MedPharmRes

journal of University of Medicine and Pharmacy at Ho Chi Minh City
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Original article

The prevalence and related factors of phantom vibration among medical students: A first look in Vietnam

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Received January 20, 2019: Revised September 18, 2019: Accepted December 12, 2019

Abstract: ***Background:*** Phantom vibration (PV) is an illusionary perception in which people perceive their mobile phone vibrates while it actually does not. Recently, PV has attracted attention in psychology and medical field. There are several studies investigating the prevalence and risk factors associated with this phenomenon. However, the findings are inconsistent. The prevalence of PV fluctuates from 21% to 89% among different groups and its mechanism remains unclear. Further understanding is necessary to identify the settings in which PV may harm the population and warrant further exploration. ***Objectives:*** This study aims to explore the prevalence of PV among medical students in Ho Chi Minh City and settings that PV can risk people's health. Relationships between PV and phone usage habits as well as psychiatric disturbance also are investigated. ***Methods:*** By using online questionnaire on 377 undergraduate medical students in Ho Chi Minh City, Vietnam, the cross-sectional study explored factors associated with PV, including demographic, behavioral phone usage, and mental/emotional factors using the Self Reporting Questionaire - 20 (SRQ-20). The descriptive and association analyses were employed using R software. ***Results:*** The study found a significant association between mental/emotional factors (i.e. mental disturbance and phone attachment) and PV (OR=2.15, 95% CI=1.21-3.81, p value=0.009; OR=1.75, 95% CI=1.02-3.01, p value=0.043 respectively), which suggests an important role of mental/emotional factors in explaining the potential mechanism of PV. A high proportion of participants also experienced PV while driving (55.5%) within the last month. This implies the impact of PV possibly becomes significant, causing an increase in the risk of traffic accident due to distracted driving.

Keywords: Phantom vibration; student; prevalence; perception; questionnaire; survey; mental; emotional.

1. INTRODUCTION

The modern technologies such as smartphones, personal handheld devices, tablets, online social networks, etc. provide their users with many advantages and convenience in life. On the other side, those technologies possibly induce some psychological issues such as nomophobia, cybersickness, Facebook depression [1], and phantom vibration syndrome (PVS). PVS was depicted as an illusionary perception in which a mobile phone is felt vibrating, but it is actually not. It

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was first described as "phantom-pager syndrome" in 1996 by cartoonist Scott Adams in his comic strip "Dilbert" [http://dilbert.com/strip/1996-09-16]. PVS's phenomenon was described in many studies. Rothberg et al. did not recognize PVS as a real syndrome [2]. Later on, Drouin et al. suggested that "phantom vibration" (PV) may be a more appropriate term for this phenomenon [3]. In addition, another phone-related illusionary perception was described as a phantom ringing syndrome [4, 5]. More recently, the general term Phantom Phone Signals (PPS) has been introduced by Tanis et al. which includes all type of illusionary perception on phone signals, such as vibrating, ringing, or blinking [6].

There is no consensus on the prevalence of PV among the literature. Drouin et al. found 89% of undergraduate students have experienced PV at least one time in their life [3]. Other studies show the prevalence of PV was 68% and 78.1% among medical staff and students respectively [2, 5]. Meanwhile, the prevalence was only 21% in high-tech workers [7]. The literature shows that studies on PVS mainly focus on medical students and staffs. It was explained that this population is prone to anxiety due to high working pressure. They are also expected to frequently carry a mobile phone for professional communication. The studies also chose to focus on the young population due to their frequency of mobile usage.

Although PVS is frequently recognized, participants in past studies only reported it as "bothersome" and did not see it as severe issues [2-5]. The findings of PV's related issues are inconsistent. Anxiety and depression were associated with PV in Lin et al.'s study [5] but Chen et al did not find this link [7]. However, depression and anxiety do not fully reflect the multidimensional nature of "mental/psychiatric disorders" [8]. Since anxiety, depression and other mental disorders can have negative impacts on people's life, more studies are needed to examine the relationships between mental health issues and PVS.

