

# Relationship Between Alexithymia, Smartphone Addiction, and Psychological Distress Among University Students: A Multi-country Study

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## ABSTRACT

**Objectives:** Increasing dependence on smartphones results in the appearance of psychological problems, especially among young people. This study aims to determine the rates of alexithymia and its relationship with smartphone addiction and psychological distress in university students. **Methods:** A total of 2616 students (mean age = 22.5±3.5 years; 73.1% female) from universities in Egypt, Oman, and Pakistan were included in a cross-sectional and comparative study conducted through a web survey during the COVID-19 pandemic from October to December 2021. The following scales were used: Toronto Alexithymia Scale (TAS-20), Depression Anxiety Stress Scale (DASS-21), and Smartphone Addiction Scale-Short Version (SAS-SV). The survey also included questions related to sociodemographic and smartphone usage patterns. **Results:** Students scoring above the TAS-20 cutoff point were significantly more likely to have smartphone addiction ( $\chi^2(1) = 45.41; p < 0.001$ ) and psychological distress ( $\chi^2(1) = 246.31; p < 0.001$ ). Likewise, smartphone addiction was significantly associated with psychological distress ( $\chi^2(1) = 57.46; p < 0.001$ ). However, at each of the TAS-20, SAS-SV, and DASS-21 variables, there were significant differences between the students of the three countries ( $p < 0.050$ ,  $p < 0.010$ , and  $p < 0.010$ , respectively); smartphone addiction was highest in Oman, while alexithymia and psychological distress were most severe in Egypt. Women scored higher than men on SAS and TAS scales ( $p < 0.001$ ). Students who used social media frequently were more prone to smartphone addiction. **Conclusions:** Understanding cultural and socioeconomic factors (such as living standards, technology accessibility, and social interaction patterns) is crucial for generating strategies to improve the psychological well-being of the youth of different regions and countries. Further, this study confirms the findings of recent studies indicating the heightened university students' psychological vulnerability during the COVID-19 pandemic.

In 1973, Peter Sifneos originally coined the term alexithymia based on three Greek word roots (a: lack, *lexis*: word, and *thymos*: mood/emotion).<sup>1</sup> Literally translated as 'no words for mood', alexithymia is now considered a multidimensional personality trait. An alexithymic individual may have difficulties in identifying and characterizing feelings, trouble recognizing emotions from physical sensations, a restricted

capacity to form mental images with insufficiency of imagination, and a lack of concrete and inadequate analytical thinking.<sup>2</sup>

Alexithymia has also been defined as a general impairment in emotional processing as well as having trouble distinguishing personal emotional states with a restricted ability to transmit these feelings to others.<sup>3</sup> Alexithymia has been associated with problems dealing with challenging situations which

may generate anxiety and depression. It is linked to a higher risk of mortality from a variety of causes (suicide, disasters, trauma, or aggression).<sup>4</sup>

Alexithymia is linked with multiple psychological and psychosomatic disorders such as affective dysregulation,<sup>5</sup> low self-esteem, traumatic experiences,<sup>4</sup> intimate relationship dissatisfaction,<sup>6</sup> sleep problems,<sup>7</sup> and challenges forming and sustaining interpersonal connections.<sup>8</sup> Many recent studies have found associations between alexithymia and addictive behaviors such as internet gaming disorder, smartphone addiction,<sup>9,10</sup> substance abuse, excessive drinking,<sup>11</sup> and eating disorders.<sup>5</sup> One explanation for this association is that alexithymic people may be attempting to self-regulate their emotional expressions by indulging in addictive or maladaptive behaviors.<sup>12,13</sup>

Smartphones are information-processing devices that incorporate the Internet and social networking access, texting, and multimedia in addition to their primary function as a communication tool. There is a growing concern that frequent smartphone use could indicate that they are becoming a source of behavioral addiction.<sup>13</sup> Smartphone addiction is not recognized as a condition in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders, published in 2013.<sup>14</sup>

Despite the benefits of giving information and communication options, excessive smartphone usage has been linked to physical health issues including vision impairment, nerve pain, auditory pain, headaches, and sleep disturbances.<sup>15</sup> Several mental health issues such as depression and anxiety have been related to smartphone addiction.<sup>16</sup>

Internet access has become easy and affordable because of the rapid emergence of cheap smartphones.<sup>17</sup> Individuals suffering from alexithymia may utilize the Internet to regulate their feelings due to difficulty identifying and explaining them.<sup>13</sup> Consequently, this group's usage of smartphones, and perhaps dependence on them, may be higher. A few studies have linked alexithymia with psychological distress and smartphone addiction.<sup>18-20</sup> To our knowledge, there is a dearth of studies on this from the Middle East and Pakistan. Therefore, the present study investigates alexithymia and its relationship to smartphone addiction among college students belonging to different ethnicities living in Egypt, Oman, and Pakistan, through a multi-country comparative approach.

