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Social Media Networking Sites Usage and Depression Among University Students During the COVID-19 Pandemic: The Mediating Roles of Social Anxiety and Loneliness

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Abstract

The current COVID-19 pandemic has resulted in increased psychological issues such as excessive social media networking sites usage (SMNSU), loneliness, social anxiety, and depression. In this quantitative study, we examined how SMNSU can directly and indirectly influence depression, with loneliness and social anxiety examined as mediator variables. A 39-item questionnaire was used to collect survey data on SMNSU, loneliness, social anxiety, and depression from 244 blended learning undergraduate students from universities in the Hunan province in China. Partial least squares structural equation modeling was conducted using SmartPLS 3.3.3 to measure the relationships between the stated variables of interest. Results indicated that SMNSU has a direct, significant, and positive relationship with depression. In terms of mediating effects, both loneliness and social anxiety have an intervening role in the association between SMNSU and depression. This study focused on the higher education sector of China by recruiting students who were enrolled in blended learning courses during the COVID-19 pandemic and experiencing psychological problems. We found that excessive SMNSU is associated with depression. Loneliness and social anxiety also increase depression along with excessive SMNSU among blended learning students during unprecedented situations, in this case, the COVID-19 pandemic. The valuable implications of these findings for teachers, counselors, and university managers are discussed, along with a consideration of future research directions.

Keywords

social media networking sites usage, social anxiety, loneliness, depression, students, COVID-19 pandemic

Introduction

Social media networking sites usage (SMNSU) has substantially increased since the beginning of the COVID-19 pandemic (Ostic et al., 2021). SMNSU facilitates interaction between users through its various platforms by allowing individuals to share opinions, images, information, and content (Doganer & Akoglu, 2020). Similarly, SMNSU creates other opportunities such as communication, searching for information, and entertainment. Undergraduate students, in particular, spend considerable time on social media networking sites (Twenge & Campbell, 2019). However, some studies suggest that SMNSU has led to increases in emotional issues such as loneliness, social anxiety, and depression (Escobar-Viera et al., 2018).

As such, various scholars have raised concerns about the possible undesirable influence of SMNSU on mental health (Kircaburun et al., 2020; Ostic et al., 2021). SMNSU can sometimes amuse individuals by providing social interaction and relationships with others. However, several studies have

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indicated that excessive SMNSU might lead to social media addiction, in part through creating a fear of “missing out” of something (i.e., text messages, friends updates, and social events) on social networking sites (Leong et al., 2019; Li et al., 2020). It has been discussed that extreme use of social media is linked with social isolation, anxiety, loneliness, and depression (Reer et al., 2019; Van den Eijnden et al., 2016). In addition, excessive SMNSU distracts the attention of individuals even during face-to-face communication processes (Choi & Noh, 2020).

Correspondingly, loneliness and social anxiety are the main associated factors of depression among students during this critical time, with both contributing to an increase in the threat of depression (Loades et al., 2020). The painful emotional state of loneliness is created through a lack of social interaction (Lisitsa et al., 2020) and it has been recently suggested that changes in society resulting from the COVID-19 pandemic and anxiety may increase rates of depression (Racine et al., 2020; Sequeira et al., 2021). However, it has been suggested that social engagement among individuals, even virtually, can be a critical factor in reducing depression arising from isolation during the COVID-19 pandemic (Sequeira et al., 2021). These contradictory perspectives require exploration and therefore, in the present study, we studied how loneliness and social anxiety may influence depression.

SMNSU may contribute to creating a sense of belonging with other related people and this may help in reducing feelings of loneliness (Twenge & Campbell, 2019). Similarly, SMNSU may further help by allowing individuals to interact with relatives, friends, and family, as well as distant or formal acquaintances such as colleagues and coworkers, and even strangers (Ostic et al., 2021). Social media networking sites are also considered important for people of all ages in exploiting their sense of connectedness in various social settings (Chen & Li, 2017).

However, fears remain about the possible undesirable influences of SMNSU, including increased loneliness, social anxiety, and depression. A number of studies have determined a positive role of social media in our daily routine life (Chen & Li, 2017; Twenge & Campbell, 2019), with beneficial impacts on the development of our reputation, identity, and (Barbosa et al., 2020; Ostic et al., 2021). Furthermore, social media is also helpful in sharing ideas, building and maintaining relationships, social interaction, and social support (Carlson et al., 2016). Many other studies have suggested that social media device usage effects on emotional well-being depend on screen time, the type of networking sites, and the nature of activities engaged in by users (Barbosa et al., 2020; David et al., 2018).

Consideration of the research discussed above provides contrary clues regarding the impact of SMNSU on loneliness, social anxiety, and depression, with both the promising positive and undesirable effects emerging, and the potential implications for social improvement. The societal implications of SMNSU need to be explored (Jiao et al., 2017; Ostic

et al., 2021), and we contend there is an urgent need to better understand the effect of SMNSU on students’ depression, taking into account the potential impact of loneliness and social anxiety as mediator variables.

