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Prevalence of phantom vibration syndrome and its associated factors among undergraduate students in a public university

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ABSTRACT

Background: Phantom Vibration Syndrome (PVS) is a unique and interesting phenomenon caused by the widespread use of smart devices where individuals perceive vibrations from their smart devices when none are occurring. It is classified as a tactile hallucination because the brain interprets an absent sensation. This study highlights the importance of urgency in dealing with this issue in our technologically advanced society by providing useful information for both scholarly discussion and real-life use in the digital age.

Objectives: This study was conducted to determine the prevalence of PVS and its associated factors, which include sociodemographic characteristics, device characteristics, device usage patterns, smartphone addiction, and mental health.

Methodology: A cross-sectional study was conducted using a validated questionnaire among undergraduate students in a public university in Malaysia, who were identified using proportionate stratified random sampling. The dependent variable measured through the questionnaire was the prevalence of PVS, while the independent variables were socio-demographic factors (age, gender, ethnic), device characteristics (types of devices, device location, notification alert in vibration mode and regularity in using vibration mode), device usage patterns (frequency, duration and purpose of using devices), smartphone addiction, and mental health (perceived stress, anxiety and depression). Data were analyzed using IBM SPSS application version 29.

Results: A total of 381 responses were obtained, with response rate of 92.7%. The mean age of respondents was 21.96 ± 1.64 years. The prevalence of PVS was 49.3%, which was predicted by age (AOR: 0.55; 95%CI: 0.38–0.95), location of device carried in the front pocket of pants (AOR: 0.58; 95%CI: 0.36–0.95), location of device carried in sling bag (AOR: 0.49; 95%CI: 0.32–0.77), notification alert in vibration mode (AOR: 2.33; 95% CI: 1.33–4.09) and regularity using vibration mode (AOR: 2.91; 95%CI: 1.84–4.61).

Conclusion: Five factors predicted PVS in this study, comprising one sociodemographic variable and 4 device characteristics variables. Based on the results, health education should teach undergraduate students to recognize PVS symptoms and implement healthy technology practices such as optimizing device placement, decreasing vibration mode usage, and regulating device usage behaviors. Practical advice on setting limits and taking breaks can also reduce PVS risk.

1. Introduction

The Fourth Industrial Revolution (IR 4.0) has dramatically altered the landscape of communication and information access, with electronic devices such as pagers, wearable devices, and smartphones becoming an essential part of daily life. Before the widespread adoption of smartphones, pagers were indispensable tools for professionals whose duties necessitated prompt and unambiguous communication. In the present day, smartphones have assumed this function, transcending their status as ordinary communication devices to become an integral part of our digital existence. These devices are frequently connected to wearables such as digital wristbands and timepieces, which alert users of incoming messages or alerts through audible or vibrational signals. Users frequently activate vibration mode to reduce disturbances in environments that necessitate discretion, such as classrooms or meetings. Nevertheless, the growing reliance on smartphones, particularly among university students, raises concerns about its effect on mental health, productivity, and overall quality of life. One such concern is the

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emergence of Phantom Vibration Syndrome (PVS), which demonstrate the psychological effects of our increased involvement with technology.

PVS occurs when individuals perceive their device vibrating without an actual notification, resulting from habitual use and heightened sensitivity caused by the continuous vibration sensation received by the body (Meshram et al., 2023; Drouin et al., 2012). Research has indicated high prevalence rates of PVS among device users, with prolonged use increasing the likelihood of experiencing this phenomenon (Lin et al., 2013; Rothberg et al., 2010). This tactile hallucination occurs when the brain misinterprets an absent sensation, reflecting a broader issue linked to increased smartphone use. The significance of PVS for undergraduate students lies in its potential to cause anxiety, stress, and reduced academic performance, making it a critical issue for this population, given their reliance on smartphones for education, social interaction, and daily tasks (Dang et al., 2019). Research indicates that PVS affects over 60% of users globally, with prevalence rates as high as 72.7% among medical staff in Pakistan and 77% among undergraduate students in the United States (Drouin et al., 2012; Riaz et al., 2022). These findings underscore the importance of studying PVS, especially among students, to better understand its impact and promote healthier device usage practices.