From a public health perspective, a health-related phenomenon is not considered to be a problem if it does not cause any serious issue to the population health. Therefore, studies should not focus only on the direct consequence of PV but also on the settings in which PV can create harms to population health. There are some preliminary studies investigating factors associated with PV [2-6]. Nevertheless, the factors found in recent research are highly inconsistent. For example, Rothberg et al. identified four factors that were independently associated with phantom vibration in medical staffs, including occupation (resident vs. attending physicians), device location (breast pocket vs. belt), time to carrying the device, and the frequency of putting the device in vibrate mode [2]. Another study, however, failed to find the same association between device location and PV [4].

Previous studies show various findings on PV's prevalence, consequences, and the risk of other phone usage habits. In the present study, we conducted a cross-sectional online survey among Vietnamese medical undergraduate students of the University of Medicine and Pharmacy, Ho Chi Minh City, Vietnam (UMP-HCMC) with three specific purposes: (1) to estimate the prevalence of PV among medical students UMP-HCMC and to explore the settings in which PV may harm the population health; (2) to examine the relationship between phone usage related factors and PV; and (3) to investigate the association between psychiatric disturbance and PV. The main purpose of this study is to understand the comprehensive overview of factors associated with PV in order to contribute new perspectives to the current scarce and inconsistent literature. Therefore, we included some variables which already investigated in previous studies (e.g. type of devices, location of devices, etc.) as well as new variables such as SRQ20, the settings in which PV happens and phone usage related factors (e.g. phone attachment).

2. MATERIALS AND METHOD

2.1. Participants:

UMP-HCMC is the biggest medical institution located in the South of Vietnam, and its undergraduate medical curriculum includes six years of study. We recruited 377 UMP-HCMC medical under-graduates in a cross-sectional online survey from 14 November 2014 to 5 January 2015. A web-based structured questionnaire was issued through Google Form to six Facebook groups of UMP-HCMC medical students. Each group represented for each school year of the students. After the participants submitted their responses, the data were transferred automatically to a Google Sheet which could be accessed only by the investigators of the current study. This online survey strictly followed the recommendation of the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) in order to ensure the quality of the survey (S1 Table) [10]. The voluntariness of participants was guaranteed by a written informed consent embedded at the beginning of the online questionnaire. Checking a box stating "I agree to participate" after reading the whole informed consent was taken as informed consent. Participation was anonymous without collecting personal data such as name, telephone number, email, IP address, home address, or company. No ethical approval was needed for the study according to The Nagasaki University Ethical Committees.

2.2. Measurements:

The questionnaire consisted of 44 questions divided into four parts as follows:

Prevalence of PV and demographic data (7 questions): The prevalence of PV (i.e. life-time PV and last-month PV) was estimated using 2 questions: "Have you ever experienced PV"; and "In last month, have you ever experienced PV" respectively. These options help to explore the life-time prevalence of PV and assess whether there are relationships between current psychological disturbances and the current period of PV experience.

Demographic variables include gender, age, and school year. Two other questions about the name of the university and the major of students were used to prevent irrelevant subjects such as graduate and non-medical students potentially participating in the online Facebook groups from contaminating the target population

Phone usage related factors (11 questions): type of device, location of the device, the intensity of phone usage, and phone attachment. Firstly, the intensity of phone usage has been investigated in relation to PV in previous studies, by asking the amount of time or the frequency of checking the phone per day [2, 11]. In this study, we brought a further step by asking the frequency of phone use for different purposes, such as email, social network, calling, and texting. Secondly, phone attachment is defined as a strong emotional connection of the user to their phone [12]. To explore the association between phone attachment and PV, two questions using 5-point Likert scale options were introduced, including the "frequency of

caring phone by side" (1= "rarely" to 5= "very often") and "feeling anxious when not caring devices" (1= "very relaxed" to 5 ="very anxious"). For analyzing these data, a new binary variable namely "phone attachment" was created and received "yes" when "frequency of caring phone by side" is "often" or "very often", and "feeling anxious when not caring devices" is "anxious" or "very anxious".

Characteristics of respondents experiencing PV within last month (6 questions): we focused on the settings in which PV most happened to people who experienced PV within last month while they were driving, walking, working, or resting in order to figure out the proportion that PV can constitute to the harm of population health. Other questions about "bothersome feeling", "number of experienced PV", "the need for treatment", and "waiting for phone calls or messages before experiencing PV" were also included.

