Mobile phone use screening test: Development, validation, and implications for screening excessive mobile use

Manoj Kumar Sharma, Nitin Anand, Kalpana Srivastava\(^1\), Rajesh Sagar\(^2\), P. Marimuthu\(^3\), B. N. Roopesh, Shilpi Saraswat

Service for Healthy Use of Technology (SHUT) Clinic, Department of Clinical Psychology, National Institute of Mental Health and Neuro Sciences (NIMHANS), Bengaluru, Karnataka, \(^1\)Department of Psychiatry, Armed Forces Medical College (AFMC), Pune, Maharashtra, \(^2\)Department of Psychiatry, All India Institute of Medical Sciences (AIIMS), New Delhi, India

Address for correspondence: Dr. Manoj Kumar Sharma, Service for Healthy Use of Technology (SHUT) Clinic, Department of Clinical Psychology, National Institute of Mental Health and Neuro Sciences (NIMHANS), Bengaluru, Karnataka, India. E-mail: shutclinic@gmail.com

Received: 01 September 2020
Revised: 19 October 2020
Accepted: 12 January 2021
Published: 15 March 2021

Background: Early identification for the addictive use of smartphones would enable timely intervention to minimize suffering from compromised functioning and associated psychological problems. This study is the first such attempt to develop a test for addictive/excessive use of the mobile phone in the Indian context. The present study aims to develop and validate the mobile phone use screening test (MUST) for the Indian subcontinent. Materials and Methods: Five hundred individuals aged 18–40 years, residing in the South Indian city of Bangalore participated in the study. The sociodemographic datasheet and the newly developed test were administered on these individuals to gather demographic information and patterns of excessive mobile phone use. Results: The developed test has 18-items which use a self-report Likert-type scale format. The test–retest reliability was 0.93 and the Cronbach’s alpha was found to be 0.86. The scoring criterion for the overall score was: < 30 = mild use; 31–49 = moderate use; and 50 and above = excessive/addictive smartphone use. The scale has four components: craving, loss of control, coping, and consequences. Conclusions: The MUST can be used for the identification of addictive/excessive use of mobile phone among adolescents and young adult groups.

Keywords: Addiction, excessive, mobile phone, screening, test

How to cite this article: Sharma MK, Anand N, Srivastava K, Sagar R, Marimuthu P, Roopesh BN, et al. Mobile phone use screening test: Development, validation, and implications for screening excessive mobile use. Ind Psychiatry J 2020;29:279-84.
addiction to mobile phones, in the same manner as seen in other behavioral addictions. However, these speculations do not exist concerning addictive behaviors related to substance use, which are more readily identified and accepted as problematic. The mobile phone, particularly since the arrival of smartphone devices, has emerged as a potential source of addictive behavior. Further, there has been an evolution of addictive/problematic mobile phone use from viewing overall use as problematic to identifying specific addictive behaviors which vary by content and mobile applications over various mobile phone platforms. Whether the content and applications are themselves problematic, or the mobile phone itself in general, is debatable. Regardless, smartphones have an exhaustive list of applications for communication, work, and entertainment purposes, and pose a greater potential for abuse than regular feature phones.

In terms of internet penetration, urban India has achieved nearly 60% internet accessibility, whereas rural areas in India have internet penetration at around 17%. It is also understood that as of 2017, India has between 300 and 400 million smartphone users which are likely to increase to 530 million users by 2020.

We have an understanding that excessive use of the mobile phone is a problematic phenomenon, but there is a paucity of specific assessment tools in the Indian context which can screen and identify excessive mobile phone use. Recent years have seen an increase in the number of cases seeking help for issues related to mobile phone use at India’s first tech-addiction clinic known as Service for Healthy Use of Technology (SHUT) clinic at NIMHANS, Bangalore, Karnataka, India. Further, frequent media reports highlight the excessive and problematic use of the mobile phone in society. The present work focused on the development and validation of a test for the screening of excessive mobile phone use. This tool will help in identifying mobile phone use patterns in India, and screen for users that might require specialist intervention. This study aims to develop and validate the mobile phone use screening test (MUST) for screening excessive mobile phone use in the Indian context.

**MATERIALS AND METHODS**

**Sample**
The sample size was calculated by assuming \( P = 0.3 \), keeping the margin of error of 0.03, equal representation of male and female participants, and nonresponse. The calculated sample size was 500. The sample was taken from the community, i.e., it consisted of college students, college staff, and individuals working in government and private sector organizations at Bangalore, Karnataka, India. The study was advertised in various settings to increase demographic diversity in the sample. The individuals were aged between 18 and 40 years, could speak, read, and write English, and had been using smartphones for the previous 12 months. The individuals were selected from different age groups (18–20, 21–24, 25–30, 31–35, and 36–40). The ethical approval was received from the Institute Ethics Committee before initiation of the study.

**Procedure**
A sociodemographic data sheet for collecting relevant biographical details was prepared. This captured details about name, age, gender, education, occupation, marital status, and language for all the 500 participants. The advertisement for the study was made in colleges, government, and private workplaces. Informed consent was taken before the inclusion of participants from respective sites.