Additionally, the COVID-19 pandemic has further complicated the issue by increasing screen time and reliance on digital devices due to online learning and virtual interactions. The shift to virtual education and remote communication during the pandemic significantly altered technology use patterns, potentially amplifying PVS prevalence among students. Investigating PVS in a post-pandemic context is vital to uncovering new contributing factors and understanding how these changes have affected its occurrence. However, previous research on PVS predominantly focused on data collected before the pandemic, leaving a gap in understanding the impact of these recent changes.

This study aims to fill this gap by examining the prevalence and factors associated with PVS among undergraduate students at a public university in the post-pandemic context. By exploring the societal implications of increased smartphone reliance, particularly in educational environments, targeted intervention to identify strategies to mitigate PVS and its adverse effects, enhancing healthier technological habits during a crucial developmental stage.

2. Materials and methods

2.1. Participants and procedure

The sample size was calculated based on a cross-sectional study conducted among students in Kerala, India (Sebastian et al., 2020). The two-proportion formula by Lwanga and Lemeshow (1991) was used to calculate the estimated sample size. On top of that, the sampling population for this study comprised undergraduate students from University Putra Malaysia, Serdang, who met both the inclusion and exclusion criteria. To qualify for inclusion criteria, participants needed to be Malaysian undergraduate students who own electronic devices with a vibrating mode, such as smartphones, smartwatches, or pager devices. Conversely, the exclusion criteria applied to postgraduate students, international students, and foundation programme students. Postgraduate and international students were excluded due to their differences in academic and lifestyle factors that could influence device usage patterns and PVS prevalence. For instance, postgraduate students may have fewer classes but longer research hours, and international students may have different device usage habits due to long-distance relationships with their families, which often require them to spend more time on their devices.

The present sample included 381 University Putra Malaysia undergraduates (226 female; mean age = 21.96, SD = 1.63). The questionnaire was administered online through Google Forms. To ensure consistency across participants, the survey link was distributed via official selected students university email and WhatsApp application, accompanied by clear instructions on how to complete the survey. Participants were encouraged to complete the survey in one sitting, and reminders were sent periodically to avoid delays. Data collection took place from March to April 2024. The protocol of the present study was approved by the research ethics committee (reference number: UPM. TNCPI.800-2/1/7) at the first author's affiliated university. Participants were given proper instructions regarding the study. Participation was anonymous and voluntary, and only those who provided informed consent participated.

2.2. Measures

2.2.1. Existence of phantom vibration syndrome

Participants were asked if they had experienced the sensation that their smartphone or smartwatch or pager device was vibrating for the past 2 weeks, when in fact it had not vibrated (0 = no, 1 = yes). The question was adapted from Ramasubramani et al. (2023).

2.2.2. Device characteristics and usage patterns

The questions that were asked in this section related to the device characteristics and usage patterns. The questions were mainly adapted from the study done by Rajesh et al. (2021) to assess the factors associated with PVS. It consisted of 11 questions where the options for the answers varied depending on the question asked. Participants needed to provide information on device characteristics, including the type of device they use, where they typically carry or wear these devices, whether they enable vibration mode for notifications, and how frequently they utilize the vibration mode. Additionally, participants were asked about their device usage patterns, including the frequency, duration, and purpose of use. For those who own a smartwatch, specific questions regarding its usage were also included.

2.2.3. Smartphone addiction

The questions to assess smartphone addiction were adopted from the validated Smartphone Addiction Scale-Short Version (SAS-SV) by Kwon et al. (2013), which had a reported internal consistency result (Cronbach's alpha) of 0.966. The SAS-SV contained 10 items, each score on a Likert scale of 1 (*strongly disagree*), 2 (*disagree*), 3 (*weakly disagree*), 4 (*weakly agree*), 5 (*agree*), and 6 (*strongly agree*). The 10 items assess the risk of six-related Problematic Smartphone Use (PSU) symptoms: 'loss of control' (Items 1 and 8), 'disruption' (Items 2 and 10), 'disregard' (Items 3 and 7), 'withdrawal' (Items 4 and 5), 'preoccupation' (Item 6) and 'tolerance' (Item 9). The sum of these items gives an overall SAS-SV score (range: 10–60) with higher scores indicating PSU. Cut-off scores are set at 31/60 for males and 33/60 for females to indicate the presence of smartphone addiction.