## METHODS

This cross-sectional survey was conducted online on a convenience sample of 2616 university students from October to December 2021. Two researchers were responsible for performing and supervising the data collection; one researcher dealt with the respondents in Egypt and Oman, while the other addressed the students in Pakistan.

Ethical permission was provided by the Ethics Committee of Menoufia University on 16<sup>th</sup> August 2021 for the conduct of this study. The study was conducted in accordance with the Declaration of Helsinki and the American Psychological Association's (APA) ethical standards for psychological research. Potential participants were given a participant information e-sheet outlining the research team's responsibilities and the rights of the participants. All participants provided in advance their informed written consent. The questionnaire was randomly distributed to selected universities in Egypt (Menoufia University, Cairo University, and Banha University), Oman (Sultan Qaboos University, Nizwa University, and Sohar University), and Pakistan (COMSATS University Islamabad, University of Karachi, and University of Punjab). Adult students (above the age of 18) who were current social media users met the inclusion requirements for participation (this entailed having an account on any social media platform). The participants were advised to forward the link to other students in their university in order to increase the responses.

Three instruments were incorporated into the online questionnaire: (1) the Toronto Alexithymia Scale (TAS-20), the Depression, (2) the Anxiety and Stress Scale with 21 Items (DASS-21), and (3) the Smartphone Addiction Scale Short Version (SAS-SV). In Egypt and Oman, a previously translated and validated Arabic version of TAS-20,<sup>21</sup> DASS-21,<sup>22</sup> and SAS-SV<sup>23</sup> was used; while in Pakistan, a previously translated and validated Urdu version of TAS-20,<sup>24</sup> DASS-21,<sup>25</sup> and SAS-SV<sup>26</sup> was used. TAS-20 is organized into three subscales that measure: (1) difficulty identifying feelings (seven items), (2) difficulty describing feelings (five items), and (3) externally oriented thinking (eight items).<sup>27</sup> In this study, the Cronbach's Alpha score for TAS-20 was 0.82 (> 0.80), demonstrating a good reliability. Further, an adequate Kaiser-Meyer-Olkin (KMO) value and significant Bartlett's test of sphericity for

TAS-20 were found in this study (0.88, chi square ( $\chi^2$ ) = 11540.6;  $p < 0.001$ ). Thus, this scale showed psychometric adequacy and sufficient levels of reliability and validity.

The SAS-SV scale is made up of ten items.<sup>28</sup> Participants respond on a Likert scale of 1 to 6 (from 'strongly disagree' to 'strongly agree'). In this study, Cronbach's Alpha score for SAS-SV was 0.87 ( $> 0.80$ ), demonstrating a good reliability. Further, an adequate KMO value and significant Bartlett's test of sphericity for SAS-SV were found in this study (0.90,  $\chi^2 = 9748.31$ ;  $p < 0.001$ ). Thus, the scale showed psychometric adequacy and sufficient levels of reliability and validity.

The DASS-21 consists of 21 items in three subscales that are valid and reliable measures of depression (items 3, 5, 10, 13, 16, 17, 21), anxiety (items 2, 4, 7, 9, 15, 19, 20), and stress (items 1, 6, 8, 11, 12, 14, 18) separately;<sup>29</sup> the scale also taps into a more general dimension of psychological distress and it can be used as a measure of distress in adolescents.<sup>30</sup> Responses are scored on a 4-point Likert scale where zero is given to the response 'Does not apply to me at all' and three to the response 'Applies to me very much or most of the time.' In this study, DASS-21 was adopted as a general dimension, known more precisely as DASS-21 Total Score.<sup>30</sup> Further, in this study, the Cronbach's Alpha score for DASS-21 was 0.94 ( $> 0.90$ ), demonstrating an excellent reliability. Further, we found an adequate KMO value and significant Bartlett's test of sphericity for DASS-21 (0.97,  $\chi^2 = 24538.5$ ;  $p < 0.001$ ). Thus, the scale showed psychometric adequacy and sufficient levels of reliability and validity.

