ADAPTATION OF SMARTPHONE ADDICTION SCALE

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Date received: 23/05/2019, date revised: 21/06/2019, date accepted: 26/06/2019

Abstract

In many youth communities in the world, the misuse of smartphones leads to 'smartphone addiction', creating mental health concerns. This research aimed at studying the smartphone addiction among the youth and to test the adapted scale by measuring the gender wise difference in smartphone addiction. The steps followed in the study include item development, data collection and psychometric evaluation. The researchers developed a 24-itemstool on scientific rationale by adapting few existing tools, considered ideal for the assessment of smartphone addiction. The adapted tool is considered comprehensive as it can be used for various measurement purposes. The study found that there exists significant difference in smartphone addiction between males and females wherein males have higher level of smartphone addiction according to the adapted tool.

Keywords: Addiction, behavioural addiction, smartphone addiction, adaptation

1. Introduction

Smartphones have granted immense convenience to the present society. In the past few years, the popularity of smartphones has multiplied manifold around the globe. Latest statistics how that more than half of the mobile phone subscribers use smart phones, and the number is growing. Thus, digital communication is now all pervasive and digital devices have become part of daily lives. However, the use of smartphones has in many situations acquired what is known as 'pathological use'. This pathological use, known as 'smartphone addiction', is creating a new mental health concern of serious dimensions among communities (Kim, et al., 2012; Kwon, et al., 2013).Such addictive behaviours could lead to panic type situations when they are prevented from using smartphones (Haverlag, 2013).

Though this phenomenon is new, it is estimated that around 46 per cent of smartphone users are in some form of addiction (Intermarketresearch, 2013). Evidences suggest that smartphone addiction leads to various clinical features such as intolerance, withdrawal symptoms, salience, mood modification, craving, loss of control, and so on. Health policy makers globally are concerned about the rapidly emerging issue of smartphone addiction (Davey and Davey 2014). Though prevalent globally, and is causing concern to the society, research data is scarce about this new behavioural addiction (Griffiths, 2000), and not much tools exist in India to assess smartphone addiction. The present study takes the form of adaptation of available tools developed in the area, instead of constructing a new one.

2. Objectivesof the study

Delgado-Rico, Carretero-Dios &Ruch (2012) stated that it is possible to enrich the adaptation of tools by "creating new items based on the definition of the original construct". This process helps in adapting to the new context. In addition, it helps in broadening the view of validity through involvement of a variety of samples and items. Delgado-Rico, et al. (2012) is of the opinion that as in the case of construction, adaptation processes also require reviewing the theoretical aspects of available scales and presenting the relevant information about the definition of the construct and related items.

This study was conducted with 131 samples statistically selected from among the population of smartphone users in Kerala, India, as the region is highly populated while people are educated. The primary objective of the study is to validate the adaption of available smartphone addiction tools following the steps of items and data collection, scale development and evaluation. The secondary objective is to find out the gender wise difference in smartphone addiction. The following section presents the review of related literature in the area.

3. Review of literature

3.1 Addiction

Defining behavioural addictions, including smartphone addiction, is a tough proposition (Al-Barashdi, Bouazza and Jabur, 2015), since addictions are related to physical, psychological and social aspects (Douglas, et al., 2009; and Griffiths, 2000).The term 'addiction' has a long history of being associated with alcohol or drugs abuse. Addiction could include losing self-control, such that individuals having addiction lose control of their behavior. Now, it is widely accepted that addictions are not limited to drugs or alcohol (APA, 2001). According to APA (2001) in addition to substances, people can develop addictions to specific

behavioural patterns. WHO (1964) defines addiction as "dependence, as the continuous use of something for the sake of relief, comfort, or stimulation, which often causes cravings when it is absent". Lee, Ahn, Choi and Choi (2014) defined smartphone addiction as "the excessive use of smartphones that interferes with the daily lives of the users".