Psychiatric disturbance (20 questions): Psychiatric disturbance among participants during last month was screened using the SQR-20 questionnaire, which consists of 20 yes/no questions with a maximum score of 20. SRQ-20 was developed by the World Health Organization as an instrument to screen for psychiatric disturbance, which covers three main multidimensional factors of mental/psychiatric disorders (i.e. somatic factors, depressive/anxiety symptoms, and cognitive/decreased energy factors) [8, 9]. The SQR20 also has been found to be reliable, valid and suitable for screening mental/psychiatric disorders in many countries, especially in developing ones [13, 14]. Hence, SRQ-20 can be considered as a good instrument in order to examine the association between mental health factors and PV which goes beyond depression and anxiety.

In a recent validation study of SRQ-20 conducted on a Vietnamese population, Giang et al. found that the optimal cut-off score was 8/9. This means the total scores are 8 or lower is considered as "non-case" and 9 or upper as "case", for the age group of 18-24 with the area under the curve (AUC) was equal to 0.97 [15]. Since the ages of our target population were also ranging from 18 to 24 years, we adopted the result of Giang et al. into our study.

A pilot study was conducted among the research members and colleagues to validate the accuracy and duration of the questionnaire before the real survey took place. The English translation of our questionnaire is shown in S2 Table. The overview of study procedures is described in (Fig. 1).

2.3. Statistical Analysis

The data analysis was performed using the open source software R version 3.1.1. In order to assess the association between demographic characteristics, phone usage related factors and PV, the Chi-square test was performed for nominal categorical variables. In case of the expected value of any cell in the 2×n contingency table was smaller than 5, the Fisher's exact test was employed as an alternative. The non-parametric test for trend was used for ordered categorical variables [16]. The strength of association between phone usage related factors and PV was determined by calculating the odds ratio (OR) with 95% confidence interval (95% CI) using logistic regression model. The skewness and kurtosis tests were carried out to evaluate the normal distribution of SRQ-20 scores. The difference and 95% CI in SRQ-20 score between life-time PV and last month PV were assessed using the bootstrap method [17]. Significant level was set at p-value <0.05. All the significant variables were incorporated into the final model for multivariable analysis.

3. RESULTS

3.1. The prevalence of PV and demographic characteristics

Table 1. Demographic characteristics and their association coefficients of 348 respondents from the University of Medicine and Pharmacy, Ho Chi Minh City, Vietnam in the phantom vibration survey 2014-2015

Characteristics		No (%) of respondents		Chi2 p-value
		Total (% of column)	With PV (% of row)	
Sex		348 (100)		
	Male	185(53.1)	141(76.22)	0.767
	Female	163(46.9)	122(74.85)	
School year		346(100)		
	Sixth	53(15.3)	42(79.25)	
	Fifth	71(20.5)	59(83.1)	
	Fourth	36(10.4)	26(72.2)	
	Third	68(19.65)	51(75)	0.544
	Second	73(21.1)	52(71.2)	
	First	45(13.2)	32(71.1)	
Age		348(100)		
	28	1(0.3)	1(100)	
	27	1(0.3)	0(0)	
	26	13(3.7)	10(76.9)	
	25	55(15.8)	45(81.8)	
	24	60(17.2)	48(80.0)	
	23	51(14.7)	40(78.4)	0.528*
	22	61(17.5)	44(72.1)	
	21	72(20.7)	52(72.2)	
	20	34(9.8)	23(67.65)	