To this end, we proposed a synthesized research framework based on social capital theory (SCT) for investigating the relationship among variables. The SCT has been previously used to explore how social media usage affects anxiety, isolation, and emotional well-being (Ge, 2020; Ostic et al., 2021). Most studies so far have discussed only a partial model of relationships, which although statistically acceptable and providing understanding on the scope of social networks, still do not adequately cover the phenomena of interest in this study. Moreover, contradictory findings suggest that the undesirable impacts of social media on developing loneliness, social anxiety, and depression have not been explored adequately, especially in the Chinese context. According to Valkenburg (2022), dozens of meta-analysis during last 3 years have shown an association of social media use with happiness, well-being and satisfaction. It depends on the active and passive uses of the social media. For example, Valkenburg et al. (2021) say that active use might lead to decreased loneliness, whereas passive use might lead to increased loneliness.

Bearing in mind these gaps in the literature, we aimed to highlight the undesirable effects of SMNSU along with loneliness and social anxiety on depression. We also explored the mediating effects of loneliness and social anxiety. To obtain an extensive insight into these phenomena, in the literature review, we highlight various variables affecting the associations between SMNSU and depression, including loneliness and social anxiety. This study used a quantitative method, was conducted in China with 244 higher education students as participants, and structural equation modeling (SEM) was used to test the relations among variables.

This article provides numerous scientific contributions. First, it contributes to the existing literature about the relationship between SMNSU and depression. Second, it offers a synthesized research framework in which we integrate supplementary viewpoints on the direct and indirect influences of SMNSU. Third, we provide robust statistical analysis along with empirical evidence highlighting the influences of SMNSU on depression in emerging nations. Finally, this study provides insights into how excessive SMNSU both creates and increases depression among students. On the basis of these findings, we offer valuable recommendations for mental health experts. Overall, this article provides a worthy understanding to practitioners, researchers, and academics.

Literature Review

Conceptual Framework. We propose a synthesized research framework wherein the SMNSU impacts on depression were explored taking into account the effects of loneliness and social anxiety. SMNSU is a negative and positive predictor

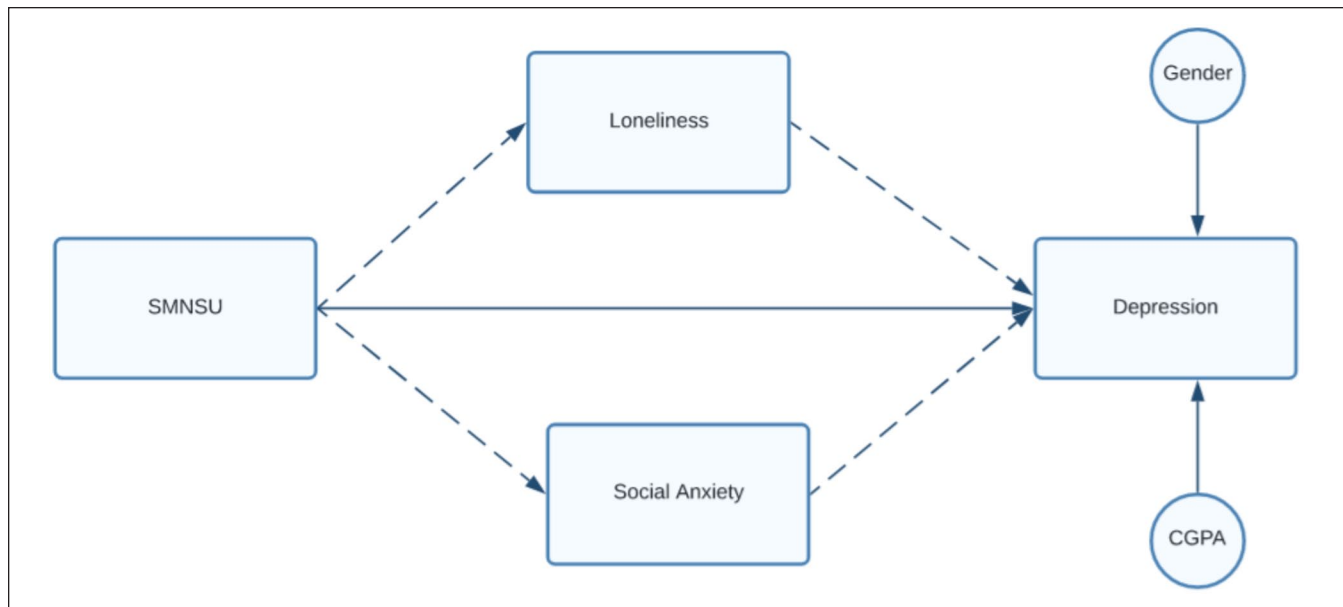


Figure 1. Conceptual framework.

of significant impact on depression (J.-L. Wang et al., 2019). Most studies have investigated the direct influence of SMNSU on depression (Elhai et al., 2018; Keles et al., 2020; Parent et al., 2019). In addition, previous studies have identified that the risk factors for SMNSU include loneliness, social anxiety, and depression (Bozoglan et al., 2013; Ko et al., 2009; Taylor et al., 2019). The present research explored loneliness and social anxiety as mediators in the relationship between SMNSU and depression and we explored these associations during the COVID-19 pandemic in China. Research such as this can help improve understanding of how SMNSU may encumber students' social and psychological development and can help in the development of guidance for improving emotional well-being. Figure 1 demonstrates the proposed research model incorporating the research hypotheses in this study.

