

## REVIEW

# Phantom vibration and phantom ringing among mobile phone users: A systematic review of literature

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**Keywords**

mobile phone, phantom ringing, phantom vibration, ringxiety, technopathology

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Received 6 June 2014

Accepted 8 October 2014

DOI:10.1111/appy.12164

**Abstract**

The last decade has witnessed considerable interest in pathological conditions stemming from misuse or overuse of technology, a condition commonly referred to as technopathology. Of the several complaints reported, phantom vibration or phantom ringing is one that has not yet been widely explored. The objective of conducting a systematic review is to provide an understanding of the phenomena and summarize the research conducted so far. Major databases were searched and articles that matched the inclusion criteria were selected for final analysis. According to findings obtained, phantom vibration or phantom ringing was commonly experienced by mobile phone users; however, few found it bothersome and hence took no steps to eliminate it. As of now, literature in the area is limited and many aspects of the phenomena such as its prevalence across populations, causal factors, consequences, and treatment plans are yet to be studied. Also, a clinical criterion for identification of the condition needs to be formulated. With increase in the number of individuals reporting mobile phone-related problem behavior, phantom vibration, or phantom ringing may be expected to become a cause of concern for mental health professionals within some years. Finally, the need for further research is emphasized while presenting directions for future investigations.

For most individuals, going through an hour without looking at their mobile phones is unimaginable. Even when one is occupied with other important activities such as traveling, cooking, watching television, attending a lecture in the classroom, or even driving, individuals are constantly connected to others through various social media. This almost unbroken association with mobile phones has resulted in addition of a new term to the field of psychology and psychiatry. Ringxiety refers to the condition of hearing the mobile phone vibrating or ringing even when it is not. In scientific literature, ringxiety is also referred to as phantom vibration (PV) or phantom ringing (PR). It is understood to be similar to the sensations felt by individuals after the amputation of a part of the body.

The earliest reported research on this phenomenon was conducted by Laramie (2007) as a part of his doctoral dissertation in which the term “ringxiety” was coined by the researcher. The investigation

focused on the emotional and behavioral aspects of mobile phone usage in 320 adult mobile phone users, of whom two thirds reported their phone ring when it had not. Users often place such devices on vibrate mode in order to have telephonic access in public places where one is required to maintain silence such as in hospitals, libraries, and classrooms. Repeated use of the vibration mode may result in intermittent perception that the device is vibrating when in fact, it is not (Rothberg *et al.*, 2010). This systematic review is aimed at understanding the phenomena, summarizing the findings obtained so far, and providing directions for future research. A systematic review, according to Garg *et al.* (2008), allows the reader to gauge for themselves the quality of the review process and the potential for bias. This makes the review transparent provided that the authors are not influenced by preconceived notions. Attempting to summarize a less researched topic poses an interesting challenge. It

provides an opportunity to the reviewer to learn about a novel topic, sometimes discovering more questions than answers, and attempting to make the review as extensive as possible while maintaining a clear focus so that future researchers may find it useful.

## Methods

A literature search was conducted to look for articles from the earliest time available. The terms “ringxiety,” “phantom ring,” and “phantom vibration” were used as keywords in searching major databases such as EBSCOhost, Google Scholar, PsycINFO, PubMed, ScienceDirect, and Scopus. Results obtained were remarkably scarce. For instance, PubMed searches using the keywords phantom + vibration and then, phantom + ringing resulted in four search results each time, of which three were common. Initially, the search was restricted to these databases only. However when after the removal of duplicate items, very few papers remained, a Google search using the same keywords was conducted. The Google search led to a plethora of information some of which were related but not relevant such as research articles on tinnitus – a phantom auditory perception, and dependency on technological devices. Additionally, a variety of terms that were used to refer to the phenomena were discovered in informal reports, online magazines, newsletters, and newspaper articles; these included phantom ring effect, vibranxiety, hypovibrochondria, and fauxcellarm. Mahood *et al.* (2013) observe that while searching for grey literature can be challenging despite greater access through the Internet, search engines and online bibliographic databases, inclusion of such information can broaden the scope to more relevant studies, thereby providing a more complete view of available evidence. Moreover, “a comprehensive search is important not only for ensuring that as many studies as possible are identified but also to minimize selection bias for those that are found” (Akobeng, 2005, p. 847). Following this, names of researchers from articles found so far were added to the initially used search words, and these were used as new search words. This helped in detection of other unpublished or published work by the same author on the topic. Using multiple search methods helped to cover as many citations as possible. Once again, duplicate items were required to be identified and removed as use of different search approaches resulted in discovery of the same items through different sources. In one case, duplication was avoided when matching journal papers with conference papers, as both papers

had turned up in the search results. Authors were contacted to clarify doubts. All abstracts were reviewed and full original articles were retrieved from available sources. The reference list for all articles was searched to identify any other relevant article that may have been excluded during earlier searches.