**Phase I: Item development for tool**
In this phase, items for the scale were generated through a review of the literature and focus group discussions (5–6 mobile phone users in each group) and 5–6 professionals working in the mental health area for 5 years or more). A review was also conducted on available scales for assessment of mobile phone addiction, smartphone addiction, and problematic mobile phone use developed in other countries for problematic mobile phone use assessment. A total of 140 items were developed for the scale of the addictive use of mobile phones. These items were examined for their cultural relevance and those items which were felt to be culturally irrelevant were omitted. Further, ambiguous items were excluded from the items list like “my life would be meaningless without the use of a smartphone”, “I prefer to do online shopping through my smartphone app than actually visiting a store to shop”, and the like. Around 30 items like “I am uncomfortable without my smartphone”, “I use smartphone to escape/avoid day to day problems” and the like which appeared more relevant were retained for the next phase of tool development. In addition, if the retained items were understood to be worded in a complicated manner, they were further edited while retaining their core content.

**Phase II: Content validation**
The instrument with developed items \((n = 30)\) was given to ten professionals (psychiatrists, psychologists, and social workers) working in the field of mental health or substance use for an expert rating on item content appropriateness, item difficulty level, and instruction for administrations. This process was used to arrive at a set of items to be included in the final test/instrument. These experts were not part of Phase I of test development. This process led to
the retention of 29 items in the tool. Likert type five-point scale scoring method was used. The score options were Never, Rarely, Occasionally, Frequently, or Always.

Data was collected on a sample of 50 healthy individuals. The criteria adopted for the selection of the sample were as follows: (1) age: Six age groups were included as 18–20, 21–25, 26–30, 31–35, and 36–40. (2) Education: individuals were educated at the 11th standard level and above. An attempt was made to include individuals representing every age range from 18 to 40 (both years inclusive).

Phase III: Item reduction/analysis
The developed screening tool was administered to 150 subjects in the age range of 18 years to 40 years. An attempt was made to select subjects from different age groups (18–20, 21–25, 26–30, 31–35, and 36–40). The data obtained from the community sample were subjected to item analysis of the test items using factor analysis. The principal component analysis was used to identify components that explained variability in the data. The scores were compared for age and education groups. The analysis resulted in 18 items being retained for the test. The items excluded were-I cannot resist myself to stop using smartphone in prohibited places; I find it easy to put smartphone on silent; etc. There was an attempt made to keep both Kaiser and Scree criteria equal to the number of items being developed. An attempt was made to only keep items that clearly load on a single appropriate factor. Items that were most clearly representative of the content domain of the underlying construct and met the 0.40 criterion level for factor loading were retained. Reverse scoring was used for items, i.e., I experience problems in school, college due to excessive use of smartphone (Item no 5); Reduction of battery power on my smartphone disturbs me (Item No 10); When I can't use my smartphone I feel like I have lost my connection with others (Item no 17). Percentile scores were used to determine the cut-off score for the test. The tool consisted of items representing themes of craving, loss of control, mobile use for coping, and consequences related to mobile phone use. Cronbach’s alpha indicated acceptable internal consistency of 0.86.

Phase IV: Field trial
The MUST was administered on 300 mobile user subjects of either gender, aged between 18 and 40 years, and who met the study inclusion criteria. The tool was developed in the English language and the psychometric properties of the tool were evaluated.

Phase V: Test–retest reliability
To establish the internal reliability, the final set of 18 items were administered on a representative sub-sample of 30 subjects.

Statistical analysis
Pearson’s correlation coefficient was used for determining the reliability coefficient and Cronbach’s alpha was used for assessing internal consistency. Percentile scores were used for determining the cut-off score for the test. The principal component analysis was used for identifying the variables which were contributing more for explaining the variability in the data.

RESULTS
The demographic information is presented in Table 1: There were 175 males (58.3%) and 125 females (41.6%) who participated in the final trial. The sample had five age group divisions and the minimum qualification of the community participants was high school education [Table 1]. The sample had an education of 12 years and above.

Table 2 shows the percentile cutoff scores for mobile phone users and their interpretation. The scoring criteria for the overall cutoff score were <30: mild use; 31–49: moderate use; and 50 and above: excessive/addictive use.

Table 3 shows factor analysis which was done by considering the principal component method. Factors were selected

---

**Table 1: Demographic information: distribution of age and sample**

| Age domain | n (%) |
|------------|-------|
| ≤18        | 60 (20)|
| 21-25      | 52 (17.3)|
| 26-30      | 67 (22.3)|
| 31-40      | 121 (40.0)|

**Table 2: Percentile cutoff score for total score of mobile users**

| Age groups (years) | Subjects (n) | Score | Interpretation          |
|--------------------|--------------|-------|-------------------------|
| 18-40              | 300          | <30   | Mild use                |
|                    |              | 31-49 | Moderate use            |
|                    |              | >50   | Excessive/addictive use |
| 18-20              | 60           | <27   | Mild use                |
|                    |              | 28-53 | Moderate use            |
|                    |              | >54   | Excessive/addictive use |
| 21-25              | 52           | <34   | Mild use                |
|                    |              | 35-49 | Moderate use            |
|                    |              | >50   | Excessive/addictive use |
| 26-30              | 67           | <30   | Mild use                |
|                    |              | 31-43 | Moderate use            |
|                    |              | >44   | Excessive/addictive use |
| 31-40              | 121          | <31   | Mild use                |
|                    |              | 32-50 | Moderate use            |
|                    |              | >51   | Excessive/addictive use |
for Eigenvalues >1 and the initial component matrix was orthogonally rotated by the varimax method. There were four factors retained, which were named as craving, loss of control, coping, and consequences.