SMNSU and Depression. Most studies have shown that SMNSU creates emotional and cognitive deficits (J.-L. Wang et al., 2019) and that social media impacts the mental health of individuals, and is associated with depression in particular (Hawi et al., 2018; Liu et al., 2018). A longitudinal study showed that SMNSU leads to severe depression and determined the bidirectional association between online Internet usage, depression, and addiction. People were found to use mobile gaming and social media as a way to cope with mental stress but the results of another study indicated that excessive online mobile gaming and social media usage leads to isolation among individuals and detachment from real-life relationships (King & Delfabbro, 2016). The whole situation may influence severe mental disorders like depression (King & Delfabbro, 2016). Therefore, we assumed that there would be a positive relationship between SMNSU and depression.

SMNSU and Loneliness. A number of studies have found that SMNSU influences loneliness in both positive and negative ways. The unpleasant experience of loneliness originates in important scarcities in an individual's social relationships (J.-L. Wang et al., 2019). The existing literature explains an association between social media, gaming addiction, and loneliness (Spilkova et al., 2017; Van Rooij et al., 2014). Another study explored how social media creates loneliness, although it remains possible that loneliness is the possible reason of social media addiction, and possibly a reciprocal relationship between these variables exists (Lemmens et al., 2009). Previous studies have shown that social media provides temporary relief through the avoidance of negative thoughts which are associated with social scarcities, but excessive use of social media is unlikely to contribute to building real-life relationships. What may result instead is deterioration in real social connections and loneliness may increase (Boursier et al., 2020). Therefore, we predicted that SMNSU and loneliness are positively associated.

SMNSU and Social Anxiety. Social anxiety is a state of discomfort and tension faced by a person during social interaction (Baltaci, 2019). Most studies have explored the potential consequences of SMNSU on social anxiety among adolescents (Erlíksson et al., 2020; Rice et al., 2020). The literature indicates that social media networking, Internet addiction, and smartphone addiction are associated with social anxiety among individuals (Elhai et al., 2018). Furthermore, the potential effects of social media networking addiction are built upon high levels of social anxiety which lead to deterioration in interpersonal relationships among the young generation (Baltaci, 2019). We, therefore, predicted a positive association between SMNSU and social anxiety.

Loneliness and Depression. The literature shows that loneliness influences depression (Erzen & Çikrikci, 2018) with a clear relationship between the two (Kabátová et al., 2016). Furthermore, studies have shown an important contribution of loneliness in worsening the experience of depression among individuals. In another study, positive associations were found between loneliness and depression and it was interpreted that changes in depression state can arise due to changes in loneliness. It has further been discussed that loneliness can be high for those with higher levels of extraversion (Liu et al., 2020; Mishra et al., 2018) conducted a longitudinal study and found that loneliness is positively associated with depression.

Social Anxiety and Depression. Many studies have shown that social anxiety and depression are associated with expressive suppression and cognitive reappraisal (Dryman & Heimberg, 2018). Social anxiety is related to depression (De-Jong et al., 2012) and (Manes et al., 2016) have shown that social anxiety is a predictor of depression. Thus, it can be suggested that social anxiety leads to depression among students. Both social anxiety and depression are associated with different attention deficit disorder components (H. Wang et al., 2020). Therefore, in this study, we assumed that social anxiety has a positive relationship with depression.

Mediating Roles of Loneliness and Social Anxiety. After an extensive review of the related literature, it was found that few studies have examined the potential roles of loneliness and social anxiety as mediators. Different types of social media networking and the extent to which these are used have different roles in the association between loneliness and depression. One study explored a wide range of social associations that can be more valuable than strategies based on successful non-adaptive social cognition in loneliness and depression among individuals (Domènech-Abella et al., 2017). Similarly, loneliness and depression create a high-level association between empty-nest and not-empty-nest rural elderly adults (Elhai et al., 2018). In another study, the mediating role of loneliness on the relationship between empty-nest syndrome and depression was explored (G. Wang et al., 2017). The direct relationships between loneliness and social anxiety with depression were also investigated. However, the mediating roles of loneliness and social anxiety in the relationship between SMNSU and depression remain untested. We assumed mediating roles for loneliness and social anxiety in the relationship between SMNSU and depression.

Research Methods

The current study was conducted in the higher education sector in an emerging country (China). Most studies to date have been conducted in the Western world, and very few studies have been conducted in the Chinese context or

focused on SMNSU, loneliness, social anxiety, and depression during the COVID-19 pandemic. Like many other sectors, higher education has been impacted by the pandemic, and as such, the authors were driven to conduct this research in an academic setting to add to the range of diverse perspectives.