2.2.4. Mental health variables

2.2.4.1. Depression. The Patient Health Questionnaire-9 (PHQ-9; Sun et al., 2022), was used to measure respondents' levels of depression. The PHQ-9 comprises 9 items rated on a 4-point Likert scale ranging from 0 (*not at all*) to 3 (*nearly every day*). The items inquire about the frequency of depressive symptoms such as "little interest or pleasure in doing things" and "feeling down, depressed, or hopeless." Cronbach's alpha was 0.85 in the present study.

2.2.4.2. Anxiety. The General Anxiety Disorder-7 (GAD-7; Dhira et al., 2021), was used to measure respondents' anxiety levels. The GAD-7 comprises 7 items rated on a 4-point Likert scale ranging from 0 (*not at all*) to 3 (*nearly every day*). The items inquire about the frequency of symptoms of anxiety such as "feeling nervous, anxious, or on edge" and "worrying too much about different things." Cronbach's alpha was 0.87 in the present study.

2.2.4.3. Perceived stress. The level of perceived stress was assessed by

using The Perceived Stress Scale (PSS), a measurement tool to understand how different situations can affect respondents' feelings and measure individual perceived stress levels. The scale's internal consistency, as measured by Cronbach's alpha, ranged from 0.71 to 0.91 (Mozumder, 2022). The scoring was determined as 0 (never), 1 (almost never), 2 (sometimes), 3 (*fairly often*), and 4 (*very often*). The scores were reversed for questions 4, 5, 7 and 8. Individual scores on the PSS can range from 0 to 40 with higher scores indicating higher perceived stress. Scores ranging from (0-13) would be considered low stress, (14–26) would be considered moderate stress, and (27–40) would be considered high perceived stress.

2.2.5. Validity and reliability test

To ensure the validity and reliability of the study instrument used in this study, both content and face validity were analyzed. Content validity was assessed by public health specialists and psychiatrists who provided feedback on the questionnaire, which was incorporated into its final version. For face validity, the questionnaire, prepared in English, was reviewed by an English language expert. Additionally, a pilot test was conducted with 41 undergraduate students from University Putra Malaysia, Serdang (excluded from the final study) to evaluate the phrasing, clarity, and feasibility of the questions.

Reliability was tested through internal consistency and a test-retest approach. Internal consistency was measured using Cronbach's alpha, particularly for sections on smartphone addiction, perceived stress, anxiety, and depression, ensuring consistent responses on Likert scale questions with the value range from 0.85 to 0.91. Test-retest reliability was assessed using Cohen's Kappa for categorical questions on prevalence of PVS, device characteristics, and usage patterns, ensuring its reproducibility and consistency across the questionnaire.

2.3. Statistical analyses

Statistical Package of Social Sciences System (SPSS), version 29.0 was used for data analysis. Descriptive statistics of variables presented as frequency, percentage, mean, and standard deviation were used to describe the distribution of the variables.

Inferential statistics were employed in this study, utilizing tests such as the Chi-Square test and Simple Logistic Regression to assess associations and determine the strength and direction of relationships between categorical independent variables and the categorical dependent variable, namely the presence of PVS in this study. For a more comprehensive analysis, Multiple Logistic Regression was applied to perform multivariate analysis, allowing for a deeper understanding of the factors contributing to this phenomenon.

3. Results

3.1. Descriptive analysis

A total of 381 questionnaires were completed and consented to, resulting in a response rate of 92.7%. The descriptive statistics for sociodemographic analysis, prevalence of PVS, device characteristics and usage patterns, smartphone addiction, and mental health variables are presented in Tables 1 and 2.

The student's sociodemographic distribution includes factors such as age, gender, and race. The mean age was 21.96 years (1.638), with a range of 19–26 years. The respondents consisted of 59.3% females and 63.3% Malay. In relation to PVS, 49.3% of students reporting experiencing it, as illustrated in Fig. 1.