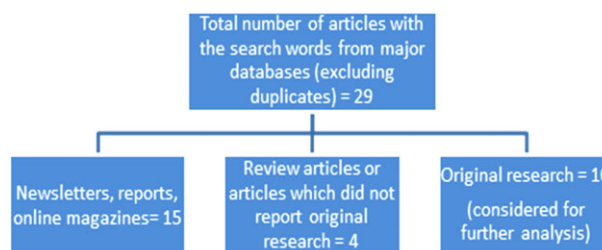
A total of 29 articles that reported research identified by the keywords were discovered. These included articles on the consequences of mobile phone use where PV/PR was mentioned as one of the health hazards. If PV/PR was not included as one of the variables measured in the research, then the study was excluded from further analysis. Following this criteria, four articles including review papers were discarded. Of the remaining papers, 15 were from informal reports, newsletters, or online magazines (Fig. 1).

Finally, 10 papers that reported original research were considered eligible for further analysis. The focus of six investigations were PV/PR; whereas the remaining four studied consequences of mobile phone use where participants reported if they experienced PV/PR, among other conditions (Table 1).

The shortlisted studies were then analyzed, focusing on the objective of the study, participant description, findings, and limitations of the study.

## Results and discussion

The 10 studies selected for the review were conducted in four countries – India, Iraq, Taiwan, and the United States. Although six of these studies looked into the



**Figure 1.** Article identification process.

**Table 1.** The 10 papers considered eligible for further analysis

Original empirical articles published on ringxiety/phantom vibration/phantom ringing	7
Research report from a study conducted at a premier university	1
Dissertation on emotional and behavioral aspects of mobile phone use	1
Conference presentation	1

phenomenon of ringxiety directly, the objective of the remaining investigations was to study the psychological aspects of mobile phone use of which ringxiety was one of the reported conditions. Apart from information on prevalence of PV/PR in the sample, investigators also reported information on factors related to pattern of mobile phone usage, personality of the users, and consequences of ringxiety including experience of symptoms. The summary of these findings is discussed below.

## Participants

One of the most striking facts about the literature reviewed was that a large proportion of these studies had recruited students and medical professionals as participants. Six out of 10 studies were conducted on either medical students or staff, one study focused on psychology students, whereas the remaining studies investigated adults, many of whom were university students. The strong emphasis on student participants may have been a result of earlier research suggesting that age (younger) predicts the frequency of mobile phone use. According to Bianchi and Phillip (2005), older mobile phone users are not expected to spend as much time on their mobile phones as younger users, or to experience as many mobile phone-related problems. Also, younger individuals are technically more aware, and better able to use their mobile applications as compared with their older counterparts. This may lead to the assumption that a younger person's attachment with the phone could be greater than an older adult's attachment with their phone, and therefore, the former may be more prone to experiencing psychological or physiological effects associated with mobile phone usage. Another important observation here was that many investigators studied medical students or staff. This may be due to the reason that the medical profession is not only a highly stressful place to work in, but also because the mobile phone plays an important role in connecting medical professionals in emergency situations. Rothberg *et al.* (2010) note that due to the demands of their profession, those working in the medical field are expected to carry an electronic communication device. Being available on phone more regularly than those in non-medical professions make them an important subject for study.

## Prevalence of PV/PR

Findings from the studies reviewed showed that most participants reported PV/PR. Six investigations reported in percentage the proportion of individuals

who had experienced PV/PR. This statistic ranged between 27.4% and 89%. The data were unavailable for the remaining studies. Although the earliest reported study on ringxiety found two thirds of the sample experiencing PR (Laramie, 2007), the highest statistic of 89% was reported by 290 undergraduates in Drouin *et al.*'s (2012) study who experienced PV about once every two weeks. Of the 200 adults who participated in Saaid Al-Ani *et al.*'s (2009) study, 73% reported experiencing ringxiety from time to time, whereas 4% reported frequent ringxiety. Similar data were reported by Catchings *et al.*'s (2010) study on 130 university students where 71% of phone users had experienced PRs. Studies conducted on medical students or staff yielded similar findings. For instance, two separate studies by Singh *et al.* (2013) and Subba *et al.* (2013) on medical students in India reported almost similar statistics with around 35% of participants reporting PV/PR in each investigation. Most participants admitted to patting their pockets to check for their phones from time to time (Singh *et al.*, 2013), and a large number of them were likely to use their phones at restricted places like classrooms (99%) and libraries (60.3%) (Subba *et al.*, 2013). These findings were confirmed by Lin *et al.* (2013a; 2013b) where both PV and PR was reported by medical students.

