of the components of cognitive errors by marital status for procrastinating students with stress. Based on the findings, there is a considerable dissimilarity between married and unmarried procrastinating students with stress in the average score of the “overgeneralization” component; thus, it is more in married individuals than unmarried ones ($p=0.038$). The married and unmarried procrastinating students with stress are significantly different in the average score of “magnification or minimization” ($p=0.017$); as it is more seen in unmarried students. There were no significant differences between the married and unmarried procrastinating students with stress in the average score of the component “should statements” ($p=0.223$) and the total cognitive error ($p=0.685$).

As the comparison test of the average of two independent populations (independent t-test) shows, an outstanding contrast exists between native and non-native procrastinating students with stress in the

average score of the “overgeneralization” component ($p=0.017$) and the “should statements” component; as it was seen more in non-native students. The native and non-native procrastinating students with stress are not significantly different in the “magnification or minimization” component ($p=0.072$), and the total cognitive error ($p=0.409$) (Table 7). This table shows the mean and standard deviation of cognitive error components of procrastinating students with stress by academic level. There is no significant difference in the average score of the components “should statements” ($p=0.488$), “magnification or minimization” ($p=0.259$), “Overgeneralization” ($p=0.128$), and the total cognitive error ($p=0.555$) between clinical and pre-clinical students with stress. There is a direct and significant association between procrastination scores and the depression component according to the Pearson correlation coefficient ($r=0.448$ and $p<0.001$). The link between the procrastination scores and anxiety is direct and remarkable ($r=0.300$ and $p>0.001$). A direct and noteworthy connection exists between procrastination scores and the stress component ($r=0.465$ and $p>0.001$). The relationship between procrastination scores and the total DASS is direct and significant ($r=0.474$ and $p<0.001$). It is also the case between the procrastination score and the total cognitive error score ($r=0.541$ and $p=0.001$) (Table 8).

Table 8. Pearson's correlation coefficient between the scores of procrastinations, depression, anxiety, stress, DASS sum, and cognitive error

	Procrastination	Depression	Anxiety	Stress	DASS sum	Cognitive error	p- value
Procrastination	1	-	-	-	-	-	<0.001
Depression	0.448	1	-	-	-	-	<0.001
Anxiety	0.300	0.590	1	-	-	-	<0.001
Stress	0.465	0.634	0.591	1	-	-	<0.001
DASS sum	0.474	0.873	0.838	0.863	1	-	<0.001
Cognitive error	0.541	0.530	0.504	0.505	0.598	1	-

Depression, Anxiety, and Stress Scale (DASS).

Discussion

According to the results of present study on 170 medical students of the Shahid Sadoughi University of Yazd showed, about 98.9% of the students suffered from procrastination with 37% having severe procrastination. These results were consistent with the results of Victor Day *et al* study on 248 Canadian university students in the 1996-7 academic year (1). This cross-cultural similarity suggests that procrastination is a widespread issue among students globally, though its psychological and social implications may vary by cultural context (32).

As for the relationship between procrastination and gender, the average score of procrastination between male and female students was not significantly different. In this research, controversial statements were found about this variable. Present study findings were aligned with the outcome of Ferrari *et al* (36), McGown *et al* (6), Wang *et al* (37), and Solomon *et al* (2), but they were inconsistent with the results of Lu *et al* (7) and Balkis *et al* (38). Based on the findings of Hayat *et al* research, about procrastination among 317 medical students at Shiraz Medical University of Science, procrastination is more seen among male students and the probable reason would be the less amount of self-regulation and self-efficacy (39) in this gender, and the fact that female students are more competitive and fearful of failure than their male colleagues. On the other hand, Song *et al* indicated that procrastination is more in female students. These gender-based differences may reflect cultural expectations around academic performance, emotional expression, and gender roles in countries

such as Iran, South Korea, and Turkey.