The study explored device usage among students, focusing on the types of devices used, where they were kept, and how often vibration mode was utilized. Most students (98.7%) frequently used smartphones, with 24.1% using smartwatches and a small minority (1.3%) using pagers. The majority carried their devices in their front trouser or skirt pockets, with other common locations being back pockets, purses, and sling bags. About 76.1% used the vibration mode for notifications, with 47.8% using it regularly, as shown in Fig. 2.

Table 1
Frequency, percentage, and mean distribution of sociodemographic characteristic and prevalence of PVS.

Respondent characteristics and Prevalence of PVS	n	%	Mean (SD)
Age (Year):			
19	21	5.5	21.96 (1.638)
20	65	17.1	
21	71	18.6	
22	77	20.2	
23	68	17.8	
24	60	15.7	
25	16	4.2	
26	3	0.8	
Gender:			
Male	155	40.7	
Female	226	59.3	
Ethnicity:			
Malay	242	63.3	
Chinese	100	26.2	
India	24	6.3	
Others	16	4.2	
Prevalence:			
Experienced Phantom Vibration Syndrome	188	49.3	
Never experienced Phantom Vibration Syndrome	193	50.7	

In terms of usage patterns, 84.5% of students made fewer than five calls per day, while 60.9% sent or received more than 15 text messages daily. Around 40.9% checked their devices more than 20 times a day. The main purpose of device use was social media and internet browsing (57.7%), with only 2.9% primarily using them for music, videos, or calls. Most students (63.8%) spent over 6 h daily on their devices.

Regarding smartphone addiction, 82.1% admitted to using their smartphones longer than intended, and 78.7% frequently checked them to stay updated with social media conversations. A significant number (68.7%) struggled to concentrate due to smartphone use. The study also examined mental health, finding that 50.4% of students often felt on top of things, while 43.6% felt nervous and stressed. Although 47.2% did not experience restlessness, 10% worried excessively daily. In terms of depression, 65.6% had no thoughts of self-harm, though 13.4% frequently felt tired or low on energy.

3.2. Inferential analysis

3.2.1. Bivariate and multivariate analysis

Table 3 shows the relationship between various factors and the PVS, which was first analyzed with univariate analysis and then with multivariate analysis. Three factors were found to significantly influence the occurrence of PVS ($p < 0.05$) in the bivariate analysis: device carried in a sling bag, using vibration mode, and frequently using the vibration mode.

Multiple logistic regression was applied to analyze the predictors of PVS. The analysis considered 12 variables. Variables with p-values <0.25 in univariate analysis were included, as this threshold is commonly used in epidemiological studies to ensure important factors are not overlooked that might still be important. According to Bursac et al. (2008), using a higher p-value threshold in univariate screening helps in identifying variables that, while not significant individually, may have a significant effect when adjusted for confounders in a multivariate model. This approach increases the robustness of the analysis and reduces the risk of omitting variables with underlying associations. In this study, the variable "location of mobile phone" and "age" met this criterion ($p = 0.155$, $p = 0.075$) and was thus included in the multivariate model, where it became statistically significant after adjustment (AOR = 0.581, $p = 0.030$, AOR = 0.551, $p = 0.033$). This suggests that its association with the outcome was confounded by other factors, justifying its inclusion in the model.

Table 2
Frequency and percentage of device characteristic and usage patterns.

Device characteristics and usage patterns	n	%
Type of device use:		
Smartphone	376	98.7
Smartwatch	92	24.1
Pager device	5	1.3
Device location:		
Shirt pocket	37	9.7
Pants or skirt front pocket	278	73.0
Pants or skirt back pocket	71	18.6
Handbag	154	40.4
Sling bag	161	42.3
Notification alert in vibration mode:		
Vibration mode	290	76.1
Not in vibration mode	91	23.9
Regularity of using vibration mode:		
Often	182	47.8
Rare	199	52.2
Calls respondents made and received per day on average:		
<5 calls	322	84.5
5-10 calls	50	13.1
11-15 calls	3	0.8
>15 calls	6	1.6
Text messages respondents sent and received per day on average:		
<5 messages	51	13.4
5-10 messages	57	15.0
11-15 messages	41	10.8
>15 messages	232	60.9
Number of times respondents check their device per day on average:		
<10 times	95	24.9
10-20 times	130	34.1
>20 times	156	40.9
Purpose of respondent used the smartphone to the maximum:		
Calls	11	2.9
Text message	127	33.3
Social media and Internet Surfing	220	57.7
Playing games	12	3.1
Listening songs/watching videos	11	2.9
Duration of using device		
<6 h	138	36.2
>6 h	243	63.8
Number of days the respondent wear smartwatch (smartwatch owner only) (N=92):		
Once a week	7	7.6
3 times a week	18	19.5
Daily	67	72.8