## Diagnostic criteria of PV/PR and its assessment

There appears to be a lack of well-researched diagnostic criteria for PV/PR. Studies conducted so far were found to employ self-report questionnaires that inquired how frequently participants experienced PV/PR and to what extent they were disturbed by it. Although some findings indicate that PV/PR could be related to a certain pattern of mobile phone usage (Subba *et al.*, 2013), investigators are yet to come to an agreement about this.

The word addiction is commonly used in non-medical settings to describe nonsubstance-related behavioral disorders that "show some similarities to substance use disorders and gambling disorder" (American Psychiatric Association, 2013, p. 796). Griffiths (1996) operationally defines technological addiction as a behavioral addiction that involves human-machine interaction and is nonchemical in nature. Regardless of whether the excessive use of technology can or should be labeled an "addiction," researchers have found some evidence to cite that such behavior can be deemed problematic (Bianchi and Phillip, 2005). The researchers add that such evidence serves as a useful starting point for an

examination of problem behaviors including problem mobile phone use.

The Diagnostic and Statistical Manual, 5th Edition (DSM-V) and International Classification of Diseases, 10th Edition (ICD-10) do not include any mobile phone-related disorders including PV, PR, or addiction to mobile phones. Although gambling disorder is the only nonsubstance-related disorder categorized by the DSM-V, Internet gaming disorder has been listed under Section III of the DSM-V highlighting the requirement for further studies for it to be considered as a disorder (American Psychiatric Association, 2013).

The symptoms commonly reported by those addicted to mobile phones include a sense of loss of control and withdrawal symptoms when away from their phones (Walsh *et al.*, 2010). This is similar to symptoms associated with substance-related disorders. Cassidy (2006) argues that there are similarities between young people's mobile phone use and other addictive behaviors such as smoking. However, diagnosis of such addictions is made difficult by the lack of physiological indicators and visible signs of discomfort (Walsh *et al.*, 2008). As of now, behavioral addictions including "sex addiction," "exercise addiction," or "shopping addiction" are not included in the DSM-V due to "insufficient peer-reviewed evidence to establish the diagnostic criteria and course descriptions needed to identify these behaviors as mental disorders . . ." (American Psychiatric Association, 2013, p. 481). Thus, more evidence on tolerance, withdrawal, attempts to control addictive behavior, and impairment in normal functioning is required in order to formulate criteria for diagnosis of technology-related addictions and associated problems such as PV/PR.

### Pattern of mobile phone use and PV/PR

Investigators have attempted to identify a pattern of mobile phone use that may be associated with the phenomenon. In doing so, they focused upon factors including hours spent on calls and Short message service (SMS), kind of ringtone used, and location of the phone in the user's pocket. Although Catchings *et al.* (2010) found no significant statistical relationship between ringxiety and the amount of mobile phone use, some investigations conducted later reported contradictory findings. A total of 112 medical staff in Rothberg *et al.*'s (2010) study reported that although most of them ( $N = 68$ ) began experiencing PV after carrying the device for between 1 month and 1 year, 18 participants experienced them after less than a month, and 26 did not experience them until

they had used the device for a year or more. Of those who experienced it, most (87%) felt the PV either weekly or monthly; the rest experienced them on a daily basis. Four factors independently associated with PV were identified: occupation (resident versus attending physician), device location (breast pocket versus belt), hours carried, and frequent use in vibration mode. However, Lin *et al.*'s (2013a) study could not replicate the results indicating that carrying a mobile phone in the breast pocket is a risk factor for PV/PR. Also, they found no statistically significant difference in the severity of PV between those who used their phone on both vibrate and ring mode versus those who used it only on ring mode.