The origin of addiction is based on the "positive reinforcement of a substance or action, the time between consumption or action, and the physiological response" (Carbonell, Oberst, &Beranuy, 2013). When there is a strong and positive reinforcement, the action becomes more addictive. Elaborating on the sequence of events that leads to addiction, Martin, Kamins, Pirouz, Davis, Haws, Mirabito, Mukherjee, Rapp & Grover (2013) stated that these addictions do not happen overnight, and could occur via a process. It normally begins with a seemingly benign behaviour like shopping, cell-phone use, etc. This could result in psychological, biophysical, and/or environment triggers that may eventually become harmful and result in addiction (Grover, Kamins, Martin, Davis, Haws, Mirabito, Mukherjee, Pirouz& Rapp, 2011).

3.2 Smartphone addiction

Oulasvirta, Rattenbury, Ma & Raita (2011) opined that smartphone addiction starts with the so called 'negative checking habits'. This involves automatic actions, and the phone is checked for notifications frequently. This could interfere with the daily life. In the event of there being a new message or notification, the checking becomes rewarding. Such rewards could encourage repeated actions (Everitt & Robbins, 2005) and the resultant habit. Thus the usage could become habits through repetitions, and stimulation from various applications (Bolle, 2012).According to Carbonell, Oberst, &Beranuy (2013) smartphones have various types of gratifications, which could possibly make a strong and positive reinforcement in its users. This positive reinforcement could take the form of pleasurable experiences. A number of unique gratifications delivered by smartphones, and those which have the possibility of causing positive reinforcement by its users have been listed by Carbonell, et al (2013). They include euphoria, instrumental function, identity and status symbol, social networking, dependency, feeling of control, entertainment, expression of feelings, etc.

When people are overly engaged in the use of smartphones, there is the propensity to neglect many other areas of life. In such a situation, smartphone addiction occurs (Al-Barashdi, Bouazza and Jabur, 2015).However, smartphone addicts may not exhibit any symptomslike cravings. They would continue to work normally, and in most occasions in a socially acceptable manner (Griffiths, 1996; Lemon, 2002). It can also have negative influences on a variety of aspects of individuals like financial, physical, psychological, and social (Young, 1999).

3.3 Consequences of smartphone addiction

Among adolescents, smartphone addiction is found to have increased the risk for severe psychopathologies, and impact social and health aspects (Brauser, 2013).It could also lead to a host of problematic behaviours like attention deficits, aggression, etc. Rush (2011) found that smartphone addicts of developed countries had problems in their family, vocational and social lives. Smartphone addiction can also seriously affect sleep cycles (Khan, 2008).Some of the addiction symptoms include considerably reduced levels of tolerance, withdrawal, attention span, as well as complete inability to reduce the use (Al-Barashdi, et al., 2015). It could also lead to a host of behavioural obsessions (Walsh, White, and Young, 2008). According to Walsh, White, and Young (2008) smartphone addiction could lead to certain behavioural symptoms that could lead to conflicts, intolerance towards others and withdrawal.

Another conclusion of the study was that, the students were so addicted that they tend to develop various behavioural obsessions. Chóliz (2012) listed the problems with parents, conflict with parents, reduced time for other activities, emotional instability etc., as repercussions when the mobile phone is blocked from use. A partly similar finding was observed by Park (2005). He found that when the usage of the phone was blocked, addicts tend to be anxious and irritated. Shambare, Rugimbana and Zhowa (2012) are of the opinion that though smartphones have become the 21st century's icon, its usage has become addictive, compulsive and habitual. They identified it as "possibly the biggest non-drug addiction of the century".

3.4 Addiction and academic performance

Does smartphone addiction affect academic performance? This was examined by a number of social scientists (Cheon, Lee, Crooks & Song, 2012; Javid, Malik &Gujjar, 2011; Markett, Sánchez, Weber & Tangney, 2006; Monk, Carroll, Parker &Blythe, 2004; Palen, Salzman, &Youngs, 2001). The results provide a mixed picture. While Javid et al. (2011) and Markett et al. (2006) observed positive effect due to smartphone usage, many others differ with this. For instance, the opposite of the above results, i.e. reduced academic performance, was observed by Kubey et al. (2001), Monk, et al. (2004),Palen et al. (2001) and Sheereen and Rozumah (2009).Recent findings of Al-Barashdi, et al. (2015) also corroborated these findings.