For data analysis, we used the Python libraries Sklearn and Scipy. Statistical analysis was performed using SPSS (IBM Corp. Released 2010. IBM SPSS Statistics for Windows, Version 19.0. Armonk, NY: IBM Corp.). Numeric SAS-SV, TAS-20, and DASS-21 scores were treated, almost exclusively, as target variables. In Python, labels represented the variable names, which facilitated easy recognition of their meanings. The predictive influence of each categorical binary data label variable was measured with a two-sided *t*-test. When the label variables had more than two categories, one-way ANOVA was used. Ordinary least squares regression was used for estimating coefficients of linear regression equations and describing the relationship between the three main measures of this study.

The authors of the TAS-20 scale endorsed using the scores as a continuous measure of alexithymia severity. Nonetheless, the cut-off scores for 'alexithymic' and 'non-alexithymic' have been established. Accordingly, this study refers to these cut-off scores which were classified as follows:  $\leq 51$  indicates non-alexithymia,  $\geq 61$  indicates alexithymia, and 52–60 indicates alexithymia.<sup>27,31</sup>

Pertinent evidence indicates that significant differences exist in the SAS-SV scores for gender ( $p < 0.001$ ) and that based on receiver operating characteristics (ROC) curve analysis and subsequent computed specificity and sensitivity values, the smartphone addictive group can be identified by the following cut-off scoring:  $\geq 31$  for males and  $\geq 33$  for females.<sup>28</sup> Also, statistically analyzing the ROC curve to identify psychologically distressed groups using the DASS-21 total score indicated that a cut-off score of  $\geq 14$  was deemed to be best suited for female adolescents, while a cut-off score of  $\geq 17$  was deemed best for male adolescents.<sup>30</sup>

The aim of employing the cut-off scores is to enhance interpretability and minimize subjective judgment. Hence, based on relevant evidence, the TAS-20, DASS-21, and SAS-SV scores were transformed into binary categorical target variables using the above-mentioned evident cut-off scoring criteria. In these cases, chi-squared tests of independence and crosstabulations were used.

## RESULTS

This study included 2616 university students (1911 women and 705 men). Most participants were from Oman (1619; 61.9%), followed by Egypt (489; 18.7%) and Pakistan (508; 19.4%). The participants' mean age was  $22.5 \pm 3.5$  years. The comparisons of mean values based on the characteristics of the participants are presented in Table 1, and this has been demonstrated to the three applied scales: TAS-20, SAS-SV, and DASS-21. The mean scores on the TAS-20, SAS-SV, and DASS-21 total scale were  $59.1 \pm 11.5$ ,  $35.4 \pm 9.9$ , and  $21.8 \pm 12.9$ , respectively. At this time point, the mean TAS-20 score was slightly below the cut-off value ( $\geq 61$ ); however, the mean SAS-SV score was above the cut-off value ( $\geq 31$  for males and  $\geq 33$  for females), indicating a high risk of smartphone addiction. Further, the mean DASS-21 score was above the cut-off value ( $\geq 17$

**Table 1:** Characteristics of the participants, and comparisons of mean scores for TAS-20, SAS-SV, and DASS-21 classified under various parameters (N = 2616).