Questionnaire Development

In the present study, SMNSU was the independent variable and depression was the dependent variable. Loneliness and social anxiety were explored as mediators in the relationship between SMNSU and depression. To measure these variables, we developed a 39-item questionnaire comprised three parts. The questionnaire adapted reliable and valid constructs and relevant items from previous studies. Five experts reviewed the questionnaire. They suggested contextual changes for the content validity and face validity of the items. Questionnaire items were adapted according to experts' suggestions. The first part presented information on the purpose of the study, anonymity, and privacy statements along with instructions for the respondents. Part two collected demographic information such as gender, sector, and field of study. The third part collected data on SMNSU (10 items), loneliness (12 items), social anxiety (6 items), and depression (11 items) using a 7-point Likert-type scale ranging from 1 = *strongly disagree* to 7 = *strongly agree*. Before final data collection, the reliability and validity of the questionnaire were ensured through pilot testing with 30 participants. The pilot participants had similar demographic profiles to the final sample participants and this allowed a practice run of the data analysis. In addition, the pilot participants provided feedback on the questionnaire. The items were modified in accordance with this and the revised version of the questionnaire was used for final data collection.

Social Media Networking Sites Usage. The items relating to SMNSU were adapted from the work of (Baltaci, 2019) and (Leong et al., 2019). This part comprises 10 items. Example items include "I always find that I visit sites online longer than I intended" and "I often feel fear that life without the Internet would be boring, empty, and joyless." Cronbach's alpha was .894 (Table 2) confirming that the scale is reliable.

Loneliness. The items relating to loneliness were adapted from the works of Boursier et al. (2020) and Domènech-Abella et al. (2017). This part comprises 12 items. Example items include "I am unhappy doing so many things alone" and "I am no longer close to anyone." Cronbach's alpha was .967 (Table 2) confirming that the scale is reliable.

Social Anxiety. The items relating to social anxiety were adapted from the work of Manes et al. (2016) and J.-L. Wang et al. (2019). This part comprises six items. Example items include "I worry about what others say about me" and "I felt

that everything I did was an effort.” Cronbach’s alpha was .934 (Table 2) confirming that the scale is reliable.

Depression. The items relating to depression were adapted from the works of Elhai et al. (2018); J.-L. Wang et al. (2019). This part comprises 11 items. Example items include “I thought my life had been a failure” and “I worry about being teased.” Cronbach’s alpha was .945 (Table 2) confirming that the scale is reliable.

Data Collection

The sample comprised students enrolled in blended learning courses at the universities of Hunan province, China. The stratified random sampling technique was used to collect the data ensuring equal representation and accuracy of the subgroups. A cover letter was provided to participants containing information about the privacy and confidentiality of responses and the assurance that collected data would be used for educational research purposes only. The researchers approached students via an online questionnaire and requested that they complete the questionnaires. We circulated 400 questionnaires via email to students studying social sciences, business sciences, natural sciences, and medical sciences, and 244 useable questionnaires were returned, creating a response rate of 61%. We started data analysis after the recruitment and sampling were completed.

Data Analysis

We used robust analysis approaches to ensure the validity, reliability, and credibility of the findings using two statistically efficient software packages (SPSS and SmartPLS 3.3.3). The descriptive analyses were conducted in SPSS and SmartPLS 3.3.3 was used for measurement modeling and structural modeling analyses (Henseler et al., 2014).

First, we conducted descriptive statistical analyses on the participant demographics. Second, measurement modeling analysis was performed by calculating factor loading, Cronbach’s alpha, ρ_A , composite reliability, convergent reliability, and discriminant validity. We also solved collinearity problems and improved model fit, and present the details related to model explanatory power. Third, we performed descriptive analyses on the scales used in the research model to measure mean scores and standard deviations. Finally, we conducted SEM to measure the direct and indirect relationships among the constructs in the research model.

Results

Participant Characteristics

All universities approached for data collection have fixed numbers for new admissions for their undergraduate programs. Since all the students had about the same probability

Table 1. Participant Characteristics.

Variable	Category	Frequency (f)	Percentage
Gender	Male	131	53.6
	Female	113	46.4
	Total	244	100
Field of study	Social sciences	98	40.3
	Business science	55	22.6
	Natural sciences	48	19.5
	Medical sciences	43	17.6
	Total	244	100
Cumulative grade point average	Less than 2.00	5	2.2
	2.1–3.00	134	54.8
	3.1–4.00	105	43.0
	Total	244	100

of selection, thus it is highly likely that the respondents were from all semesters. In such a setting, the intergroup variability is likely to be very small. Descriptive analyses showed that the majority of the respondents were male and belonged to the social sciences. The majority of students had a cumulative grade point average between 2.1 and 3. Further details are shown in Table 1.

Measurement Model

SmartPLS 3.3.3 was used for SEM to assess the association between the variables used in the conceptual research framework (Iqbal et al., 2021; Iqbal et al., 2022). SmartPLS 3.3.3 is considered statistically more efficient and comparatively less sensitive to sample size than other statistical software utilized for covariance-based SEM analysis such as AMOS (Asghar, Barberà, et al., 2021; Hair et al., 2019; Malik & Asghar, 2020). The present research explored the associations between SMNSU and depression with social anxiety and loneliness as mediator variables. Thus, before measuring the direct and indirect relationships, we ensured the reliability and validity of the scales utilized in the research framework as shown in Table 2.