3.5 Addiction and demographics

There are adequate studies that have identified the effect of demographics on mobile addiction. Pawłowska & Potembska (2012) found that males and females use smartphones differently. Lee, et al (2014) observed that women involve in

conversations for a longer time. Jedy (2008), in a Jordanian sample, found that the percent of addicted females was twice that of males. This was also confirmed by Hong, Chiu, and Huang (2012) in a Taiwanese sample. Higher smartphone dependence was observed by Chóliz (2012), often leading to economic and family problems. Another interesting finding was that girls use them to tide over uncomfortable mood states. Restraining them often led to ill feelings (Chóliz, 2012). Another study by Satoko, Masahiro, Aki, Rei and Kanehisa (2009) found that addicted females had higher levels of neuroticism, and led an unhealthy lifestyle. A strong association with social anxiety among female smartphone addicts was found by Jenaro, Gomez-Vela, Gonzalez-Gil &Caballo (2007). Age has significant association with smartphone habits and smartphone addiction. CBS (2013) confirmed that young people and adolescents are heavy users of smartphones. Despite its recent origins, smartphone addiction has been widely researched.

3.6 Tools used for the study

Research in the area of smartphone addiction is less than a decade old. However, a review of related literature revealed that there exists considerable number of tools that measures the construct. A few prominent among such tools are presented in Table 1.

Table 1 Tools for smartphone addiction

No	Author	Name of scale	Factors	No. of items
1	Koo (2009)	Cell Phone Addiction Scale (CPAS)	3 factors – Withdrawal /Tolerance, Life dysfunction and Compulsion or Persistence	20 (five point scale)
2	Kim, Jung, Lee, Kim, Lee, Kang, Keum, & Nam (2012).	Smartphone Addiction Proneness Scale for Adults: Self-Report	4 factors – Interference, Virtual world, Withdrawal, and Tolerance.	15 (four point scale)
3	Kwon, Lee, Won, et al., (2013)	Korean Smartphone Addiction Scale (K-SAS)	6 factors – Daily-life disturbance, Positive anticipation, Withdrawal, Cyberspace-oriented relationship, Overuse, and Tolerance	33 (six point scale)
4	Lopez-Fernandez, Honrubia-	MPPUSA scale	6 factors – Tolerance, Escape from problems, Withdrawal, Craving,	26 (ten point scale)

	Serrano, Freixa-Blanxart, & Gibson (2014)		Negative consequences, and Social motivations	
5	Roberts, Yaya and Manolis (2014).	Manolis/Roberts Cell Phone Addiction Scale (MRCPAS)	One factor	4 (seven point scale)
6	Tossell, Kortum, Shepard, Rahmati and Zhong (2015)	Smartphone Addiction Measurement Instrument (SAMI)	3 factors – Inability to control craving, Feeling anxious and lost, and Withdrawal/escape	15 (five point scale)

Most of the above instruments have been tested and validated in countries like Korea, Netherlands, USA etc. A scientifically prepared instrument, constructed and validated in India is hard to find. The present work is an attempt to fill this gap in literature.

4. Adaptation and validation of the scale

A number of classical studies have presented the scientific processes that facilitate construction or adaption of empirically strong measures (Clark and Watson, 1995; Kumar & Beyerlein, 1991; Hinkin, 1998; Schwab, 1980). While the steps suggested by Kumar & Beyerlein (1991) include item construction, selection, reduction, reliability and validity; Schwab (1980) suggested three basic stages–item generation/development, scale development and psychometric evaluation. The present study has closely followed the steps suggested by these pioneers. The steps taken to develop this tool include item development, data collection, scale development, and evaluation. Throughout the analysis, the suggestions of Clark and Watson (1995) were closely followed i.e., creating a valid measure of the underlying construct, beginning with a clear conceptualization of the target construct and achieve unidimensionality rather than internal consistency. Factor analysis was used to ensure the unidimensionality and discriminant validity of scales.