* Fisher's test p-value

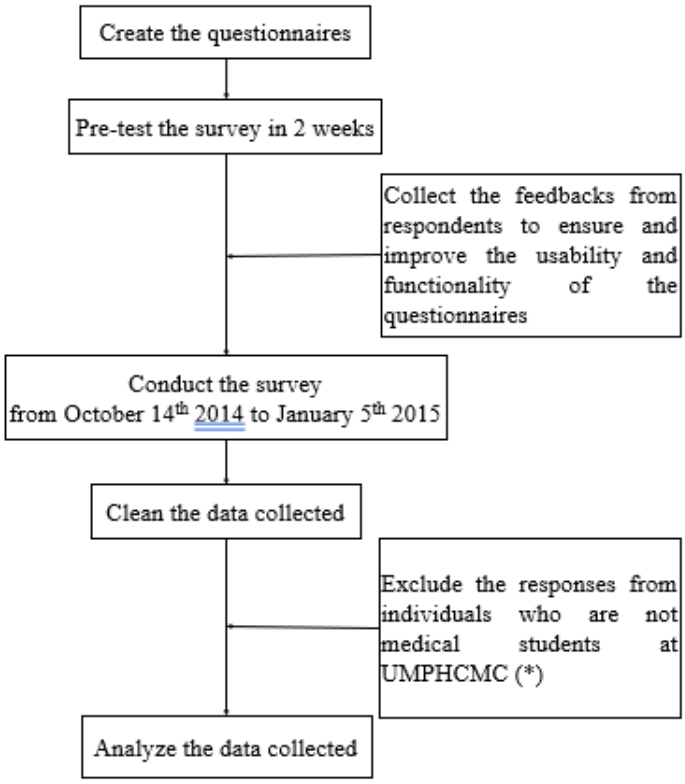

Figure 1: Flowchart of Study

The analysis included 348 completed responses from the students of six medical classes of UMP-HCM. Two responses with unidentified classes and the questionnaires with missing data were excluded from the final analysis. The response rate of 15.7 % was calculated by assuming that the total number of all members participating in six Facebook groups roughly represented the total number of the target population. 75.6% (263/348) students experienced life-time PV, and 49.7%

(173/348) respondents experienced PV last month (Fig. 1). The prevalence of PV was not a significant difference in gender, age, and year of study (Table 1).

3.2. PV and phone usage related factors

In the univariate analysis, no significant association between types of devices, mode setting of devices and PV was found. However, experiencing PV was associated with locations of devices: Side pocket (OR=2.07, 95% CI=1.16-3.68, p value=0.012), Bag and handbag (OR=1.23, 95% CI=1.01-1.49, p value=0.012). With regard to the intensity of phone usage, the association between PV and either hour of phone usage per day or frequency of checking the phone for specific purposes was not significant. The phone attachment, in contrast, was found to be significantly associated with PV (OR=2.1, 95% CI=1.25-3.57, p value=0.005) (Table 2).

Table 2. Association between PV and phone usage related factors

Characteristics	PV (n=263)	Non-PV (n=85)	Chi2 p-value	OR (95%CI)
Type of devices (multiple choice)				
Smart phone				
Yes	188(71.5)	65(76.5)	0.370	//
No	75(28.5)	20(23.5)		
Ordinary phone				
Yes	98(37.3)	28(32.9)	0.471	//
No	165(62.7)	57(67.1)		
Setting mode (multiple choice)				
Ring				
Yes	36(13.7)	16(18.8)	0.248	//
No	227(86.3)	69(81.2)		
Vibrate				
Yes	104(39.5)	25(29.4)	0.093	//
No	159(60.5)	60(70.6)		
Ring and vibrate				
Yes	130(49.4)	44(51.8)	0.708	//
No	133(50.6)	41(48.2)		
Silence				
Yes	13(4.9)	7(8.2)	0.285	//
No	250(95.1)	78(91.8)		
Location of devices (multiple choice)				
Breast pocket				
Yes	9(3.4)	1(1.2)	0.461	//
No	254(96.6)	84(98.8)		
Side pocket				
Yes	221(84.0)	61(71.8)	**0.012**	2.07 (1.16, 3.68)
No	42(16.0)	24(28.2)		
Back pocket				
Yes	2(0.8)	1(1.2)	0.570	//
No	261(99.2)	84(98.8)		
Belt				
Yes	2(0.8)	0(0)	1*	//
No	261(99.2)	85(100)		
Jacket pockets				
Yes	16(6.1)	5(5.9)	0.946	//
No	247(93.9)	80(94.1)		
bag or hand bag				
Yes	76(28.9)	39(45.9)	**0.004**	0.48 (0.29, 0.79)
No	187(71.1)	46(54.1)		1
Phone attachment[(a)]				
Yes	123(46.8)	25(29.4)	**0.005**	2.1(1.25, 3.57)
No	140(53.2)	60(70.6)		
Hours of using phone per day				
<3 hours	123(47.3)	52(61.2)		
3-6 hours	81(31.1)	17(20.0)		
>6 – 12 hours	33(12.7)	11(12.9)	0.115	//
>12 hours	23(8.8)	5(5.8)		