For reliability, the factor loading indicator explains that each item index is above the threshold of 0.60 (Hair et al., 2019; Henseler et al., 2015). With factor loading, some reliability approaches such as Cronbach’s alpha, composite reliability, and ρ_A were also applied. The recommended threshold value for all these approaches is 0.70 (Asghar et al., 2022; Iqbal et al., 2021; Malik et al., 2021). Table 2 shows that Cronbach’s alpha, ρ_A , and composite reliability are higher than the threshold value. Thus, it was concluded that the questionnaire had fulfilled these requirements. Similarly, the convergent validity was assessed based on the average variance extracted (AVE) approach. The threshold value of AVE is 0.50 (Hair et al., 2019; Henseler et al., 2015; Zhou et al., 2021). Table 2 indicates that the AVE value for all the subscales is more than 0.50, which means the scales were valid.

Table 2. Analysis of Reliability and Convergent Validity.

Scales	Factor loading	Cronbach's alpha	rho_A	Composite reliability	Average variance extracted
Social media networking sites usage (SMNSU)		.894	0.913	0.913	0.514
SMNSU1	0.863				
SMNSU2	0.674				
SMNSU3	0.616				
SMNSU4	0.699				
SMNSU5	0.820				
SMNSU6	0.632				
SMNSU7	0.628				
SMNSU8	0.652				
SMNSU9	0.770				
SMNSU10	0.769				
Loneliness (L)		.967	0.967	0.971	0.733
L1	0.862				
L2	0.877				
L3	0.826				
L4	0.780				
L5	0.864				
L6	0.756				
L7	0.860				
L8	0.898				
L9	0.880				
L10	0.876				
L11	0.871				
L12	0.912				
Social anxiety (SA)		.934	0.934	0.948	0.754
SA1	0.878				
SA2	0.901				
SA3	0.874				
SA4	0.849				
SA5	0.887				
SA6	0.817				
Depression (D)		.945	0.949	0.952	0.647
D1	0.702				
D2	0.816				
D3	0.819				
D4	0.908				
D5	0.878				
D6	0.657				
D7	0.825				
D8	0.823				
D9	0.824				
D10	0.774				
D11	0.791				

Fornell and Larcker's approach was criticized by Henseler et al. (2015). They claimed that this approach is not appropriate when measuring the discriminant validity of the reflective scales and proposed the alternative heterotrait–monotrait (HTMT) approach in partial least squares SEM (Henseler et al., 2015) as being more appropriate. Therefore, we applied the HTMT approach to measure the discriminant validity of the reflective scales by measuring the inter-item correlation

between constructs along with the correlation of the items of the same construct (Asghar, Arif, et al., 2021; Iqbal et al., 2021). Henseler et al. (2015) and Malik et al. (2021) proposed a threshold value lower than 0.90 for HTMT. A value above 0.90 shows poor discriminant validity of the construct. Table 3 shows that the HTMT value of each construct is less than 0.90; thus, the discriminant validity of the reflective scale was appropriate.

Collinearity problems were tested through the variance inflation factor (VIF) in SEM (Huang, 2021). The VIF threshold value is less than 5 and Table 4 indicates that the VIF range value is between 1.000 and 1.763 in the current study, showing that the dimensions have no collinearity problems. For model fit, three main indicators were used for assessing model appropriateness: standardized root mean square residual (SRMR), normed fit index (NFI), and RMS_theta (Henseler et al., 2015). These have ideal threshold values as less than 0.08, above 0.90, and less than 0.12, respectively (Bentler & Bonett, 1980; Henseler et al., 2014). In Table 4, the results indicate that SRMR, NFI, and RMS_theta indexes are 0.084, 0.899, and 0.14, respectively. We observed in the other indicators that the model was reasonably well fitted overall $NFI > 0.8$ and $SRMR < .05$ (Tasdemir et al., 2020). Table 4 presents further details regarding the collinearity and model fit analyses.

The structural model's explanatory power was measured based on the R^2 value that ranges from 0 to 1. Threshold values of the model's explanatory power are 0.75, 0.50, and 0.25, which are considered substantial, moderated, and weak, respectively. Table 5 indicates that the depression dimension has strong while loneliness and social anxiety have moderated explanatory power. Thus, the model explained the latent variables well and has the appropriate level of explanatory power.

Descriptive Statistics

Table 6 presents the descriptive statistics (minimum, maximum, and mean score) for each scale, along with the standard deviation.

Structural Model

SmartPLS-SEM 3.3.3 was used to assess the associations between the variables in the conceptual research framework,

Table 3. Discriminant Validity.

Scales	Depression	Loneliness	SMNSU	Social anxiety
Depression	0.804			
Loneliness	0.833	0.856		
SMNSU	0.615	0.565	0.717	
Social anxiety	0.653	0.624	0.478	0.868

Note. SMNSU = social media networking sites usage.

Table 4. Collinearity and Saturated Model Estimated Model Fit.

Constructs	VIF—anxiety	VIF—depression	VIF—loneliness	Model fit
Social anxiety		1.703		SRMR
Loneliness		1.930		NFI
SMNSU	1.000	1.527	1.000	RMS_Theta

Note. SMNSU = social media networking sites usage; VIF = variance inflation factor; SRMR = standardized root mean square residual; NFI = normed fit index.

facilitating the synchronized evaluation of the measurement model. The validity and reliability of the scales were also tested through this technique (Asghar, Iqbal, et al., 2021; Iqbal, Asghar, & Asghar, 2022).