4.1Creation of items pool

Based on Hinkin's (1998) guidelines for tool development, a broad pool of initial survey items was created. The items have been gathered from existing tools (Table 1) that measure smartphone addiction with some modifications to suit Indian smartphone users. The items in the earlier tools ranged from a minimum of four (Roberts, Yaya and Manolis, 2014) to a maximum of 33 (Kwon, Lee, Won, et al., 2013). There was wide difference with respect to the number of

factors too. It ranged from a single factor (Roberts, Yaya and Manolis, 2014) to a maximum of six (Kwon, Lee, Won, et al., 2013).

Deciding on the number of items is of paramount importance, as the scale length dependent on the number of items could be a determinant of the quality of responses (Sulphey, 2016). Towards this, due consideration should be provided to a host of aspects. Hinkin (1995) is of the opinion that the length of the scale is important to be considered. According to him, too long or short scales would present potentially "negative effects on results". While Anastasi (1976) and Schriesheim & Eisenbach (1991) are of the opinion that maintaining the scale sufficiently short is an effective way of dealing with problems arising out of demands in terms of time, and minimizing response biases that could occur as a result of boredom and fatigue. Hinkin (1995), Kenny (1979) and Nunnally (1978) opined if there are too few items the tool could result in lack of content as well as construct validities, internal consistency and reliability. However, there are contra views too. Cook, Hepworth, Wall &Warr (1981) is of the opinion that internal consistency and reliability is possible with minimal items – even as low as three items. In line with this opinion, Carmines & Zeller (1979) stated that increasing the number of items indefinitely has decreasing impact on the reliability.

There is no difference of opinion regarding the need for adequate domain sampling and parsimony which would help in obtaining content and construct validities (Cronbach and Meehl, 1955). According to Hinkin (1995) proper scale length has the twin advantage of being capable of minimizing a host of response biases, and at the same time guaranteeing internal consistency and reliability. In the present work all these aspects have been closely considered and care has been taken to ensure that the scale length is neither too short nor too long. During creation of item pool, with a view to have content validity; domain and item identification were done based on earlier literature and tools (Kim, et al., 2012; Kwon, et al., 2013; Lopez-Fernandez, et al., 2014; and Tossell, et al., 2015), and discussion of experts in the academia. A scale will have content validity only if the items accurately represent "the thing being measured" (Vogt, 1993). Great care was exercised in this direction and the stipulations of Bearden, Netemeyer & Mobley (1993) were closely followed, as content validity is considered as an aspect of expert judgment, and not a statistical property. Items were identified based on the need for required domain sampling, as well as parsimony. Content and construct validity may not be possible in the absence of this (Cronbach & Meehl, 1955). A total of 25 items were thus selected into a pool at this stage. Refining of the pool resulted in the elimination of one item which was double-barrelled.

Another important area that requires care and caution is face validity. A tool has face validity if it looks clear, well-organized, and is understood by the respondents as desired. During the preparation phase due importance was provided so as to have face validity for the tool.

4.2 Scaling

According to Hinkin (1995), a scale should generate enough variance among the respondents. Without this, statistical analysis would be impossible. Normally, Likert-type scales use response options that range between three and 10. Lissitz & Green (1975) have found that Coefficient alpha with Likert-type scales increase up to five points, and subsequently level off. Considering Lissitz & Green's (1975) suggestion the present study used a five-point scale.

4.3Data collection

The sample sizes should be adequate to conduct tests of statistical significance (Hinkin, 1995). Though larger sample is ideal for using powerful statistical tests, with the increased likelihood of obtaining statistical significance (Stone, 1978), collection of large samples is costly in terms of both time and resources. However, adequate sample size for factor analysis has been a matter of serious discussion (Hinkin, 1995; Hoelter, 1993; Rummel, 1970; Schwab, 1980; Viswanathan, 1993). While Schwab (1980) recommended item-to-response ratio of 1:10, Rummel (1970) suggested 1:4. Hoelter (1993) suggested 200 as the minimum acceptable sample size, and Hinkin (1995) put it at 150. There is no uniformity in this aspect, as quite a few studies have used less than 100 samples (Hinkin, 1995). Viswanathan (1993) made use of 90 and 93 samples for 20 items.