Another study on medical students experiencing ringxiety also reported frequent mobile phone usage, even using their phones in restricted places (Subba *et al.*, 2013). For instance, investigators reported that medical students who reported ringxiety were significantly more likely to be using mobile phones in the classroom, with 99.1% of them doing so, as compared with 93.5% among the no-ringxiety group. Similarly, use of phones while eating was also significantly more among the ringxiety group at 72.8% as compared with 61% among the no-ringxiety group. A high proportion of those who reported ringxiety also admitted to using their mobile phones while driving, as compared with the no-ringxiety group; however, this difference was not statistically significant. Those who experienced ringxiety also spent more money on their mobile phones with 23.9% of them having had to borrow money from friends for mobile phone-related expenditure; compared with 11.4% of participants who did not report ringxiety. However, it was interesting to note that the number of hours spent on phone per day did not differ significantly between the ringxiety and no-ringxiety group. This was contradicted by the findings of Saaid Al-Ani *et al.* (2009) and Rothberg *et al.* (2010) where the sensations were linked to frequency of use. Additionally, Saaid Al-Ani *et al.* (2009) also found no associations between ringxiety and age, education, type of ring tone, or SMS usage. Similarly, gender and the location in which the interns keep their phones were not found to be related to the prevalence of PV/PR in Lin *et al.*'s (2013a) study on medical interns. However, the investigators found that the use of vibration mode increased the odds of PV, but not PR.

Few investigators so far have sought to explore personality variables in this context. Drouin *et al.* (2012), who were studying undergraduates, found that those higher in conscientiousness experienced PV less frequently. This study also revealed that those who had strong emotional reactions to text messages

were more bothered by PV. Parisi (2013) suggested that PV may have links with the conscientiousness as well as neuroticism, extraversion, and text message dependency. In Lin *et al.*'s (2013a) study, medical interns with PR obtained significantly higher scores on the novelty seeking subscale of the Chinese version of the tridimensional personality questionnaire, than those without PR. However, there was no difference in harm avoidance and reward dependence. Also, scores on tridimensional personality questionnaire were not related to the prevalence of PV/PR. Medical students who experienced ringxiety also reported using their phones at restricted times and places and getting very upset if there was inaccessibility (Subba *et al.*, 2013). As a result of limited findings on personality and ringxiety, there is inconclusive evidence on why some individuals experience PV/PR and others do not.

### Association with stressful experiences and clinical symptoms

Some investigations explored if there was a relationship between PV/PR and stressful experiences and if those experiencing PV/PR also reported clinical symptoms. Lin *et al.* (2013a) designed a cohort study to investigate PV and PR during the medical internship year in Taiwan. This setting was chosen because the age, lifestyle, and educational background of medical interns are similar and "a medical internship provides a rare instance in which the onset of a major stressor can be predicted for a defined population" (p. 6). Incidence of PV and PR increased significantly during the internship and both decreased considerably from their baseline levels 2 weeks after the internship ended. They explain that while the internship demands that the participants work approximately 86.7 hours a week, including 33.5 consecutive work hours, which they do not have before the internship, they also get a short period of free time after internship during which the assessments were done while the participants were not working. However, scores on personality, depression, and anxiety measures were not related to the prevalence of PV/PR. The researchers claim that PV and PR are entities that are independent of anxiety or depression and that internship-related stress might have simultaneously increased the interns' anxiety, depression, and hallucinations. Furthermore, no significant correlation between PV/PR was found. A similar attempt by Lin *et al.* (2013b) revealed that, compared with interns with subclinical PV and PR, interns with severe PV and PR had higher subjective and somatic anxiety and somatic depressive scores at any time point throughout the internship. While

interns with severe PV/PR had more somatic depression, only those with severe PR had more cognitive/affective depression.

These results have found support from studies on clinical symptoms associated with the use of technology. For instance, Rosen *et al.* (2013) found that younger individuals are more anxious than older ones and most anxiety (moderate and high anxiety) appears to be related to not being able to check text messages, followed by phone calls, and then personal email and social networks.

While many participants in the studies reviewed reported either PV/PR or both, not all individuals who experience them are disturbed by it. Of the medical staff who experienced PV in Lin *et al.*'s (2013b) study, 93% reported the sensation to be not at all or only a little bothersome. However, the remaining 7% reported it to be bothersome or very bothersome. Similar results were reported by Drouin *et al.*'s (2012) sample, in which few of whom found PV bothersome. Similar results were reported by Rothberg *et al.* (2010) who testified that most respondents in their investigation found the sensations to be only mildly annoying, only 2% described them as very bothersome.

PV/PR has been reported to hamper day-to-day activities in some cases. This was reported by the medical students who participated in Singh *et al.*'s (2013) and Subba *et al.*'s (2013) study. While participants in the first study reported decline in academic performance after having acquired a mobile phone, the latter investigation found that a significantly large proportion of the sample who experienced ringxiety also complained that their studies were being hampered.