Hence, the final model identified were age, location of device carried in pants front pocket, location of device carried in sling bag, notification alert in vibration mode, and regularity using vibration mode. The multiple logistic regression analysis showed that students older than 20 years were less likely to experience PVS, with a likelihood of 0.55 times lower compared to younger students (95% CI: 0.38–0.95). Additionally, students who carry their devices in their front pants pocket were 0.58 times less likely to experience PVS compared to those who do not (95% CI: 0.36–0.95) while students who keep their devices in a sling bag are 0.49 times less likely to experience PVS (95% CI: 0.32–0.77). On the other hand, students using vibration mode for notifications are 2.33 times more likely to experience PVS compared to those who do not use it (95% CI: 1.33–4.09). Finally, students who frequently use vibration mode are 2.91 times more likely to experience PVS compared to those who use it rarely (95% CI: 1.84–4.61).

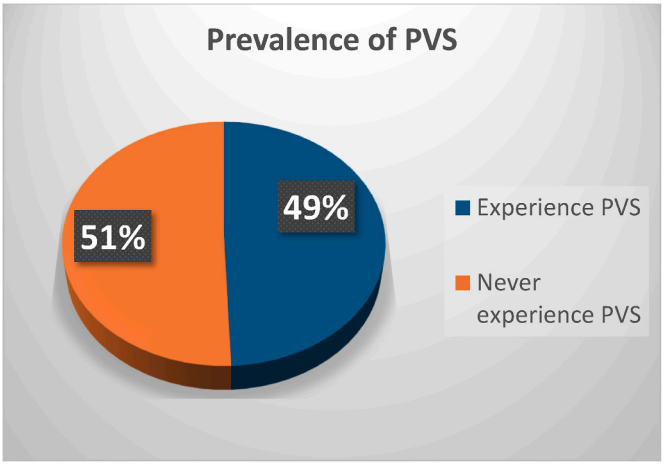

Fig. 1. Prevalence of Phantom Vibration Syndrome among university students.

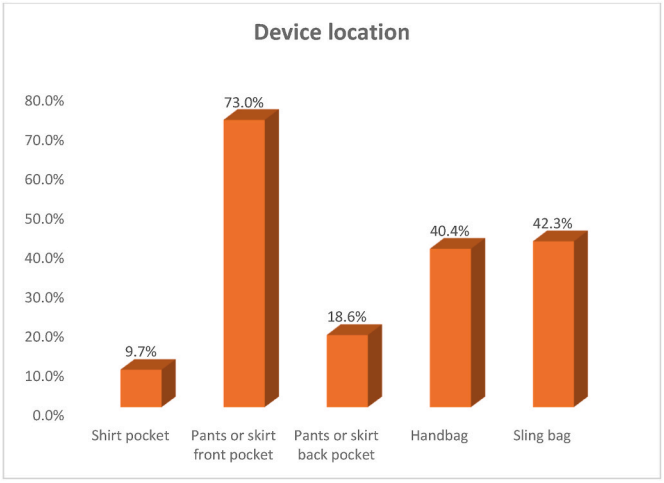

Fig. 2. Location of device carried by respondents.

4. Discussion

4.1. Age and phantom vibration syndrome

This study found that age is a predictor of PVS. Individuals over 20 years old are less likely to experience PVS compared to those under 20. This finding contrasts with a study in Italy by Pisano et al. (2019), which reported higher PVS rates among older students. However, it aligns with a study by Rothberg et al. (2010) on U.S. medical staff, showing age as a significant factor, with those aged 20–69 being more affected. The prolonged exposure to technology among older individuals may increase the likelihood of experiencing PVS due to the brain misinterpreting sensory signals.