In the structural model, we analyzed the hypothesized associations between the model variables (Henseler et al., 2015; Tasdemir et al., 2020). Table 7 shows the direct associations between the five constructs. SMNSU had a positive, significant and direct relationship with depression ($\beta = 0.176, p < .05$), confirming H1. Similarly, SMNSU had a positive, significant, and direct relationship with loneliness ($\beta = 0.565, p < .05$), which supported H2. SMNSU had a positive, significant, and direct relationship with social anxiety ($\beta = 0.478, p < .05$), which confirmed H3. Likewise, loneliness had a positive, significant, and direct relationship with depression ($\beta = 0.618, p < .05$), confirming H4. Finally, social anxiety had a positive, significant, and direct association with depression ($\beta = 0.188, p < .05$), which confirmed H5. We also measured two control variables such as Gender and CGPA (cumulative grade point average), of them, no one has a significant influence on depression ($\beta = -0.009, p > .05$; $\beta = 0.036, p > .05$). Table 8 and Figure 2 explain these direct relationships.

Mediating Effect

We tested the intervening effects of loneliness and social anxiety on the relationship between SMNSU and depression. Table 8 indicates that loneliness played an intervening role in strengthening this relationship ($\beta = 0.349, p < .05$), confirming H6.1. Similarly, social anxiety played an intervening role in strengthening this relationship ($\beta = 0.090, p < .05$), confirming H6.2.

SMNSU and depression had a significant, positive, direct, and indirect relationship, demonstrated through the significant partially mediated effects between SMNSU and depression through loneliness and social anxiety. Table 8 and Figure 2 present the coefficients and other statistical outcomes.

Discussion

The present study concentrated on the relationships between SMNSU, loneliness, social anxiety, and depression. The outcomes indicate the valuable relationships between variables based on the research framework. Currently, the majority of studies of this nature have been conducted in

advanced countries (Boursier et al., 2020; Lisitsa et al., 2020; Rice et al., 2020), and before the COVID-19 pandemic. Only limited research has been conducted in emerging countries like China. As per the authors' best information, this is the first study to measure the associations between SMNSU, loneliness, social anxiety, and depression in the current COVID-19 pandemic condition in the Chinese context, and the first to consider loneliness and social anxiety as mediating variables.

First, we found that SMNSU direct positively and significantly influenced depression, which confirmed H1. These results are consistent with previous studies showing that social media networking sites are associated with depression (Keles et al., 2020; Parent et al., 2019). Similarly, (Seabrook et al., 2016) conducted a systematic review based on multi-databases and found a positive interaction between social media usage and depression. It seems possible that

excessive use of SMNSU may lead to depression in the COVID-19 pandemic among students. In addition, the COVID-19 pandemic may independently lead to depression among students.

Second, we found that SMNSU direct positively and significantly influenced loneliness, confirming H2. These results were consistent with previous research findings showing that SMNSU is linked with loneliness (Savci & Aysan, 2016). Correspondingly, (Marttila et al., 2021) found that increased SMNSU predicts loneliness in Finland. Recently, a study reported that excessive SMNSU by young adults during the COVID-19 pandemic created loneliness (Lee et al., 2020). It seems possible that excessive use of social media networking sites may become a major predictor of loneliness among students during the COVID-19 pandemic.

Third, we assessed the positive relationship between SMNSU and social anxiety. We found that SMNSU was positive and significantly associated with social anxiety, confirming H3. These results were consistent with prior studies showing that SMNSU positively enhances social anxiety (Erlksson et al., 2020). Similarly, Baltaci (2019) also identified a positive association between social media excessive use and social anxiety among students in Turkey. Therefore, it could be concluded that excessive use of social media

Table 5. R Square Values.

Construct	R ²	R ² -adjusted
Depression	.746	.741
Loneliness	.319	.297
Social anxiety	.226	.247

Table 6. Descriptive Statistics.

Measure	N	Minimum	Maximum	M	SD
Social media networking sites usage	244	1.00	7.00	5.121	1.160
Loneliness	244	1.00	7.00	5.322	1.052
Social anxiety	244	1.00	7.00	5.033	1.371
Depression	244	1.00	7.00	5.203	1.211

Table 7. Direct Relationships Between Variables.

Direct relationship	Coefficients	M	SD	T value	p value	Result
SMNSU -> depression	.176	0.176	0.056	3.126	.002	Sig.
SMNSU -> loneliness	.565	0.567	0.052	10.934	.000	Sig.
SMNSU ->social anxiety	.478	0.479	0.062	7.679	.000	Sig.
Loneliness -> depression	.618	0.621	0.053	11.766	.000	Sig.
Social anxiety -> depression	.188	0.186	0.058	3.244	.001	Sig.
Gender -> depression	-.009	-0.009	0.038	0.238	.812	Insig.
CGPA -> depression	.036	0.036	0.035	1.030	.303	Insig.

Note. SMNSU= social media networking sites usage.

