J Biochem Technol (2022) 13(1): 34-40
https://doi.org/10.51847/zN5yXIP0nK
ISSN: 0974-2328

Nomophobia and Stress among Vietnamese High School Students in Covid-19 Pandemic: A Mediation Model of Loneliness

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Received: 28 October 2021 / Received in revised form: 28 January 2022, Accepted: 03 February 2022, Published online: 02 March 2022

Abstract

Nomophobia is rising among high school students, especially in light of the Covid-19 pandemic, such as social distancing, long-term online learning, and lack of social support. Many studies have also shown that students with high levels of nomophobia have a higher risk of stress. However, very few researchers are interested in studying loneliness as a mediation factor for the relationship between nomophobia and stress. This study investigated whether the loneliness factor is a mediator in the relationship between nomophobia and stress in Vietnamese high school students. Participants include 556 Vietnamese high school students. Participants completed the Nomophobia Scale, Depression Anxiety Stress Scales 21, The UCLA loneliness scale version 3. In this research, to test variable relationships, the mediation analyzing method by the PROCESS macro 3.5 will be applied. The research concludes that for Vietnam high school students, the mediating role of loneliness was identified in the relationship between nomophobia and stress. It is a suggestion through this research that nomophobia preventive and mitigating measures should reduce loneliness in students.

Keywords: High school students, Loneliness, Nomophobia, Stress

Introduction

In 2019, the emergence of the global pandemic Covid-19 had significant impacts on people's health, economy, and lifestyles. In particular, social distancing is applied in many countries as an urgent measure to prevent the spread of the virus, which has changed people's daily habits and relationships. The stressful situation of Covid-19 also causes pressure and fear for people (Lu *et al*., 2020; Davico *et al*., 2021). Such adjustments in living and interacting with life lead to depression, isolation, anxiety, and frustration. Many people face psychological disorders and addictions (Augner & Hacker, 2012; Wang *et al*., 2020). Recent studies have confirmed the negative impact of the COVID-19 pandemic, especially on stress, anxiety, and depression (Cao *et al*., 2020; Rajkumar, 2020). According to recent reports, it has been found that curfews and social distancing have an impact on mental health decline (Wang *et al*., 2020). Stress negatively affects function; prolonged exposure to stress causes physical and mental health problems, affects everyday behavior, and reduces the quality of life (Taylor & Dorn, 2006). In addition to the stress-related mental health effects of the COVID-19 pandemic, in-person educational disruptions and mandatory social distancing have increased students' perception of stress. Computers and smartphones have dramatically changed the learning and teaching environment.

In recent times, while phone usage has increased thanks to advances in technology, it is believed that amid the Covid-19 pandemic, time spent on mobile phones has increased due to social isolation, and this is substituted for face-to-face interactions. Some scholars have emphasized that smartphone use can lead to solid psychological attachment, leading to addiction (Lee *et al*., 2015). Nomophobia is considered a manifestation of excessive phone use (King *et al*., 2013), seen as equivalent to smartphone addiction (Bragazzi & Del Puente, 2014). According to existing studies, smartphone applications such as social networks, mobile games, and entertainment will induce nomophobia (Jeong *et al*., 2016). According to (King *et al*., 2013), nomophobia is a specific form of phobia defined as a feeling of discomfort or anxiety caused by the absence of a phone, personal computer, or any other communication device virtual. The results of nomophobia can cause problems with concentration, insomnia, decreased performance, and stress (Augner & Hacker, 2012). is considered a way to deal with stress. Recent research has shown a significant positive relationship between increased stress levels and nomophobia (Bano *et al*., 2021; Farchakh *et al*., 2021).