Students at the University of Maryland, College Park stayed "media-free" for 24 hours and later blogged about their experience to understand participants' consumption of media and how they reacted to the absence of it. The students observed that their phones "feel like a part of me" (24 Hours: Unplugged, n. d., p. 11), resulting in hallucinations that their phones were in their pockets even when they were not. They reported reaching into their pockets for their vibrating phone, even when they knew it was switched off and kept away. This happened several times throughout the day even when they were involved in academic activities in the library or classroom. These disturbing ringxiety sensations made the students realize that they were "so dependent on these inanimate objects" (24 Hours: Unplugged, n.d., p. 11). Additionally, ringxiety might also cause discomfort or loss of concentration during driving or while using dangerous machinery (Saaid Al-Ani *et al.*, 2009).

## Causes behind PV/PS

Most studies conducted so far have been of an exploratory nature, attempting to outline the prevalence and features of the phenomena. There have been comparatively less explorations into the causes behind PV/PR (Rothberg *et al.*, 2010). Drouin *et al.* (2012) observed that PVs have been described as either sensations and perceptions, or sometimes both by researchers. However, the researchers opine that the term sensation may not be appropriate as the vibrations that are experienced as a result of sensations are phantom. Therefore, PV/PR may be more suitably described as perceptions that involve the interpretation of sensory stimuli. Rothberg *et al.* (2010) suggested that PV may result from a misinterpretation of incoming sensory signals by the cerebral cortex. That is, if the brain is anticipating a call, it misinterprets other sensory input such as pressure from clothing or muscle contractions as the phone vibrating. Similarly, auditory hallucinations of mobile phone ring tones also occur, where other music may be misinterpreted as one's mobile ringtone.

In attempting to answer why younger people experience it more commonly than older people, Rothberg *et al.* (2010) propose that neural plasticity of younger individuals may make them more susceptible to imagining vibrations. Also, medical staff and students are very likely to receive calls or messages that require urgent attention, as a result of which, they may be on high alert for any related stimulus. This is similar to situations where new mothers imagine their babies crying and check on them when in fact the babies are actually sleeping. This is because they are always vigilant for any cues related to the baby (Dennis, 2007; Saaid Al-Ani *et al.*, 2009; Rothberg *et al.*, 2010). This may be the reason why there is a high prevalence of PV among this sample as reported by different studies (Saaid Al-Ani *et al.*, 2009; Rothberg *et al.*, 2010; Lin *et al.*, 2013b; Singh *et al.*, 2013; Subba *et al.*, 2013). The vigilance factor has also been supported by Lin *et al.* (2013a) who declare that in some circumstances, hallucinatory experiences are extremely common and may be aggravated by stress. Thus, a high degree of expectancy during a state of hypervigilance or conditioning to such situations may lower the threshold for hallucinations. Parisi (2013) summarizes that hallucinations can signify the desire for constant social contact, or dread and anxiety in anticipation of an incoming message.

## Treatment of PV/PS

Few investigations also attempted to explore whether participants attempted to stop PV/PR; and if yes, what techniques were employed for the purpose. Only 61% of those who experienced PV/PR in Rothberg *et al.*'s (2010) study attempted to stop it as most individuals did not find it too bothersome. One of the methods that was most successful was relocation of the device. The researchers explained that moving the source of the vibrations interferes with the brain's creation of a sensory memory for that particular location. Also, the sensations, which were associated with frequency of use, seemed to disappear if not reinforced. Some reported that they refrained from using the phone in vibrate mode to avoid PV; this technique however did not work for all (Rothberg *et al.*, 2010).

## Dependence on mobile phones

Any discussion on the phenomena of PV/PR is incomplete without reference to mobile phone dependency. Rosen (2012), in his book *iDisorder*, summarizes how technology has taken over our lives in so many ways, citing examples from various areas. For instance, he notes how new words in the New Oxford American Dictionary from 2008 to 2010 are mostly technology-related such as unfriend and intoxicated in 2009 and retweet and webisode in 2010. Of late, the focus of several studies has been mobile phone dependency specifically among adolescents and young adults. Investigators in the area have unearthed valuable information regarding mobile phone behavior such as individuals perceiving a loss of control and withdrawal symptoms when away from their phones (Walsh *et al.*, 2010), and using it not only for communication, but also for other purposes such as keeping track of time and setting reminders (24 Hours: Unplugged, n. d.; Walsh *et al.*, 2010). Mobile phones are also commonly used by youngsters for taking photographs, listening to music, surfing the Internet for quick information, and checking emails. Rosen (2012) remarks that we cannot perform even simple activities without first consulting the Internet.