In the present work, the recommendation of Rummel (1970) has been followed. The graduating students of Arts and Science colleges in Kerala state constitute the population. From this infinite population, based on the pre-test, a sample size of 131 was arrived, statistically. The primary data was collected from the selected samples. The questionnaire was administered directly to volunteers, who were willing to participate and give information. The demographic profile of the respondents is given in table 2.

The mean age was found to be 18.57 years, and standard deviation .68. The minimum and maximum ages are 18 and 21 years respectively. There were 58 males and 73 females. The use of smartphone ranged from six months to seven years. The average period of use was 1.92 years and the standard deviation was 1.548.

Table 2Demographics of sample

Demographics		Number	Per cent
Gender	Male	58	44.3
	Female	73	55.7
	Total	131	100
Age	18 years	68	51.9
	19 years	53	40.5
	20 and above	10	7.6
	Total	131	100
Smartphone usage	One year or less	62	47.3
	2 years	30	22.9
	3 year and above	39	29.8
	Total	131	100

4.4Item reduction

A variety of statistical techniques have been recommended for item reduction and refining. Commonly used techniques include inter-item correlation and factor analysis (Boyle, 1991; Hinkin, 1995, 1998). The present study subjected the pool of 24 items to both inter-item correlation and factor analysis. Boyle (1991) is of the opinion that elimination of items could be done, if inter-item correlations were found to exceed .70, as "this could help in avoiding too much redundancy and artificially inflated estimates of internal consistency". It appeared that no items were eliminated from the pool, as no inter-item correlation exceeds .70.

Factor analysis using principal component axis and Varimax rotation method with Kaiser Normalization was done in the study. The rotations were found to converge at 11iterations.Ford, MacCallum, & Tait (1986) and Hinkin (1995) have stipulated a minimum threshold of .40as a criterion for which any factor loading lower than .40may be excluded. Since all the factors loading were above .40 no items were excluded. Four factors emerged as a result of factor analysis (Table 3).

4.5 Scale evaluation

This phase looks into the reliability and validity of the tool. As per the stipulations of the American Psychological Association (APA), a measure is strong if it is capable of demonstrating reliability and validity of content, criterion-related and construct. It should also demonstrate sufficient level of internal consistency.

Table3 Items and factor loadings

No	Item	Factor loading	Item to total correlation
	Factor 1		
1	I have tried to shorten my Smartphone use time, but failed all the time.	.517	.710
2	I keep on using Smartphone while thinking about stopping it.	.550	.699
3	I don't spend much time on Smartphone	.623	.574
4	I constantly check my Smartphone so as not to miss conversations between other people on facebook/What'sapp.	.740	.721
5	I use my Smartphone longer than I had intended.	.666	.733
6	People around me complain that I use my Smartphone too much.	.573	.797
7	Even when I think I should stop, I continue to use my Smartphone.	.725	.824
8	Spending a lot of time on my Smartphone has become a habit.	.546	.751
	Eigen value	8.329	
	Per cent of variance explained	34.702	
	Mean	23.105	
	Standard deviation	6.99	
	Factor 2		
1	I feel empty when not using my Smartphone	.680	.719
2	I won't be able to stand not having a Smartphone.	.760	.689
3	I feel depressed, anxious, or oversensitive when I am not able to use my Smartphone.	.780	.740
4	I feel impatient when not holding my Smartphone.	.662	.659
5	I am not able to study without my Smartphone.	.557	.669
6	Using a Smartphone is more enjoyable than spending time with my family or friends.	.530	.393
	Eigen value	2.007	
	Per cent of variance explained	8.362	
	Mean	21.34	
	Standard deviation	6.52	
	Factor 3		
1	I miss planned work due to Smartphone use.	.424	.582
2	I have a hard time concentrating in class due to Smartphone use.	.532	.706
3	I have a hard time while doing assignments due to	.700	.723

	Smartphone use.		
4	I feel pain in the wrists or back of the neck while using a Smartphone.	.590	.578
5	My examination grades dropped due to excessive Smartphone use.	.505	.666
	Eigen value	1.512	
	Per cent of variance explained	6.301	
	Mean	12.16	
	Standard deviation	3.77	
Factor 4			
1	I have my Smartphone in my mind even when I am not using it.	.581	.684
2	I will never give up using my Smartphone even if my daily life gets affected by it.	.415	.685
3	When I cannot use my Smartphone, I feel like I have lost the entire world.	.673	.759
4	It would be distressing if I am not allowed to use my Smartphone.	.581	.669
5	I become restless and nervous when Smartphone use is obstructed.	.722	.732
	Eigen value	1.430	
	Per cent of variance explained	5.957	
	Mean	12.27	
	Standard deviation	3.89	

Note: N = 131

These factors accounted for a cumulative variance of 55.32 per cent.