In the study on the relationship between nomophobia and depression, anxiety, and stress by cross-sectional study method, Bano *et al*. (2021) reported higher anxiety and stress scores in students with severe nomadism. Farchakh *et al*. (2021) also showed a positive correlation between nomophobia and anxiety, depression, stress, insomnia, and impulsivity. The tendency to become addicted to smartphones increases with stress and anxiety. A study of medical students found smartphones addiction tends to

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increase with stress and anxiety. The survey concluded that the internet addiction score was directly proportional to the anxiety score (Yücens & Üzer, 2018). Those who scored high for gaming addiction, compulsive internet use, and social media use also reported high scores for depression, loneliness, avoidance, poor sleep quality, and depression-related anxiety (Fernandes *et al*., 2020). In the report of Thomée *et al*. (2011) and Kalaskar (2015), the conclusions are also highlighted that people who use their smartphones regularly (from 5-6 hours a day) are more prone to problems such as stress, anxiety, decreased learning efficiency and sleep disorders.

In recent years, studies have investigated the relationship between agoraphobia and loneliness, stress, anxiety, depression, and other mental health problems (Augner & Hacker, 2012; Bano *et al*., 2021; Farchakh *et al*., 2021; Li *et al*., 2021). However, research on loneliness factors of high school students in the relationship between nomophobia and stress has not been carried out. On the other hand, during the prolonged Covid-19 pandemic, Vietnam reports more than 12,000 infections per day as of August 28, 2021 (Ministry of Health, 2021). In that context, the Vietnamese government has implemented social distancing orders in some localities; students switch to online learning; do not gather in large numbers, do not participate in recreational activities in the community. Because individuals do not lack face-to-face interaction with friends and do not engage in recreational activities, the fear of contracting Covid-19 can make people feel lonely, frustrated, bored, which increases the risk of mental disorders, especially problematic smartphone use. This study will contribute more information/research results by testing a theoretical model that considers loneliness a mediator of the association between nomophobia and stress.

The Mediating Effect of Loneliness on Nomophobia and Stress

Nomophobia and Loneliness

Loneliness is a negative emotional state that arises when a perceived difference between desired and actual social relationships (Farchakh *et al*., 2021). Loneliness is a feeling of exclusion, disconnection from others, and unhappiness with relationships (Snape & Manclossi, 2018). Previous studies have shown that there is a positive correlation between nomophobia and loneliness, with higher levels of loneliness increasing the risk of developing nomophobia (Li *et al*., 2021). Ozdemir *et al*. (2018) research on university students has also shown a positive correlation between nomophobia and self-esteem and loneliness, whereas subjective happiness and nomophobia are negatively correlated. Kara *et al*. (2021) reported that adolescents who use smartphones for long periods of the day are at increased risk of developing nomophobia, in which loneliness plays a solid mediating role. Besides, the daily use of smartphones increases, adolescents feel more lonely and anxious, thus increasing nomophobia. In addition, Sum *et al*. (2008) asserted that there is an association between loneliness and high levels of Internet use for social interaction. During a pandemic, loneliness is positively correlated with anxiety in both direct and indirect ways. Feelings of loneliness and isolation were predictive of increased social media use and stress levels. Loneliness can influence one's decision to use the Internet for entertainment, exacerbating cell phone addiction (Brand *et al*., 2019). People who feel lonely often use smartphones as a tool to combat loneliness (Jiang *et al*., 2018). As individuals spend more time at home during the COVID-19 pandemic, smartphone usage increases to pass the time and neglect other things in an individual's life, an essential component of addiction (Elhai *et al*., 2017). As a result, both loneliness and fear of Covide-19 can increase smartphone use, leading to problematic and possibly addictive smartphone use.