Variables	n (%)	SAS-SV			TAS-20			DASS-21		
		Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value
<b>Country</b>				< 0.001*			0.010*			< 0.001*
Oman	1619	36.8	9.2		59.0	11.2		19.8	12.2	
Egypt	489	36.7	9.4		60.5	11.2		26.0	12.7	
Pakistan	508	29.	10.2		58.4	12.7		24.4	13.8	
<b>Faculty</b>				0.640			0.910			0.020*
Theoretical	1221	35.3	10.0		59.2	11.5		22.5	13.1	
Practical	1395	35.5	9.7		59.1	11.6		21.	12.7	
<b>Marital status</b>				0.012 *			< 0.001*			< 0.001*
Single	2125	35.1	9.9		59.6	11.7		22.4	12.9	< 0.001*
Married	477	36.7	9.3		57.3	10.3		19.2	12.3	
<b>Paying for social media attractions</b>				0.720			0.204			< 0.001*
Yes	348	35.6	9.9		60.0	13.6		25.2	13.2	
No	2268	35.4	9.8		59.0	11.2		21.3	12.8	
<b>Academic year</b>				< 0.001*			< 0.001*			< 0.001*
1 <sup>st</sup> Year	140	36.3	10.1		63.3	12.9		24.8	13.1	
2 <sup>nd</sup> Year	318	36.4	9.7		61.0	12.		22.7	12.9	
3 <sup>rd</sup> Year	355	34.2	10.2		59.0	12.3		23.1	12.5	
4 <sup>th</sup> year	569	33.9	10.2		59.5	10.4		21.6	13.2	
5 <sup>th</sup> year	373	36.6	9.4		58.7	11.1		20.7	13.0	
6 <sup>th</sup> year	345	35.9	9.7		58.6	11.3		18.7	12.2	
7 <sup>th</sup> year	516	35.9	9.4		57.3	11.1		24.8	13.1	
<b>Place of residence</b>				0.390			0.240			0.140
With family	1812	35.4	9.9		58.9	11.6		22.0	12.9	
With friend	104	36.8	9.4		60.0	9.8		23.7	13.1	
Alone	46	34.0	10.4		58.2	10.1		23.0	14.6	
Hostel	654	35.4	9.6		59.8	11.7		21.0	12.7	
<b>Income level</b>				0.016*			0.130			< 0.001*
Low	401	34.6	10.0		60.2	14.0		23.9	13.2	
Middle	2038	35.7	9.8		58.9	11.0		21.3	12.7	
High	177	33.9	9.7		58.9	11.6		23.09	13.4	
<b>Monthly smartphone bill</b>				< 0.001*			0.020*			0.090
Very low	593	33.0	10.5		60.2	12.2		22.7	13.9	
Low	737	34.8	9.2		58.4	11.2		21.1	13.0	
Middle	1082	36.7	9.4		58.9	11.0		21.	12.1	
High	204	37.9	10.6		60.1	13.4		23.0	13.6	
<b>Freq. of changing smartphone/year</b>				0.019*			0.003*			0.270
0	2188	36.9	10.0		59.2	11.5		21.8	13.0	
1–2	219	35.8	8.5		59.2	10.8		23.1	12.2	
3–4	115	37.3	10.5		61.3	13.5		22.0	13.0	
> 4	94	36.9	8.8		55.3	11.5		20.0	11.4	
<b>Academic performance</b>				< 0.001*			0.310			< 0.001*
Pass	182	32.9	11.6		59.8	13.4		25.9	14.8	
Good	831	35.8	9.9		59.6	10.9		23.4	12.9	
Very good	1207	36.0	9.2		58.8	11.1		20.7	12.1	

**Table 1:** Characteristics of the participants, and comparisons of mean scores for TAS-20, SAS-SV and DASS-21 classified under various parameters (N = 2616).

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Variables	n (%)	SAS-SV			TAS-20			DASS-21		
		Mean	SD	p-value	Mean	SD	p-value	Mean	SD	p-value
Excellent	396	33.9	10.4		58.7	13.1		20.4	13.4	
<b>Environment</b>				0.048*			0.220			0.160
Urban	1600	35.0	10.3		59.4	11.6		21.6	13.155	
Rural	859	36.0	9.2		58.6	11.5		22.5	12.6	
Mountain	157	36.2	8.7		59.5	10.4		20.7	12.0	
<b>Freq. of social media usage</b>				< 0.001*			< 0.001*			0.053
Never	94	28.1	10.5		62.7	14.3		23.9	13.8	
Rarely	251	29.0	9.4		57.0	12.3		22.6	12.9	
Occasionally	618	32.8	9.0		57.8	10.4		20.83	12.	
Frequently	1653	37.8	9.3		59.8	11.5		22.0	13.1	

\*Statistical significance,  $p < 0.05$ . #TAS-20: Toronto Alexithymia Scale; SAS-SV: Smartphone Addiction Scale Short Version; DASS-21: Depression, Anxiety and Stress Scale with 21 Items.

for males and  $\geq 14$  for females) indicating a trend toward psychological distress.