All correlations were found to be significant at 0.01 level.

4.6Reliability

Assessing the reliability is crucial in maximizing the credibility of the study. According to Kerlinger (1986), reliability is the precision of the instrument. Without reliability there can be no validity. There are many reliability estimates, referred to as 'internal consistency measures' that require only one test administration. Internal consistency examines the consistency within the test itself, or in other sense the consistency among items (DeVellis, 1991). According to Crocker &Algina (1986) and Henson (2001), high estimates of reliability will lead to high inter-item correlations among the items.

Some commonly used methods to assess internal consistency reliability are inter-item correlations, Split-half and Cronbach Alpha (Hinkin, 1995; Price & Mueller, 1986). Hair et al. (2006) suggested a rule of thumb for inter-item correlation that the item-to-total correlations need to exceed the R-value of

0.50.Split-half reliability assesses the reliability of one half of the instrument, and compares this to the reliability of the other half. Cronbach Alpha (α) is another method used for internal consistency reliability. Nunnally (1978) has suggested a standard value of αas .70 to assure internal consistency.

The factor wise items to total correlations are presented in Table 3. These values suggest that the standard set by Hair et al. (2006) for internal consistency reliability has been met by all four factors. The split-half reliability coefficient of the tool was found to be .859. The Cronbach α for the tool was found to be .910, which is well above the standard of .70 set by Nunnally (1978). A high α, according to Kumar & Beyerlein (1991) suggests that the subjects have responded in a consistent manner to all the items. These results indicate a high reliability of the tool.

4.7 Validity

The most difficult part of scale development is validation (Spector, 1992). Validity, according to Gregory (1992) is about how much a test is capable of measuring what it claims to measure, which cannot be measured in any particular statistic (Crocker & Algina, 1986). The focus of validation need not be on the scores or items, but on the inferences that are extrapolated from the testing tool. The inferences so made from the scores should have the qualification of being appropriate, meaningful, and useful (Gregory, 1992). Validity can take the form of content, construct, criterion and consequential (Messick, 1995).The validity of content, convergent, discriminant and the criterion related validity were assessed in the present work.

4.8Content validity

This validity is "the degree to which the elements of instrument are representative of the construct" (Haynes, Richard, &Kubany, 1995). If a particular instrument covers the meaning of the concepts (Wynd, Schmidt & Schafer, 2003), then it can be said to have this validity. Presently there exists no quantitative index of content validity measures (Stone, 1978), and validation is usually made by exercising the required judgments. According to APA, AERA, and NCME (1954, 1999) content validity is essential for test construction as well as adaptation. In addition to conceptually defining the construct, it helps in laying the base for the correct explanation of variance (Haynes, Richard &Kubany, 1995).The tool in the present case has been constructed based on review of extensive literature and existing valid instruments. Furthermore utmost care has been exercised during construction while the tool has been thoroughly refined and validated. Due to these aspects, it can be considered that it is having the required content validity.

4.9Convergent and discriminant validity

Convergent validity implies that the evidences that are gathered from different sources are indicative of the same or similar meaning of a given construct (Kerlinger, 1992). Great care was exercised during item development so that the data reduction would result in the intended factors. In line with Hinkin (1998), certain known scales were considered in the item development phase. This ensures convergent validity. Some existing known scales used for item development include Kim, et al. (2012); Kwon, et al. (2013); Lopez-Fernandez, et al. (2014); and Tossell, et al. (2015). All these scales were having acceptable levels of reliability**.**

Discriminant validity assesses how much the various constructs differ from each other. To have discriminant validity, the correlation values should not be absolute value of zero or one (Campbell & Fiske, 1959). The means, standard deviations and correlations of the factors are provided in Table 3.This provides evidence of convergent validity.