Characteristics	PV (n=263)	Non-PV (n=85)	Chi2 p-value	OR (95%CI)
Frequency of checking phone for different purposes (every hours or minutes per time)				
Texting				
Not for this purpose	4(1.5)	2(2.3)		
<30 minutes	102(38.8)	31(36.5)		
30-60 minutes	15(5.7)	2(2.3)	0.670	//
>1-6 hours	71(27.0)	23(27.1)		
>6 hours	71(27.0)	27(31.8)		
Receiving or making phone calls				
Not for this purpose	2(0.8)	1(1.2)		
<30 minutes	94(35.7)	29(34.1)		
30-60 minutes	6(2.3)	5(5.9)	0.460	//
>1-6 hours	52(19.8)	14(16.5)		
>6 hours	109(41.4)	36(42.3)		
Checking social networks				
Not for this purpose	58(22.1)	17(20.0)		
<30 minutes	75(28.5)	27(31.8)		
30-60 minutes	22(8.4)	1(1.2)	0.086	//
>1-6 hours	71(27.0)	22(25.9)		
>6 hours	37(14.0)	18(21.1)		
Reading news				
Not for this purpose	80(30.4)	29(34.1)		
0-30 minutes	66(25.1)	17(20.0)		
30-60 minutes	10(3.8)	3(3.5)	0.723	//
>1-6 hours	46(17.5)	19(22.4)		
>6 hours	61(23.2)	17(20.0)		
Checking email				
Not for this purpose	130(49.4)	41(48.2)		
<30 minutes	47(17.9)	11(12.9)		
30-60 minutes	2(0.8)	1(1.2)	0.696	//
>1-6 hours	11(4.2)	4(4.7)		
>6 hours	73(27.7)	28(33.0)		

Odds Ratio (OR) and 95% confidence interval (95% CI) were calculated using logistic regression

* Fisher's test p-value

** nonparametric test for trend p value

// No calculation

[a] "Yes" for Phone attachment when the answer of carrying phone by your side is "often/very often" and the answer of feeling anxious when participants did not carry device is "anxious/very anxious"

Table 3. Characteristics of respondents experienced PV in last month

Characteristics	PV in last month (n=173)	%
Bothersome of PV		
Normal	128	74.0
Bothersome	33	19.1
Very bothersome	12	6.9
Number of PV (n=152)		
1-2 times	59	38.8
3-4 times	40	26.3
5-6 times	26	17.1
7-8 times	8	5.3
9-10 times	11	7.2
>10 times	8	5.3
Need for medical treatment to stop PV		
Yes	74	42.7
No	99	57.3
Waiting for phone calls or messages before experiencing PV (n=168)		
Yes	104	60.1
No	64	37.0

Characteristics	PV in last month (n=173)	%
The most time when experiencing PV*		
Driving	96	55.5
Studying	48	27.7
Walking	29	16.8
Working	17	9.8
Resting	16	9.2
Not know/ not pay attention	19	11.0

*The total percent is not 100 since this is a multiple response question.

Table 4. The association between PV and psychiatric disturbance

Psychiatric disturbance	Life-time PV		Chi2 p-value	OR (95% CI)	Last month PV		Chi2 p value	OR (95% CI)
	Yes	No			Yes	No		
Yes	108(41.1)	20(23.5)	0.004	2.26 (1.29-3.96)	78(45.1)	50(28.6)	0.001	2.05 (1.32-3.20)
No	155(58.9)	65(76.5)			95(54.9)	125(71.4)		

"Yes" for Psychiatric disturbance when the SRQ-20 score is equal to or more than 9. Life-time PV group was identified by asking "have you ever experienced PV" and last month PV group was identified by asking "in last month, have you ever experienced PV". The OR was calculated using a logistic regression model; $p<0.05$ indicates a statistical significance.