Walsh *et al.*'s (2011) study identified a trend, suggesting that mobile phone involvement was related to the participants' need to belong. This was confirmed by Chen and Katz (2009) as well. They reported that for many young students, the mobile phone is necessary to share experiences, fulfill family roles, and draw emotional support. The phone has been described as an "umbilical cord" (Spungin, 2006, as cited in Chen and Katz, 2009) and the term "remote mothering" has

been used to refer to the process of parental interaction style that mothers often use (Rakow and Navarro, 1993). Such over-reliance over phones and other devices leads individuals to believe that they cannot function without them (Moeller *et al.*, 2012) and they experience high stress levels when there is loss of connectivity (Singh *et al.*, 2013; Subba *et al.*, 2013). This may lead to serious psychiatric and psychological problems including ringxiety (Singh *et al.*, 2013). This is confirmed by the fact that articles on mobile phone use and clinical symptoms have frequently mentioned ringxiety (Catchings *et al.*, 2010; Kumar, 2010; Moeller *et al.*, 2012; Rosen *et al.*, 2013).

### Limitation

This review included only original research published in the English language. As a result of this, some studies published in other languages may have been omitted. Considering the study designs, objectives, and outcomes of the studies included in the review, conducting a meta-analysis was not considered appropriate.

### Future directions

Investigation into PV/PR is still in its nascent stage and although some valuable information has already been discovered, there is however a lot that is yet to be understood. Most importantly, there is a need to develop formal criteria for diagnosis of the condition. With the rise in mobile phone usage, it may be helpful to collect information that can be used in proposing criteria related to technology addictions for future editions of the *DSM*. In addition to discovering the determinants of PV/PR, future studies should also focus on people of different age groups as data presently available are mostly from studies on young individuals. Most investigations have focused on identifying features of PV/PR; there has been comparatively less emphasis on causal factors including environmental and personality variables. A vital agenda for researchers would be to build a profile of individuals who are more prone to PV/PS as compared with others. Preliminary reports seem to suggest that an individual's over-involvement with their mobile phone may be a contributor to the problem. In this context, it may help to understand the characteristics of those people who may develop an over-involvement with the device (Walsh *et al.*, 2011). This receives support from Drouin *et al.* (2012) who suggest that targeting individuals' emotional reactions to text messages might be

helpful in combating the negative consequences of both text message dependency and PV.

All studies reviewed used self-reported measures; hence, there is a possibility of erroneous estimation of the frequency or severity of PV/PR. The investigators have acknowledged the importance of more objective methods apart from self-reported information to understand the mechanism (Rothberg *et al.*, 2010; Lin *et al.*, 2013b). Participants were usually told that the study was on general behaviors related to mobile phone usage. The probability of wrongly estimating PV/PR could have increased if the participants were told the real purpose of the study or happened to find that out during the study.

It is important to develop treatment plans for those who are already experiencing it and avoidance plans for those who may be prone to it. Medical research on tinnitus, a condition of auditory phantom perception suggests that many individuals who experience it also seem to suffer from auditory dysfunction such as hearing loss and vertigo (Moller, 2007). This may be a major area of concern for researchers studying PV/PR. In many cases, controls were not used and most investigations were focused on studying the phenomena at a certain point in time. Few used longitudinal design and conducted follow-ups to assess the increase or decrease of this hallucination. Because the use of mobiles and perhaps the behaviors and consequences associated with it is now a matter of global concern, development of pathological relationships with mobile phones and other technological devices is on the rise. According to Rothberg *et al.* (2010), even if two thirds of mobile users develop PV, the global impact is still substantial. Hence, it is high time that it is given priority for further research and intervention (Subba *et al.*, 2013).

### Conclusion

Findings suggest that PV/PR is commonly experienced by regular mobile phone users. Most studies have found a link between regular mobile phone usage and PV/PR. There is also some evidence to indicate that stressful experiences coupled with vigilance may be a determinant factor. However, information is limited by the paucity of data on this topic. Research so far has shown that although many people have experienced PV/PR, few find it bothersome. Perhaps it is for this reason that this is still not considered a high-impact area for research. With time, future researchers are expected to throw light on yet unexplored aspects of

the phenomena specifically with regard to diagnostic criteria, prevention, and treatment.

## Acknowledgment

This research received no specific grant from any funding agency.

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