Loneliness and Stress

Long-term or severe loneliness can cause several emotional disturbances and impair mental health (Spitzer *et al*., 2019). Adolescence is particularly vulnerable to experiencing feelings of loneliness, which is an essential factor in adolescent health and quality of life (Danneel *et al*., 2019). Many studies indicate that stress is causally related to loneliness (Campagne, 2019). This mechanism is active not only in the elderly but across many age groups (Drake *et al*., 2016). It has been found to have multiple sources, some related to aging, but all related to loss of appropriate capacity. Feeling lonely is a risk factor for anxiety and chronic stress (McHugh & Lawlor, 2013) and high involvement in maladaptive behaviors (Loades *et al*., 2020). Glaser *et al*. (1985) in the publication of research on stress, loneliness, and herpesviruses, found that people with high levels of loneliness had higher stress levels in the student group. Which significantly affected their immune systems, which provided evidence of a causal relationship between stress, loneliness, and health. Recent studies have also found a strong, positive association between stress and loneliness (Jaremka *et al*., 2014), thus also a causal pathway through the abnormal activity of the HPA axis such as a significant component of the endocrine system (Hawkley *et al*., 2012). Social isolation and loneliness increased the risk of depression and anxiety when measuring loneliness from 0.25 years to 9 years later. Duration of loneliness was significantly more positively correlated with mental health symptoms than loneliness intensity (Loades *et al*., 2020).

Nomophobia can lead to the development of stress through many different mechanisms as shown in the analysis above. Therefore, based on the above discussion, we form Hypothesis 1:

H1. Nomophobia will indirectly affect stress through loneliness (Nomophobia will positively impact loneliness and loneliness positively affects stress).

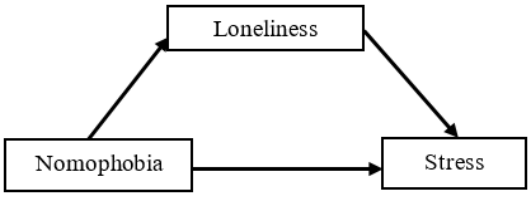

Figure 1. Hypothetical model

Materials and Methods

Participants

The study used a stratified random sampling method to survey 602 students using smartphones from two high schools in Huong Thuy town, Thua Thien Hue province. Applying Sloven's formula, the study's sample size will be more than 352 when the error rate is 5% and the total number of students in the two schools for the 2020-2021 school year is 2916. Our study had informed consent of the high school principals, and all participants consented to participate in the study. Before answering the questionnaire, we have committed to keeping the personal information provided by students confidential. In the end, there were 556 valid votes with a rate of 92.35%, exceeding the 30% response rate that most researchers require for analysis [20]. In the sample, the age group ranges from 16 to 18 (Mean = 16.99, SD = 0.840); 40.3% male students, 59.7% female students **(Table 1)**.

Table 1. An overview of survey participants

		n	%
Gender	Male	224	40.3
	Female	332	59.7
Grade	10th grade	203	36.5
	11th grade	182	32.7
	12th grade	171	30.8
Age	16	199	35.8
	17	164	29.5
	18	193	34.7
Family structure	Two-parent family	512	92.1
	Divorced or separated parents	16	2.9
	Deceased father/mother	21	3.8
	Another situation	7	1.3
Live with	Birth mother	519	93.3
	Stepmother	6	1.1
	Foster mother	1	0.2
	Other cases	30	5.4
Live with	Birth Father	531	95.5
	Stepfather	3	0.5
	Foster father	1	0.2
	Other cases	21	3.8
Academic performance (Grade point average, GPA)	Poor	5	0.9
	Below average	167	30.0
	Average	265	47.7
	Good	99	17.8
	Excellent	20	3.6