Tables 1 and 2 present comparisons between the three countries based on selected variables. For example, the statistical comparison between the three countries for the mean scores of each applied scale revealed significant differences with regard to TAS-20 ( $F [2, 2613] = 4.5; p < 0.05$ ), SAS-SV ( $F [2, 2613] = 120.7; p < 0.01$ ), and DASS-21 ( $F [2, 2613] = 57.3; p < 0.01$ ). Students from Egypt had the highest mean TAS-20 mean score ( $60.5 \pm 11.2$ ), followed by students from Oman ( $59.0 \pm 11.2$ ) and Pakistan ( $58.4 \pm 12.7$ ). Students from Oman had the highest SAS-SV mean score ( $36.8 \pm 9.2$ ), followed by students from Egypt ( $36.7 \pm 9.4$ ) and Pakistan ( $29.5 \pm 10.2$ ). The DASS-21 mean scores were  $26.0 \pm 12.7$  for Egyptian students,  $24.4 \pm 13.8$  for Pakistani students, and  $19.8 \pm 12.2$  for Omani students. In each of the three sampled countries, there was no statistically significant difference between men and women in terms of SAS-SV ( $p < 0.050$ ). However, in TAS-20, women were significantly higher than men in all three countries ( $p < 0.010$ ). In Oman and Pakistan, the differences in mean DASS-21 scores between men and women were just under the threshold of significance ( $p < 0.050$ ), while in Egypt, women scored significantly higher than men ( $p < 0.010$ ).

Women had higher mean scores of SAS-SV and TAS-20 than men ( $p < 0.001$ ), but there was no significant gender difference in DASS-21 scores

( $p = 0.590$ ) [Table 2]. Among the 1695 (64.8%) participants who were smartphone addiction positive, women constituted the majority (73.1%). However, there was insufficient evidence to suggest an association between female sex and smartphone addiction ( $\chi^2(1) = 2.33; p = 0.310$ ). Also, within the 1135 (43.4%) TAS-positive participants, three quarters were women (77.0%). Here, there was a statistically significant association between female sex and alexithymia ( $\chi^2(1) = 19.77; p < 0.010$ ).

Although R-squared values were low for the ordinary least squares regressions that were run between SAS, TAS, and DASS, there were definite underlying positive relationships,  $p < 0.010$  [Table 3]. Further, the Chi-square statistic indicated that there were statistically significant associations between SAS-SV, TAS-20, and DASS-21 ( $p < 0.010$ ) [Table 4].

Despite low association values, hours of mobile usage significantly predicted SAS-SV ( $R^2 = 0.10; p < 0.010$ ) and TAS-20 ( $R^2 = 0.01; p < 0.010$ ). The results of the  $t$ -test showed that the students who frequently used social media platforms (WhatsApp, Instagram, Facebook, Twitter, and Snapchat) had higher smartphone addiction scores than those who did not use them frequently ( $p < 0.010$ ). Further,  $\chi^2$  test revealed a significant association between the frequent usage of these platforms and smartphone addiction ( $p < 0.050$ ), explicitly indicating that frequent social media users are more vulnerable to problematic smartphone usage. Interestingly, while

**Table 2:** Comparisons of mean scores for TAS-20, SAS-SV, and DASS-21 based on gender and country (N = 2616).

Instrument	Country	Gender	Mean	SD	t	p-value	95% CI
SAS-SV	All countries	Men (n = 705)	33.5	10.6	-5.75	< 0.001*	-3.52--1.73
		women (n = 1911)	36.1	9.5			
	Oman	Men (n = 373)	36.3	9.5	-1.31	0.190	-1.83--0.37
		women (n = 1246)	37.0	9.1			
	Egypt	Men (n = 67)	35.3	10.0	-1.31	0.190	-4.30--0.89
		women (n = 421)	37.0	9.3			
	Pakistan	Men (n = 264)	29.1	10.9	-1.06	0.290	-2.72--0.82
		women (n = 244)	30.0	9.3			
TAS-20	All countries	Men	56.7	12.7	-6.13	< 0.001*	-4.39--2.26
		women	60.0	10.9			
	Oman	Men	56.7	12.7	-4.06	< 0.001*	-4.38--1.52
		women	59.7	10.7			
	Egypt	Men	56.3	14.1	-2.74	0.008*	-8.52--1.35
		women	61.2	10.5			
	Pakistan	Men	56.9	12.4	-2.75	0.006*	-5.30--0.88
		women	60.0	12.8			
DASS-21	All countries	Men	21.6	13.3	-0.54	0.590	-1.46--0.82
		women	21.9	12.7			
	Oman	Men	19.3	12.0	-0.97	0.300	-2.09--0.71
		women	20.0	12.2			
	Egypt	Men	21.9	13.4	-2.73	0.008*	-8.25--1.29
		women	26.7	12.5			
	Pakistan	Men	24.9	14.4	0.84	0.400	-1.38--3.44
		women	23.87	13.2			

TAS-20: Toronto Alexithymia Scale; SAS-SV: Smartphone Addiction Scale Short Version; DASS-21: Depression, Anxiety and Stress Scale with 21 Items; t: two-sided t-test. \*Statistical significance,  $p < 0.05$ .