Table 8. Indirect relationships between variables.

Indirect relationship	Coefficients	M	SD	T value	p value	Result
SMNSU -> loneliness -> depression	.349	0.352	0.046	7.631	.000	Sig.
SMNSU -> social anxiety -> depression	.090	0.089	0.030	3.018	.003	Sig.

Note. SMNSU= social media networking sites usage.

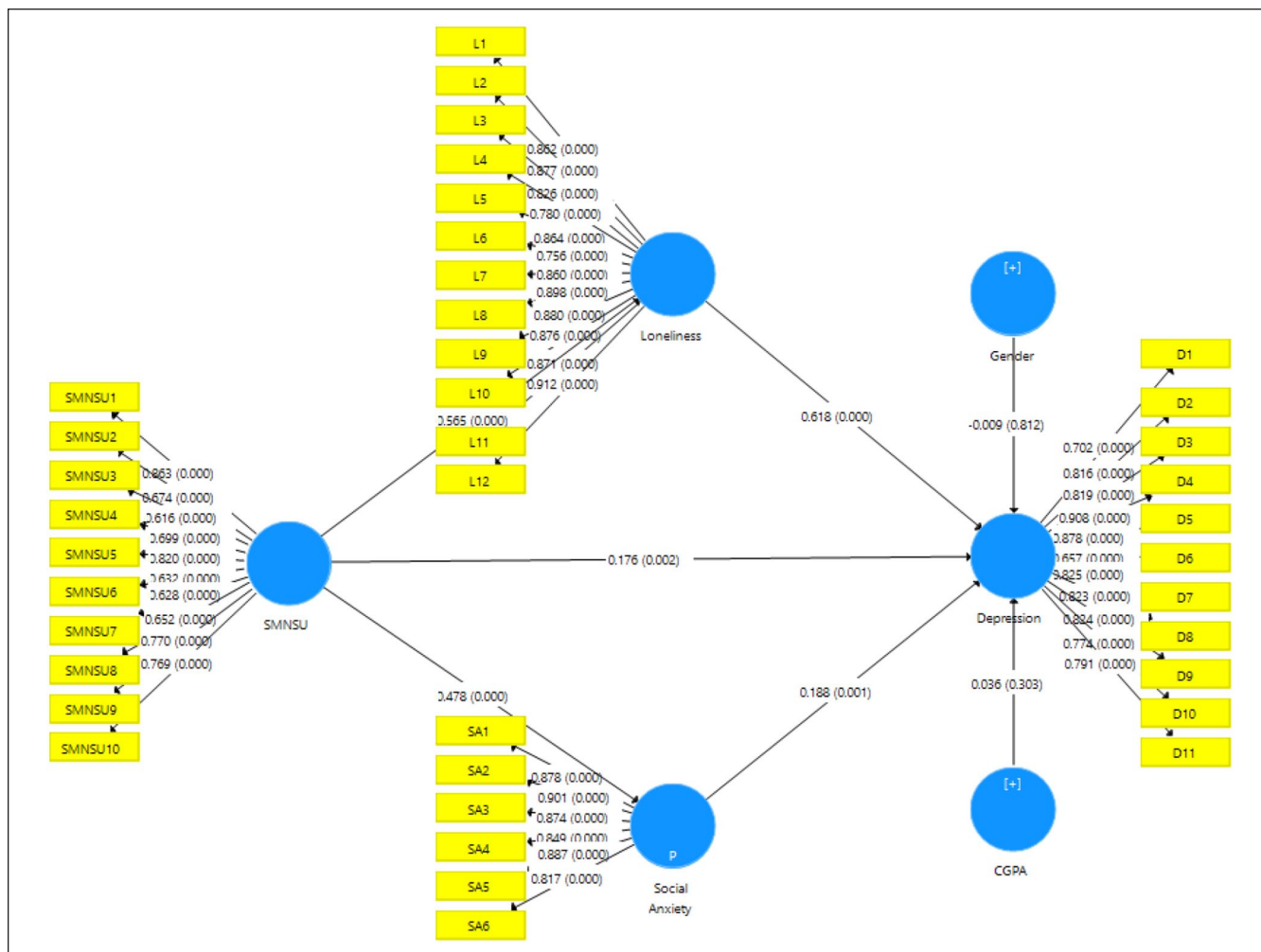


Figure 2. Structural relations between variables used in research model.

might have influenced social anxiety particularly during the COVID-19 pandemic among students.

Fourth, we measured the positive and direct relationship between loneliness and depression. Loneliness had a significant and positive association with depression, which supported H4. The results were also aligned with previous findings that loneliness has significant positive associations with depression (Ge et al., 2017). Liu et al. (2020) conducted a longitudinal study and found that loneliness is associated with depressive symptoms for both males and females. Therefore, we conclude that loneliness might positively influence depression among students during the COVID-19 pandemic due to social overuse of social media which leads to increased loneliness and depression.

Fifth, we examined a positive relationship between social anxiety and depression directly. Social anxiety had a significant and positive relationship with depression, confirming H5. These are in alignment with prior study findings that social anxiety has a positive association with depression (De-Jong et al., 2012). Similarly, Manes et al. (2016) concluded that

social anxiety is a predictor of depression. The plausible reason to create depression among students is that can be virus contains standards operating procedures (SOPs).