Note: n: Number of participants; %: Percentage

Instruments

Nomophobia Scale (NMP-Q): In this study, the Nomophobia Questionnaire (NMP-Q) of Yildirim (2014), including 20 items, is designed in the form of a 7-point Likert scale, from 1 = "Strongly disagree" to 7 = "Strongly agree." The scale consists of 4 factors: factor 1: Unable to communicate - feeling of losing immediate contact with people and not being able to use services that allow instant communication; factor 2: Disconnected - feeling disconnected and disconnected online (especially on social media); Factor 3: Information inaccessibility - upset at losing the ability to access information via smartphones, unable to retrieve and search information on smartphones; Factor 4: Inconvenience, feeling no longer as convenient as having a phone. The total score was calculated by summing the responses for each question, ranging from 20 to 140, with higher scores corresponding to a more severe fear of lack of phones. The score from the NMP-Q questionnaire is interpreted as follows: the NMP-Q score of 20 indicates that there is no fear of missing a phone; NMP-Q scores greater than 20 and less than 60 correspond to a slight fear of lack of phones; NMP-Q scores greater than or equal to 60 and less than 100 correspond to the average fear of missing phones, and NMP-Q score greater than or equal to 100 corresponds to a severe fear of lack of phones (Yildirim & Correia, 2015). Reliability test results show that the reliability of the scale in our study is quite high with $\alpha = 0.898$, with the component sentences all satisfying the condition with weight greater than 0.3, the results KMO index results meet the standard, Barlett test with $p < 0.05$ and extracted variance > 50%. This result proves that the scale has high reliability, meeting research requirements. CFA confirms the 4-factor structure derived from EFA because all the regression weights show positive, highly significant (above 0.4) relevant indices: Chi-Square = 543,365, CMIN/ DF =3.354, $P < 0.001$, CFI = 0.911, GFI = 0.914 and RMSEA = 0.065 (≤ 0.08) Based on revised indices, several covariance paths between entries 2 and 4, entries 3 and 7 was added, which improved the model fit.

Depression Anxiety Stress Scales 21 (DASS 21): DASS 21 will be shorter than DASS which includes 42 items. To evaluate stress status, the stress component (7 questions) of the 21-item Depression, Anxiety and Stress Scale (DASS-21) was used. To get the final score, it is necessary to double the score on the stress sub-scale. Scores were divided into increased stress (with scores greater than 14) and everyday stress (with scores between 0 and 14). Increased stress was also classified into highly extreme stress (with scores greater than 33), mild (with scores between 15 and 18), severe (with scores between 26 and 33), and moderate (with scores between 19 and 25). In Vietnam, Dass 21 scale shows good reliability (Tran *et al*., 2013). In this study, the scale achieved a good level of reliability ($\alpha = 0.761$).

The UCLA loneliness scale version 3 (UCLA III): The UCLA III Scale (Russell, 1996) was used to evaluate the loneliness of Vietnamese high school students who have nomophobia. There are 20 items in the UCLA III scale to measure the subjective feelings of survey participants about isolation and loneliness. The UCLA III scale includes 11 sentences in the negative direction (lonely) and nine in the positive order (not lonely). For each question, participants will rate from 1 to 4 on a Likert scale with 1 corresponding to "never" and 4 corresponding to "often". The total score for loneliness will be from 1-80 where higher scores mean higher levels of loneliness. In Vietnam, the internal reliability of the UCLA III Scale was reported to be equal to 0.85 by Ho (2021). In this study, it achieved ($\alpha = 0.792$) which means good internal reliability.

Data Analysis

SPSS 25.0 was used in this study to perform descriptive statistics and correlation analysis between Pearson's variables. The mediating role of loneliness in the relationship between nomophobia and stress will be examined by the Process macro for SPSS (Model 1).

Results and Discussion

Rates of Nomophobia in High School Students

Research results show that most high school students participating in the survey experience nomophobia to varying degrees, accounting for 99.3%. Specifically, 23.6% of students have severe nomophobia, 63.5% of students have moderate nomophobia, 12.2% have mild nomophobia, and only 0.7% have no nomophobia **(Table 2)**.