**Table 3:** OLS regressions between SAS-SV, TAS-20, and DASS-21 (N = 2616).

	Coefficient	Std error	t	p >  t	95% CI
Constant	49.88	0.821	60.75	< 0.001*	48.270--51.490
SAS-SV_total	0.2	0.0	11.768	< 0.001*	0.219--306
TAS-20 ~ SAS-SV, $R^2 = 0.050$					
Constant	8.5	0.9	9.473	< 0.001*	6.768--10.615
SAS-21_total	0.3	0.0	15.395	< 0.001*	0.329--0.425
DASS-21 ~ SAS-SV, $R^2 = 0.083$					
Constant	-3.9	1.2	-3.299	< 0.001*	-6.375--1.622
TAS-20_total	0.4	0.0	21.768	< 0.001*	0.398--0.477
DASS-21 ~ TAS-20, $R^2 = 0.153$					

OLS: ordinary least squares; TAS-20: Toronto Alexithymia Scale; SAS-SV: Smartphone Addiction Scale Short Version; DASS-21: Depression, Anxiety and Stress Scale with 21 Items; t-statistic. \*Statistical significance,  $p < 0.05$ .

the frequent usage of WhatsApp, Facebook, Twitter, or Snapchat was not significantly associated with alexithymia ( $p < 0.050$ ), the frequent Instagram usage had a significant association with the TAS-20 ( $\chi^2(1) = 8.99; p < 0.010$ ), indicating that Instagram users were relatively more vulnerable to alexithymia.

## DISCUSSION

In this cross-sectional study, the rates of alexithymia and its association with smartphone addiction and psychological distress were investigated among university students in Egypt, Oman, and Pakistan. To our knowledge, this research is the first of its

**Table 4:** Associations between different categorized groups based on thresholds of TAS-20, SAS-SV, and DASS-21 (N = 2616).

Scale group			SAS-SV		$\chi^2$	p-value
			Addicted, %	Not addicted, %		
TAS-20	Alexithymia	n	817	318	45.419	< 0.001*
		TAS-20	72.0	28.0		
		SAS-SV	48.2	34.5		
	No alexithymia	n	878	603		
		TAS-20	59.3	40.7		
		SAS-SV	51.8	65.5		
DASS-21	DASS psychologically Distressed	n	1270	559	57.461	< 0.001*
		DASS-21	69.4	30.6		
		SAS-SV	74.9	60.7		
	DASS not psychologically distressed	n	425	362		
		DASS-21	54.0	46.0		
		SAS-SV	25.1	39.3		
			TAS-20			
			Alexithymia, %	No alexithymia, %		
DASS-21	DASS psychologically distressed	n	976	853	246.311	< 0.001*
		DASS-21	53.4	46.6		
		TAS-20	86.0	57.6		
	DASS not psychologically distressed	n	159	628		
		DASS-21	20.2	79.8		
		TAS-20	14.0	42.4		

TAS-20: Toronto Alexithymia Scale; SAS-SV: Smartphone Addiction Scale Short Version; DASS-21: Depression, Anxiety and Stress Scale with 21 Items.  
\*Statistical significance,  $p < 0.05$ .

kind to study this subject through a comparative analysis among these three countries which have different ethnicities.