4.2. Device location, notification alerts, and regular vibration use as predictors of phantom vibration syndrome

The location where devices are carried, the use of vibration alerts for notifications, and the regularity of using vibration mode are significant predictors of PVS. This study found a strong association between carrying devices in front pants pockets or sling bags and a higher likelihood of experiencing PVS. These findings are consistent with research by

Table 3
Factors associated with PVS among respondents.

Factors	Univariate logistic ($n = 381$)				Multivariate logistic ($n = 381$)			
	COR	p value	95% CI		AOR	p value	95% CI	
Age								
<20 years old	1							
>20 years old	0.632	0.075	0.381	1.048	0.551	**0.033***	0.381	0.954
Gender								
Male	1							
Female	0.858	0.463	0.570	1.292				
Ethnicity								
Malay	1.378	0.133	0.907	2.095				
Others	1							
Type of device								
Have smartphone	0.646	0.634	0.107	3.909				
No smartphone	1							
Have smartwatch	1.264	0.237	0.791	2.019				
No smartwatch	1							
Have pager device	1.549	0.634	0.256	9.374				
No pager device	1							
Location of device								
Inside shirt pocket	1.573	0.198	0.789	3.134				
Not inside shirt pocket	1							
Inside front pants pocket	0.719	0.155	0.457	1.133	0.581	**0.030***	0.355	0.949
Not inside front pants pocket	1							
Inside back pants pocket	1.412	0.192	0.840	2.374				
Not inside back pants pocket	1							
Inside handbag	0.917	0.678	0.609	1.381				
Not inside handbag	1							
Inside sling bag	0.583	**0.010***	0.387	0.879	0.493	**0.002***	0.316	0.770
Not inside sling bag	1							
Vibration mode								
Yes	2.958	**<0.001***	1.784	4.906	2.332	**0.003***	1.332	4.085
No	1							
Regularity in using vibration mode								
Often	25.32	**<0.001***	2.041	4.714	2.914	**<0.001***	1.842	4.612
Rare	1							
Frequency using smartphone:								
Calls								
<5 calls	0.000	0.999	0.000	–				
5–10 calls	0.000	0.999	0.000	–				
11–15 calls	1							
>15 calls	0.539	0.479	0.097	2.983				
Messages								
<5 messages	1.051		0.461	2.400				
5–10 messages	0.467		0.206	1.060				
11–15 messages	1							
>15 messages	0.894	0.741	0.459	1.739				
Check								
<10 times	1							
10–20 times	0.823	0.471						
>20 times	1.161	0.697						
Duration:								
<6 h	1							
>6 h	0.764	0.208	0.503	1.162				
Purpose:								
Communication	1							
Entertainment and others	1.370	0.141	0.901	2.083				
Smartphone Addiction								
Have addiction	1.280	0.278	0.819	1.999				
No addiction	1							
Perceived stress								
	1							
Moderate	1.197	0.630	0.590	2.391				
High	0.990	0.985	0.339	2.887				
Anxiety								
Have anxiety	1.339	0.253	0.812	2.207				

(*continued on next page*)

Table 3 (*continued*)

Factors	Univariate logistic ($n = 381$)				Multivariate logistic ($n = 381$)		
	COR	p value	95% CI		AOR	p value	95% CI
No anxiety	1						
Depression							
Have depression	1.040	0.855	0.680	1.592			
No depression	1						

Rothberg et al. (2010) in the U.S. and Riaz et al. (2022) in Pakistan, both of which indicated that keeping devices close to the body, particularly in areas of frequent contact, leads to sensory misinterpretations that contribute to PVS.

Similarly, using vibration mode for notifications is another key predictor. Students who rely heavily on vibration alerts are more likely to misinterpret other stimuli as device vibrations, a hypothesis supported by studies like Riaz et al. (2022) and Charulatha et al. (2021). The brain becomes conditioned to expect vibrations, leading to false perceptions of device activity.