Table 2. Degree of nomophobia in high school students

Degree of nomophobia	n	%
Absence of nomophobia (0-20 score)	4	0.7
Mild level of nomophobia (21 - 59 score)	68	12.2
Moderate level of nomophobia (60 - 99 score)	353	63.5
Severe nomophobia (100 – 140 score)	131	23.6
Total	556	100.0

Correlations among Study Variables

The result shows that nomophobia has positive correlation with stress (r = 0.196, p <0.01) and loneliness (r = 0.097, p <0.05) **(Table 3)**. Loneliness was proved to be positively correlated with stress (r = 0.460, p<0.01)

Table 3. Pearson correlations, mean, and standard deviations among study variables

	M	SD	Stress	Nomophobia	Loneliness
Stress	16.93	8.709	__		
Nomophobia	82.70	21.175	0.196**	__	
Loneliness	44.78	8.212	0.460**	0.097*	__

Note: **. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Mediation Analyses

We hypothesized that loneliness has a mediating role in the relationship between nomophobia and stress level in hypothesis 1. As shown in **Table 4** and **Figure 2**, the direct paths from nomophobia to loneliness (β = 0.0628, SE = 0.0154, 95% CI [0.0326, 0.0930] were significant. The mediator's paths from loneliness to stress (β = 0.4716, SE =0.0397, 95% CI [0.5496, 0.2366] were significant. The direct path from nomophobia to stress were (β = 0.0628, SE=0.0154, 95% CI= [0.0326, 0.0930]). From **Table 4**, it is implied that the unstandardized regression coefficients of the indirect effect were significant (β = 0.0178, SE=0.0081, 95% CI= [0.0021, 0.0337]. Therefore, loneliness partially mediated the effect on the relationship between nomophobia and stress **(Figure 2)**, which supports hypothesis 1 **(Figure 1)**.

Table 4. Bias-corrected bootstrap test on mediating effects

Paths	*β*	*SE*	*95% CI*	
			Low	High
Nomophobia - Stress	0.0628***	0.0154	0.0326	0.0930
Nomophobia – Loneliness	0.0378***	0.0164	0.0055	0.0700
Loneliness – Stress	0.4716***	0.0397	0.3937	0.5496
Nomophobi – Loneliness – Stress	0.0178	0.0081	0.0021	0.0337
Age - Loneliness	0.0179	0.4136	-0.7945	0.8303
Age - Stress	0.0679	0.3860	-0.6903	0.8261

Note: * p < 0.05, *** p < 0.001.

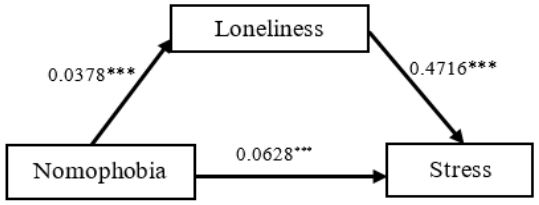

Figure 2. Moderated mediation model of the indirect effect of Nomophobia on the Stress

This study analyzes the impact of nomophobia, loneliness on stress symptoms in Vietnamese high school students. Specifically, the research will study a mediation model in which loneliness is considered a mediator in the relationship between nomophobia and stress.

Firstly, our study showed that most (99.3%) students have nomophobia at different levels. Of which 12.2% had mild nomophobia, 63.5% moderate, and 23.6% severe. Our research results are similar to Nguyen Phuong Hong Ngoc and Tran Van Cong's (2017) studies on nomophobia. Research results of Nguyen Phuong Hong Ngoc and Tran Van Cong (2017) on 365 students from 2 high schools in the inner city and suburbs of Hanoi show that most (90.6%) students have nomophobia at different levels. Gezgin *et al*. also found that the nomophobia of high school students was at an average level (Grade average score of 3.61), where a score of 3 to less than 5 has a mean are described to be moderate (Gezgin *et al*., 2018). Farooqui *et al*. (2018) study on 145 first-year students also showed that 17.9% had a mild nomophobia, 60% was moderate, and 22.1% was heavy. Or a study by N. Sharma *et al*. (2015) on 130 students (22-24 years old) had 73% had nomophobia, and 83% had panic attacks when they couldn't find their mobile device. A cross-sectional study of 1386 high school students aged 14 to 17 years by M. Sharma *et al*., (2019) showed that 41.05% had mild nomophobia, 21.86% moderate, and 5.1% is severe.