Figure 2

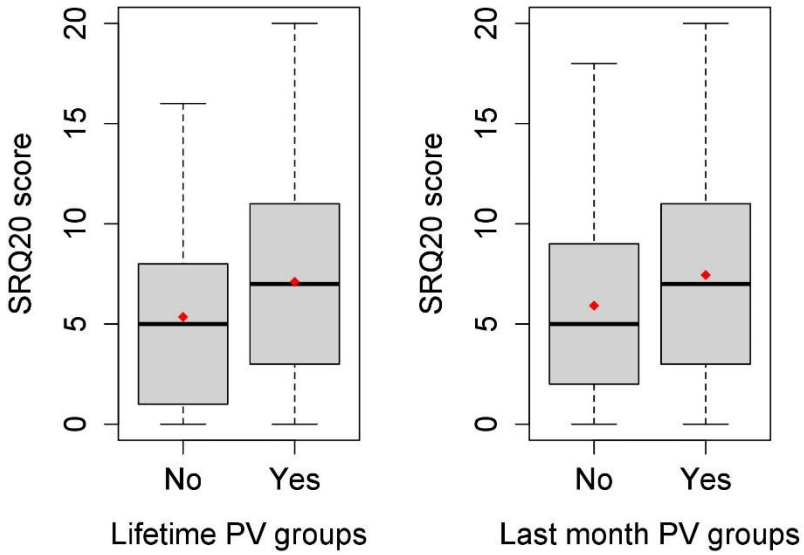

Figure 2. SRQ-20 score among PV groups of participants from the University of Medicine and Pharmacy, Ho Chi Minh City, Vietnam. SRQ-20 includes 20 yes/no questions with a maximum score of 20 to screen psychiatric disturbance. The higher the score of SRQ-20, the higher level of psychiatric disturbance is. Mean SRQ-20 score is denoted in red.

3.3. Characteristics of respondents experienced PV last month

The bothersome feeling of respondents experienced PV last month was 26% (19.1% bothersome and 6.9% very bothersome). In addition, 60.1% (104/173) of participants experiencing PV last month reported that they had been waiting for phone calls or messages before the PV occurred and 55% (96/173) of participants commonly experienced PV while they were driving (Table 3).

3.4. PV and psychiatric disturbance

Psychiatric disturbance was significantly associated with both life-time PV and last month PV groups (OR= 2.26, 95% CI= 1.29 – 3.96, p value=0.004; OR= 2.05, 95% CI= 1.32 – 3.2, p value=0.001, respectively) (Table 4). To understand the difference in the severity of psychiatric disturbance between PV groups, their SQR-20 scores are shown in (Figure 2). In life-time PV, the difference in the mean score of SRQ-20 between PV and non-PV group was 1.75 (95% CI= 0.6 – 2.89). In last month PV, the difference was 1.53 (95% CI= 0.52 – 2.54).

3.5. Multivariable analysis

To find independent predictors of PV, we included all significant variables from univariate analysis into the multivariable analysis. Only psychiatric disturbance (OR=2.15, 95% CI=1.21-3.81, p value=0.009) and phone

attachment (OR=1.75, 95% CI=1.02-3.01, p value=0.043) were found to be significantly associated with PV (Table 5).

Table 5. Multivariable analysis of predictors for experiencing PV group using a logistic regression model

Characteristic	Odds ratio (95% CI)	P value
Psychiatric disturbance		
Yes	2.15 (1.21 – 3.81)	**0.009**
No	1.00 (reference)	
Phone attachment		
Yes	1.75 (1.02 – 3.01)	**0.043**
No	1.00 (reference)	
Location of devices (side pocket)		
Yes	1.27 (0.61 – 2.65)	0.512
No	1.00 (reference)	
Location of devices (bag or handbag)		
Yes	0.56 (0.29 - 1.07)	0.078
No	1.00 (reference)	

4. DISCUSSION

Regardless of the small body of literature investigating related factors and impact of PV, there is a consensus that the severity of PV is very small. For instance, only 2% of participants who experienced PV found "very bothersome" in the studies of Rothberg et al. [2] and Drouin et al. [3], and less than 2% in a study of Lin et al. [5]. In the current study, the percentage of participants from UMP-HCMC reported their "very bothersome" feeling more than the aforementioned populations (6.9%).

Interestingly, there were 55.5% of participants who experienced PV last month while driving. This implies the severity of PV might not be merely restricted in the "very bothersome" feeling. Some studies found that distracted driving is one of the important causes of traffic crashes [18]; especially, mobile phone usage accounted for about 9% [18]. There was an estimation of a fourfold increase in the risk of accident when the driver used a mobile phone prior to the crash [19, 20]. Particularly, a recent study found that the risk of crash or near-crash was as high as in "reaching for a cell phone" compared to in "dialing a cell phone" (odds ratio= 7.05 and 8.32 respectively) [21]. It is likely that when people experience PV while driving, they may possibly reach their cell phones for confirming their feeling and potentially increase their own risk of involving into a crash. However, further study to explore how much PV contributes to the risk of collision is necessary.