Sixth, we explored a positively mediating role of loneliness in the association between SMNSU and depression. The results indicated that loneliness had an intervening role in the relationship between SMNSU and depression, confirming H6.1 and consistent with previous research suggesting that loneliness and SMNSU are positive predictors of depression (Al-Dwaikat et al., 2020). Jiang (2021) suggested that factors such as problematic social media use, anxiety, personality characteristics, and relationships can also lead to depression. Social anxiety also had an intervening role in the relationship between SMNSU and depression, confirming H6.2 and consistent with prior studies showing that loneliness and depression, along with SMNSU, increase depression (Misirlis et al., 2020). Similarly, First et al. (2021) and Lin et al. (2020) have described how social media usage can lead to depressive symptoms among university students during the COVID-19 pandemic and discussed the impact of contributing factors

such as misunderstanding, less exposure to the COVID-19 pandemic, and fear of COVID-19. Therefore, factors in addition to SMNSU and loneliness likely contribute to depression among students during the COVID-19 pandemic.

Conclusion

Our synthesized research framework was developed based on the prior literature to test the hypothesized relationships among the key variables. The results confirmed the direct, positive, significant relationships between SMNSU and depression during an unprecedented situation (i.e., the COVID-19 pandemic) in China. Similarly, the results indicated that loneliness and social anxiety also have direct, positive, significant relationships with depression. The findings also indicated that loneliness and social anxiety both mediate the relationship between SMNSU and depression.

The conclusions were drawn based on the findings and discussion of the present study. The results are particularly sensitive given the study was conducted in an unprecedented situation COVID-19 pandemic in China. Nonetheless, they can be summarized and interpreted as follows: First, excessive SMNSU is a predictor of depression. Second, increased SMNSU can become a reason of loneliness. Third, SMNSU can lead to social anxiety among the students during this pandemic. Fourth, loneliness has a positive influence on depression. Fifth, social anxiety also has a positive influence on depression. Sixth, loneliness has an intervening role in the relationship between SMNSU and depression. Finally, we also concluded that loneliness has an intervening role in the relationship between SMNSU and depression among students during the COVID-19 pandemic in China.

Implications

The unprecedented disease known as COVID-19 has created a health crisis worldwide and prompted people to live in stressful situations. The risk containment SOPs have deeply impacted individuals' daily habits and feelings, including evasive SMNSU which further led to loneliness, social anxiety, and depression. In this study, we found that SMNSU created loneliness, social anxiety, and depression among students. Based on this, we now suggest valuable implications for various stakeholders in this sector, including teachers, psychologists, and university managers.

First, teachers should guide students on how to avoid excessive SMNSU and discuss directly with them their emotional states such as loneliness, social anxiety, and depression. If necessary, students should be referred for psychological treatment to overcome issues such as loneliness, social anxiety, and depression. Counselors should help the students by providing proper care and rehabilitation plans and such services must be provided to those students requiring help. In the COVID-19 pandemic, most academic activities have shifted from face-to-face to online delivery. It is the primary responsibility of teachers to guide students in controlling SMNSU and

provide them with guidelines for constructive SMNSU, so that, they can avoid loneliness, social anxiety, and depression.

Limitations and Future Research Directions

The current study has a few limitations. For example, it focused on blended higher education in China only. Future studies could be conducted in broader and more generalizable contexts to enable academicians to understand the described phenomena better. Relatedly, we collected the data from blended learning undergraduate students only; postgraduate students were not included but this could be addressed in future studies. We adopted the participant self-report method to measure the negative influences of SMNSU along with loneliness and social anxiety on depression, wherein participants revealed that SMNSU, loneliness, and social anxiety enhanced their depression during the COVID-19 pandemic. Importantly, these effects might have occurred due to other factors such as COVID-19 SOPs implementations, fear of the virus, personality characteristics, or virtual relationships. Therefore, it is highly recommended that future research should collect data through multiple methods to reveal the associations among variables more clearly and also explore COVID-19 SOP implementations, fear of the virus, personality characteristics, and virtual relationships as factors. Data were collected after the lockdown ended but Ohannessian et al. (2021) argue that during the COVID-19 pandemic lockdown, events may have influenced people to feel anxious, lonely, and depressed, resulting in their increased usage of social media networking sites to obtain human contact to try and make themselves feel better, and this also requires exploration. This study has also limitation related to the collection of SMNSU data broadly rather than collecting data from participants about their use of specific social media platform such as Facebook, WhatsApp, and Instagram. We have also conducted mediation with cross-sectional data and there is no basis for causality, which mediation assumes.

Future studies may usefully explore the effects of anxiety, loneliness, and depression on excessive usage of social media networking sites. While the present study used a cross-sectional design, future studies may adopt a time-lag design to explore this phenomenon and hence obtain further interesting results.

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Author Contributions

All authors contributed equally to this study.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical Approval

Data were collected using a questionnaire survey. Participants were informed that they do not need to be identified and signed an informed consent letter before completing the questionnaire. This study was approved by the ethics committee of Hunan University.

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