Furthermore, regular use of vibration mode increases the likelihood of experiencing this phenomenon. Frequent exposure to vibration alerts may heighten the brain's sensitivity, causing it to misinterpret muscle contractions or other subtle sensations as device vibrations. This conclusion is backed by studies like Rothberg et al. (2010), Meshram et al. (2023), as well as Rajnish et al. (2020), who reported that nearly half of college students in India who continuously used vibration mode experienced PVS. These findings suggest that how devices are carried, and how frequently vibration alerts are used, are key factors contributing to the onset of this situation.

Ultimately, these factors highlight how the brain misinterprets routine sensations as device vibrations, emphasizing that PVS stems from heightened sensory perception caused by frequent exposure to vibrating devices.

4.3. Broader implications and unexplored factors

The findings of this study highlight the complex interplay between technology use and mental health. Beyond the predictors identified, PVS may serve as a subtle indicator of broader mental health concerns, such as stress, anxiety, or depression. This is particularly relevant in the post-pandemic context, where increased reliance on technology for communication and learning has expanded mental health challenges among students. The phenomenon of PVS highlights the need for interventions not only on technology habits but also the psychological well-being of adolescents. Future studies could explore this relationship further to understand whether mental health issues exacerbate the perception of phantom vibrations or if PVS itself contributes to psychological distress.

Additionally, the high number of PVS cases found in this study suggests that other possible reasons should be considered. While this research identified device usage patterns and vibration mode reliance as significant factors, other unmeasured variables may also play a role. These include emotional attachment to devices, fear of missing out (FOMO), or even physiological traits like heightened sensory sensitivity. Exploring these aspects in future research could provide a more comprehensive understanding of the mechanisms underlying PVS and its broader implications.

5. Strength and limitations

This study is the first to explore the prevalence of PVS among undergraduate students after the COVID-19 pandemic, a period that greatly transformed technology use and dependence among students. The pandemic led to increased reliance on electronic devices for online learning and communication, providing a unique context for understanding PVS. The novelty of examining PVS in a post-COVID-19 context adds significant value, as few studies have explored this aspect, especially among undergraduate students in Malaysia during the post-pandemic era.

The study also considers the rise in mental health issues such as stress, anxiety, and depression among young adults, which may be linked to PVS. It is one of the few studies examining the relationship between PVS and both smartphone addiction and mental health factors, offering valuable insights into these interconnected issues. Moreover, the relatively high response rate and the use of validated questionnaires enhance the reliability and credibility of the findings.

However, the study has some limitations. Its cross-sectional design prevents establishing a cause-and-effect relationship between PVS and the identified factors. The reliance on self-reported data may introduce bias, as participants might not accurately recall or report their experiences. Additionally, the focus on students from a single university with a small sample size limits the generalization of the findings to other populations. The study also did not explore other factors like emotional attachment to devices, academic performance, or nomophobia (fear of being without a mobile phone) that might influence PVS. Future research should use a cohort study to explore how long-term technology use affects PVS, with a larger and more diverse sample to improve the applicability of the findings across different populations.

The study identifies key predictors of PVS, including non-modifiable factors like age. To address this, targeted education and interventions are needed to help this age group recognize PVS symptoms and adopt healthier technology habits. Furthermore, for modifiable factors such as carrying devices in front pockets or using vibration mode, education should focus on optimizing device placement, reducing vibration mode usage, and managing technology habits. By providing practical guidance on setting boundaries for device use and encouraging regular breaks, the risk of PVS may be effectively minimized.

6. Conclusion

In conclusion, the emergence of PVS among undergraduate students in this study are almost half from the total number of students which raises concerns. Specifically, 49.3% of the undergraduate students experience PVS. The study identified five significant risk factors associated with PVS, which include being over 20 years old, carrying the device in the front pants pocket or a sling bag, using vibration mode for notifications, and frequently using vibration mode.

CRediT authorship contribution statement

Abu Bakar Bin Hamdan: Writing – original draft, Visualization, Validation, Software, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Nor Afiah Binti Mohd Zulkefli:** Writing – review & editing, Visualization, Validation, Supervision, Software, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Fatimah Binti Ahmad Fauzi:** Writing – review & editing, Visualization, Validation, Supervision, Methodology, Investigation, Formal analysis, Conceptualization.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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