The previous study found that the life-time of psychotic experiences (i.e. hallucinations and delusions) in a well-functioning population was more nuanced than previously thought [22], suggesting that hallucinations are not always linked to serious mental illness. Regarding the high prevalence of PV in this study and likewise in others [2-6], PV may not be an indicator of a serious mental illness. From the responses of our selected population, PV was found to be independently associated with psychiatric disturbance measured by SRQ-20. Since SRQ-20 covers multidimensional factors of psychiatric disorders [8, 9] and has been used to investigate the general state of mental health in the community [15], it gives a more general result which can include symptoms of anxiety, stress, or depression rather than a specific psychotic disorder. This possibly explains the difference between present findings and previous ones [4, 7].

Regarding the emotional related factors, we found a significant association between PV and phone attachment. Tanis et al. also reported a significant association between PPS (including PV, phantom ringing, and phantom blinking) and phone addiction. Even though our terms and questions are different, both results imply a common feature that emotional dependency on a cell phone may contribute in explanations of PV mechanism. In addition, a significant number of participants experiencing PV last month reported that they were waiting for phone calls or messages prior to the advent of PV. Tanis and colleagues also found the need for popularity (NFP) is a strong predictor of PPS [6]. NFP is a personality trait which refers to the need for doing things in order to become popular [23]. A person with high NFP tends to engage in communication with others to form and keep update with relationships. Therefore, that person may have a greater desire to receive phone calls and messages. Phone attachment can be caused by the overuse of mobile phone. When an individual frequently needs to constantly use his or her phone in their daily life, the absence of electronic device may cause anxiety and/or a phenomenon called fear of missing out. Besides, stress and anxiety may interfere the functions of dopamine system and hypothalamic pituitary adrenal axis. This may result in some hallucinations of tactile and auditory sensories including phantom vibrations.

Furthermore, our study did not find the association between PV and either demographic data or phone usage features including mode of setting, location of devices, type of devices, and intensity of phone usage, which is contrary to previous studies [2, 11]. Rothberg et al. suggested that the cause of PV might come from the sensory stimuli within the body or from the surroundings of the participants [2]. Interestingly, our univariate analysis indicated that the location of devices was significantly associated with PV, but this relation became ambiguous when the device's location was put together with mental/emotional factors in multivariable analysis. This raises the possibility that the contrary between our findings and Rothberg et al.'s can be explained by their lack of controlling mental/emotional factors. The lack of significant relationsip between device location with PV in this study was in light with Lin et al.'s study [4].

Even though the study was carefully planned, there were some limitations potentially reducing the strength of our findings. Firstly, our target population was accumulated within a specific

setting, so our conclusions were applied only for students in Ho Chi Minh City. In addition, the response rate was not very high and the method for its calculation was based on the assumption that all members of six Facebook groups noticed the questionnaire of our survey. It is noted that Eysenbach et al. recommended the avoidance of response rate calculation for an online survey [10]. Moreover, conducting an online survey through Facebook groups potentially included multiple repeats of the same participant after a certain amount of time. In order to reduce the impact of this possibility, a careful data cleaning process for duplicate responses was undergone before we proceeded to final data analysis. Finally, it was difficult to elaborate on the causative relationship between mental/emotional factors and PV through a cross-sectional survey. Further investigation using cohort design is necessary to strengthen the results of the study as well as understanding the causative relationship.

5. CONCLUSION

The prevalence of life-time PV and last month PV among medical students of UMP-HCMC was 75.6%, and 49.7% respectively. This study found a high proportion of participants who experienced PV last month while they were driving. This implies the impact of PV possibly becomes significant, causing an increase in the risk of traffic accident due to distracted driving. The study also found a significant association between PV and mental/emotional related factors, including mental disturbance and phone attachment, which suggests an important role of mental/emotional factors in the explanation of PV mechanism.

ACKNOWLEDGEMENTS

We sincerely thank medical students from University of Medicine and Pharmacy, Ho Chi Minh City, Vietnam, who participated in this study.

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