This research did not identify a notable difference in the connection between procrastination and the variable of being native and non-native. In the research that Hayat *et al* did, they found that the students who lived in dormitories procrastinated more compared to students who didn't live there, and to support that idea they wrote that the students who lived in dormitories had unlimited access to the internet and their social network. The difference between this research and Hayat *et al* is that as we know not all non-native students live in dormitories, and there are some cultural differences between Yazd and Shiraz. Yazd is a more traditional city compared to Shiraz; therefore, there is more amount of social support for people who are not familiar with the environment and the culture has so much respect for knowledge, especially medicine. This highlights how regional cultural norms within a country can influence psychological outcomes like procrastination.

No significant relationship was found among married and unmarried students in procrastination and marital status in this study. Mureed Hussain (40) showed that postponing work can increase the probability of being alone and not getting married, thus causing the family to remain small. Likewise, Rebetz *et al* (41) and Steel *et al* (42) showed that procrastination can be a factor in predicting the rate of divorce; which means the severe it gets, there is a higher chance for the pair to get a divorce, and the individuals who have more procrastination find it harder to get in romantic relationships. Of course, it is noteworthy that only 7% of the participants in this research were married.

In cultures where marriage is closely tied to social stability and emotional support, such as Iran, the psychological consequences of procrastination may extend beyond academic performance.

No significant difference was observed in this research in the connection between procrastination and different levels of academia. The study that Rosario *et al* did on students from seventh to ninth grade, revealed that as students go further in their educational journey their level of academic procrastination gets higher and that could be because of the fact that adolescents usually put off difficult and unpleasant tasks that involve high doses of effort, preferring to engage in activities that are more interesting to them (43).

In a study that Mohammadi *et al* (44) did on 380 a Foreign Language (EFL), learners across different years of study found that freshmen students had higher levels of academic procrastination and internet usage. In contrast, McCown and Roberts showed that freshmen had the lowest and seniors revealed the highest degree of academic procrastination (45).

Hayat *et al* (39) showed that there was a difference in academic procrastination among the students in different periods of their university studies; with an increase in the years of education, the students became more procrastinators. However, the differences were not significant.

Some researchers have reported that with an increase in the years of education, the students' motivation decreases since motivation is negatively associated with procrastination; the less the student's motivation, the more the procrastination behaviors (46). On top of that, when medical students enter higher levels of their education, they get more involved in their clinical activities and practically have less chance of following their academic duties.

This factor can be examined from two aspects of education: Ferrari *et al* found that as the level of education increases, the amount of procrastination will decrease (36). Wen and Lee (10) reported that graduated students showed more procrastination than middle and high school students. These mixed findings across countries suggest that cultural attitudes toward education, autonomy, and academic pressure may shape how procrastination evolves over time.

The findings showed that the components of "should statements", "magnification or minimization", and "overgeneralization" were the most common cognitive errors for procrastinating individuals with depression. This pattern may differ in countries with less hierarchical or less pressure-intensive clinical training environments.

These results were aligned with the results of Besharat *et al* at Iran (23) who showed there was a connection between perfectionism, procrastination, anxiety, and depression. As in the present study the component of "should statements", which is a common cognitive error among perfectionists, was one of the common cognitive errors of the study, too.

It also revealed that the total average of cognitive errors and common cognitive errors in procrastinating individuals with depression has no significant relationship with gender and marital status. The total amount of cognitive errors and also the "should statements" and "magnification or minimization" have no significant difference for native and non-native individuals. As for the cognitive error of "overgeneralization", there is a significant difference and this cognitive error is more common in individuals who are not natives of that region. For the variable of different academic levels, the cognitive error "magnification or minimization" was significantly more frequent in clinical med-students. As known when medical students get to the clinical level of their education, their responsibilities become more serious and of course they are taught to never miss any detail and never make any mistakes around patients; so it is no surprise why this cognitive error is more common among clinical students.

As for the connection between procrastination and anxiety, the components of "should statements", "magnification or minimization", and "overgeneralization" were the most common cognitive errors for procrastinating individuals with anxiety.