The prevalence rate of alexithymia among our participants (43.4%) was twice the rate found in a previous study in Egypt based on 2019 (pre-pandemic) data, where only 22% of the 200 students had alexithymia.<sup>20</sup> Similarly, the prevalence rates of psychological distress and smartphone addiction were high 70.0% and 64.8%, respectively. These high rates may pertain to the devastating influence of the COVID-19 pandemic, as data from this study was collected in the last quarter of 2021. Several reports during the COVID-19 pandemic have shown that psychological distress, intrusive thoughts, and negative emotions had exacerbated among university students worldwide.<sup>32-35</sup> An Italian study conducted during the pandemic period found that 22.9% of university students were using internet excessively and 27.3% had alexithymia.<sup>36</sup> A study conducted among Saudi Arabian university students found that 37.4% of them were addicted to

smartphone use.<sup>37</sup> However, other studies reported that the COVID-19 period was not associated with a significant increase in smartphone addiction.<sup>38,39</sup> Despite that, the mean smartphone addiction in our study was 64.8%, double that of Egyptian students' pre-pandemic addiction level of 32.5%.<sup>20</sup>

This study confirms a significant association between alexithymia and smartphone addiction and that alexithymia may be a significant predictor of smartphone addiction, in agreement with previous studies conducted in Egypt,<sup>20</sup> Turkey,<sup>10</sup> and Pakistan.<sup>40</sup> The persistence of this association across studies necessitates the attention of education providers.<sup>41</sup> Further, our results corroborate the previous reports of a significant correlation between psychological distress and problematic smartphone use among young adults and college students.<sup>42-44</sup>

Despite earlier studies suggesting that men tend to score higher in alexithymia than women,<sup>45,46</sup> in our study, women of all three countries exhibited higher levels of alexithymia ( $p < 0.010$ ). This higher vulnerability of females to alexithymia in our

sampled countries, particularly amid the COVID-19 crisis, represents an alarming trend that needs to be studied carefully to identify its predictors. In general, the COVID-19 pandemic has been reported to have negatively impacted female psychological well-being.<sup>47,48</sup>

Our study found that the greater the usage of social media, the more the likelihood of smartphone addiction. This agrees with recent research that showed that high engagement with social network sites is linked with high levels of smartphone usage and subsequent disruption to one's subjective well-being.<sup>49,50</sup> Factors aggravating smartphone addiction relate to low self-esteem, fear of missing out, and low self-efficacy. Interestingly, among the social media users, we found only Instagram users had a significant positive association with alexithymia. This supports previous research emphasizing on relationship between alexithymia and Instagram addiction.<sup>51-53</sup> Also, a study found that psychological distress during the COVID-19 pandemic significantly mediated the effect of alexithymia on Instagram addiction.<sup>51</sup>

The high prevalence of alexithymia in this study is consistent with previous research indicating that university students are at higher risk of experiencing mental health problems than the general population.<sup>54</sup> Further, the relationship we found between psychological distress and smartphone addiction is also in line with previous research.<sup>55</sup> Interventions to reduce smartphone addiction among individuals with alexithymia should focus on addressing the underlying emotional difficulties that contribute to their smartphone use. Alongside this, strategies to induce wise and balanced usage of social media networks should be considered to maintain healthy connectedness and relationships while controlling the risk of smartphone addiction.

This study had a few limitations. First, the participants were university students, and the findings may not be quite generalizable to other age groups and non-students. Second, convenience sampling was adopted which may have introduced a selection bias. Third, the cross-sectional design of the study meant that causality could not be inferred from the observed associations between alexithymia, smartphone addiction, and psychological distress. Further research using longitudinal or experimental designs are necessary to establish causality.

Despite these limitations, this study's findings have important implications for mental health

intervention and prevention efforts among university students. It highlights the need for higher educational institutions to prioritize the mental health of their students by implementing evidence-based interventions to reduce stress, enhance emotional regulation skills, and promote healthy smartphone use habits. Future research could explore the effectiveness of such interventions and their potential to improve the mental health outcomes of university students.

## CONCLUSION

This multi-country study has found the association between alexithymia, smartphone addiction, and psychological distress among university students amidst the COVID-19 pandemic to be significant. A severe prevalence of these disturbances was found among the participants in the three studied countries (Oman, Egypt, and Pakistan) with significant statistical differences between them. The study confirms the findings of recent studies indicating the heightened university students' psychological vulnerability during the COVID-19 pandemic. Future studies should explore the cultural factors that may contribute to the development of alexithymia and smartphone addiction among university students from different regions in the Middle East and South Asia. This will inform the development of culturally sensitive interventions that cater to the specific needs of students in various countries and regions.

### Disclosure

The authors declared no conflicts of interest. No funding was received for this study. We also wish to state that the first and second listed authors (M. Helmy and A.H. Ebrahim) are the de-facto joint first authors of this paper, having contributed maximally and equally to this study.

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