4.10Criterion-related validity

"The extent to which the particular construct is related to pre-specified criteria" is criterion-related validity (Saraph et al., 1989). This validity is critical in determining whether a scale behaves in an expected manner, in terms of its relationship with other theoretically related variables and constructs. This validity was assessed through correlations of the instrument with another independent measure. To test the criterion related validity, the tool was correlated with SAS-SV (Kwon, Lee, Won, et al., (2013). The *R* value (.921) exhibited high significant correlation. This denoted a strong parallel between the two measures, thus meeting the requirement of criterion validity.

4.11Overall construct validity

Construct validity, which assures that a scale "measures what it is purported to measure" (Hinkin, 1998) is indispensable in tool development/adaptation (Cronbach &Meehl, 1955). Construct validity demonstrates that the scale is scientifically strong and has quality (Scmitt & Klimoski, 1991). According to Kerlinger (1986) it is a vital link between the available theory and psychometric measurement (Kerlinger, 1986). For any tool to have construct validity, it should demonstrate internal consistency, content validity and criterion-related validity (Hinkin, 1998). The present tool enjoys construct validity, as it has demonstrated adequate internal consistency and validities.

The study also intended to find out the relationship of various demographics on smartphone addiction. The demographics identified are gender, age and

period of smartphone usage. Towards this comparison of means (t-test) was done. The results of the analysis are presented below.

4.12Measuring gender-wise difference

The t-test was done to find out if there exists any significant difference between the genders in smartphone addiction. The results are provided in Table 4.

Table 4 The t-value based on gender

Gender	N	Mean	SD	t-value
Male	58	68.41	16.059	4.091**
Female	73	57.49	14.441	

** Significant at 0.01 level

A few studies have been done to identify the effect of demographics on mobile addiction. While it has been established that males and females use smartphones differently (Pawłowska & Potembska, 2012), Lee, et al., (2014) found women to converse for longer time. These findings corroborate that of Hong, et al., (2012) and Chóliz (2012). Providing quantification for female smartphone addiction, Jedy (2008), observed that the number of addicted females was doubled that of males. The study of Chóliz (2012) observed that the higher dependence of girls often lead to economic and family problems; and unhealthy lifestyle (Satoko, et al., 2009). Thus, most of the findings point towards higher level of smartphone addiction for females. The present study, conducted among Indian population has found that there exists significant gender-wise difference in smartphone addiction. Further, as against the findings of most of the earlier studies, it is found that males have relatively higher levels of smartphone addiction, as denoted by higher mean values (Table 4). This could be due to the cultural differences that exist in India, within Indian states and other countries.

5. Discussion and Conclusion

Construction of a tool to measure smartphone addiction, through the process of adapting and validating the available tools, using Indian data was the main objective of the study. Smartphone addiction is now becoming a social problem as adolescents are increasingly being addicted to using it. Almost all the tools that measure smartphone addiction have been validated in other cultures. The present study attempted to construct a tool based on Indian population. The study has also found out the difference in smartphone addiction based on gender.

Since it is possible to enrich the adaptation of tools by creating new items based on the definition of the original construct (Delgado-Rico, et al, 2012), the present study has attempted in this direction. As in the case of construction of a tool, adaptation also requires reviewing the theoretical aspects of available scales. This has been extensively done, and this process has helped in broadening the view of validity. Since a large item pool is essential for the development of a parsimonious scale, the investigators created a large number of items that oversampled the construct (Hinkin, 1995; Stanton, Sinar, Balzer, & Smith, 2002), and the present tool has been developed from this. This would help in having better content validity (Schriesheim et al., 1993). The tool has been developed based on the parameters set by experts in the field. All possible care has been taken to see that the tool developed is scientific in all respects. The construction of the tool has provided a broad framework to further research India, in this challenging area. There is scope for further purification of the tool on a larger population, and it is expected that the present work would set a stage for considerable research in future.

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