The findings reveal that there is no remarkable dissimilarity in the total average of cognitive errors and common cognitive errors in procrastinating individuals with anxiety between men and women, married and unmarried individuals, and different academic levels. There is no significant difference in the average of total cognitive errors between

native and non-native individuals. The cognitive errors “should statements”, and “magnification or minimization” also have no noteworthy connection between native and non-native individuals, but a significant difference concerns the cognitive error “overgeneralization”. This cognitive error is more common in non-native individuals.

The highest average of cognitive error components for procrastinating individuals with stress were the components of “should statements”, “magnification or minimization”, and “overgeneralization”, respectively.

In this research, we discovered that no statistically outstanding distinction exists between men and women and different academic levels in the total average of cognitive errors and common cognitive errors in procrastinating individuals with stress. For the variable married and unmarried, there was no distinguished dissimilarity in the total amount of cognitive errors, although the “overgeneralization” component is more common among married students and the component “magnification and minimization” is more frequent among unmarried medical students. Different studies in United States and Turkey have shown that the higher the level of cognitive errors gets, the more likely a person will remain single, and marriage burnout and divorce rate have a significant relationship with cognitive errors (39,47). The authors did not find any research directly discussing the comparison of cognitive error “overgeneralization” between married and un-married students.

For the variable of being native and non-native the total amount of cognitive errors showed no significant difference, however, the components of “overgeneralization” and “should statements” were seen more among non-native medical students.

In the present research the authors did not find any article precisely discussing these two components of cognitive errors, but as a fact, the students who leave their homes and families, and start to build a life in a new environment, experience anxiety, depression and stress due to loss of their previous support system and the need to learn new language or even accent. This phenomenon has been observed in international student populations in countries like Germany, Australia, and the United Kingdom, where cultural transition can significantly affect mental health and

cognitive processing.

Susan Thomas and Teresa Larkin at the University of Wallengorg, Australia studied 120 people (60 people who were diagnosed with MDD by the DSM 5 criteria by a psychiatrist and who had not taken antidepressant medication in the past two months as the case group and 60 people who did not have depression or other psychiatric disorders as a control group). They found that the amount of stress, anxiety, and cognitive errors in the case group was more than in the control group. They also showed that those who showed a higher level of cognitive errors (by automatic thoughts questionnaire), had a higher level of stress (by DASS 21-question questionnaire) and a higher level of cortisol hormone in their plasma (48).

Limitations

This study has several limitations. The sample was culturally specific and relatively small, which may affect generalizability. Self-report measures can introduce bias, and the cross-sectional design limits causal interpretations. Future research should consider longitudinal approaches, more diverse samples, and mixed methods to deepen understanding. Examining additional factors such as socioeconomic status or parental involvement could also enrich future findings.

Another limitation is related to the cutoff score used in the procrastination scale, which seems disproportionately high. This may compromise the scale’s reliability by reducing its ability to accurately classify individuals with moderate levels of neglect. Future studies should consider re-evaluating the threshold criteria or employing alternative criteria with more refined thresholds to improve diagnostic accuracy.

Conclusion

As the findings revealed, the procrastination rate among medical students is very high, so many students suffer from depression, anxiety, and stress. Likewise, the studies revealed that a high percentage of students have cognitive errors. This can point to the importance of the fact that although procrastination is not supposedly a psychiatric disorder, it can be the cause of psychiatric disorders. As for cognitive errors, we tried to find the main cognitive errors in the

procrastinating individuals with each of the variables. They included the cognitive errors of “should statements”, “magnification or minimization”, and “overgeneralization”, and the cognitive error “overgeneralization” was higher in non-native students than native ones.

The research suggestion is that a group of randomly selected participants undergo cognitive therapy and their levels of procrastination, depression, stress, anxiety, and cognitive errors were evaluated and compared with the results of this research.

The authors suggest that further research compare the results of this research with a group of students from other fields of medical or non-medical science; also, there are other factors that could have a significant connection such as socioeconomic factors, the effect of different cultures, the number of family members, the role of addiction, *etc.*

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Conflict of Interest

Authors declare no conflict of interest.

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