Second, we agree with previous findings stating that nomophobia positively predicted stress symptoms (Kalaskar, 2015; Yücens & Üzer, 2018; Fernandes *et al*., 2020; Bano *et al*., 2021; Farchakh *et al*., 2021). Recent literature has reported that increased stress levels and nomophobia have a significant positive relationship (Bano *et al*., 2021; Farchakh *et al*., 2021). Bano *et al*., (2021) reported higher anxiety and stress scores in students with severe nomophobia. There was a significant positive correlation between nomophobia and anxiety, depression, stress, and impulsivity (Farchakh *et al*., 2021). On the other hand, the tendency to be addicted to phones increases with stress and anxiety. Those with higher Internet addiction scores were more anxious than students with lower (Yücens & Üzer, 2018). Those who scored high for gaming addiction, compulsive internet use, and social media use also reported high scores for depression, loneliness, avoidance, poor sleep quality, and depression-related anxiety translation (Fernandes *et al*., 2020). The overuse of smartphones will make it difficult to sleep, stress, anxiety, fatigue, and declining academic performance (Kalaskar, 2015). Therefore, nomophobia has a positive effect on the stress level of high school students.

Finally, it can be found that loneliness is a partial mediator in the relationship between nomophobia and stress, supporting hypothesis 1 **(Figure 1)**. These results mean that nomophobia positively predicts loneliness, and then loneliness positively predicts stress. Ozdemir *et al*., (2018) research on university students has also shown a positive correlation between nomophobia and self-esteem and loneliness, whereas subjective happiness and nomophobia are negatively correlated. The study by Kara *et al*. (2021) reported that adolescents who use smartphones for long periods of the day are at increased risk of developing nomophobia, in which loneliness plays a solid mediating role. People who feel lonely often use smartphones as a tool to combat loneliness (Jiang *et al*., 2018). Smartphone use may increase as a way to pass the time as individuals spend more time at home during the COVID-19 pandemic. This will raise smartphone use and cause the individual to neglect everything else in his/her life. This is an important part of addiction (Elhai *et al*., 2017). People who have higher levels of loneliness often face stress risks (Jaremka *et al*., 2014; Campagne, 2019). Feeling lonely has been reported to be a factor that leads to anxiety and chronic stress (McHugh & Lawlor, 2013), as well as being heavily involved in maladaptive behaviors (Loades *et al*., 2020). In the study of Boursier *et al*. (2020), they assert that feelings of loneliness caused by Covid-19 positively affect anxiety, both indirectly and directly. In addition, feeling lonely can also lead to anxiety and social media abuse. Recent studies have also found a strong, positive correlation between stress and loneliness (Jaremka *et al*., 2014). The above analysis demonstrated that nomophobia indirectly affects stress through loneliness. Therefore, reducing loneliness may prevent adolescents with high levels of nomophobia from being at risk of stress.

Conclusion

This study has extended insights into the relationship between nomophobia, loneliness, and stress among high school students. The mediating role of loneliness has identified the internal mechanism between nomophobia and stress. The present study results may provide valuable guidelines in implementing psychological interventions to improve nomophobia and stress in high school students. The results of the present study may provide valuable guidelines in implementing psychological interventions to improve claustrophobia and stress in high school students. Preventing and minimizing cell phone phobia can be used as a preventive therapy to help reduce symptoms of stress. Accordingly, interventions to prevent cell phone deprivation should focus on measures to reduce loneliness. However, limitations of cross-sectional research still exist in this study, so a longitudinal study is needed following to determine cause-and-effect relationships between variables.

Acknowledgments: The author would like to thank the participants who accepted the questionnaires to complete this study.

Conflict of interest: None

Financial support: None

Ethics statement: None

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