Table 4 shows the comparison of MUST with other scales. MUST was found to have a 1-month test–retest reliability of 0.93.

**DISCUSSION**

Screening for excessive mobile phone use can lead to timely identification of unhealthy impact on the functioning of individuals and can have significant implications for the mental health of mobile phone users. This indicates the need for developing screening instruments to identify individuals in the community who may be at risk or may be engaging in addictive mobile phone use in the Indian context. The sample comprised of 175 males (58.3%) and 125 females (41.6%) in the community population. The mean age for the community participants was 31.98 years.

The MUST categorizes mobile phone usage into mild use, moderate use, and excessive or addictive use. The test had test–retest reliability of 0.93. It can be used for persons above 18 years with high secondary school education and above. The scale items assessed craving, loss of control, coping, and consequences [Table 3].

The present scale has psychometric properties comparable to other available scales in this field. The Mobile Phone Dependence Questionnaire consists of 20-items with a Likert scale (4 points) and had a unique factor of problematic use which was understandably influenced by substance addiction research literature. This unidimensional factor covered aspects of harmful use, tolerance, salience, craving, withdrawal, use as coping behavior, and harmful consequences. The Cronbach's alpha for reliability was 0.86. One of the other used tools is the Mobile Phone Problem Use Scale which comprises 28 items, with a 10-point Likert scale allowing for a dimensional score in adult individuals. It was inspired by a review of literature in addictive disorders and covers domains of tolerance, withdrawal, escape from other problems, craving, and negative consequences on daily life at familial, financial, social, and professional levels. Cronbach’s alpha was reported to be $\alpha = 0.91$. 

Similarly, the Problematic Mobile Phone Use Questionnaire has 30 items with a Likert scale format (1–4) covering the four domains, namely prohibited use; dangerous use; dependence; and financial problems. The Cronbach’s alpha for reliability was within the range of 0.85–0.90. Mobile Phone Involvement Questionnaire is an 8 item measure, using a Likert scoring schedule for the assessment of mobile phone involvement based on both behavioral and cognitive addiction components. It included items measuring withdrawal, cognitive and behavioral salience, euphoria, loss of control, relapse and reinstatement, conflict with other activities, and interpersonal conflict, and was

| Serial number | Number of items | Population (years) | Domains covered | Test-retest | Cronbach's alpha |
|---------------|----------------|--------------------|-----------------|-------------|-----------------|
| MUST          | 18             | 18-40              | Craving, loss of control, coping, and consequences | 0.93        | 0.86            |
| MPDQ          | 20             | 19-23              | Harmful use, tolerance, salience, craving, withdrawal, use as coping behavior, and harmful consequences | -           | 0.86            |
| MPPUS         | 28             | 12-18              | Of tolerance, withdrawals, escape from other problems, craving, and negative consequences on daily life at familial, financial, social, and professional levels | -           | 0.93            |
| PMPUQ         | 30             | 20-35              | Prohibited use; dangerous use; dependence; and financial problems | -           | 0.65–0.85       |
| PUMP scale    | 20             | 18-75              | Unidimensional | -           | 0.94            |

MUST: Mobile phone use screening test, MPDQ: Mobile Phone Dependence Questionnaire, MPPUS: Mobile Phone Problem Use Scale, PMPUQ: Problematic Mobile Phone Use Questionnaire, PUMP: Problematic Use of Mobile Phone
specifically worded to relate to mobile phone behavior. It was standardized on a population of adolescents and youth and had internal reliability of 0.78, whereas the Problematic Use of Mobile Phone (PUMP) Scale\cite{15} consists of 20 items, has Likert scale scoring (1–5), and can be used on adults (18–45 years). The PUMP utilized the DSM-IV-TR criteria for substance abuse on which to model the domains of the scale. The sample included 244 individuals aged 18–45, with a majority of female participants (68.4%). Internal consistency was reported as $a = 0.94$ and correlations of $r = 0.76$ ($<0.001$) were found between the PUMP Scale and Cellular Phone Dependency Tendency Questionnaire and Cell Phone Use Questionnaire.\cite{12}

The MUST scale has the advantage of being standardized in an 18–40 years age group and is multidimensional. In contrast, the PUMP Scale can be used for a wider age group 18–75 years [Table 4]. A number of scales are available which assess the various domains of mobile phone addiction and have adequate psychometric properties. However, the present tool has an advantage that in addition to screening and identification of excessive use it also offers the patterns of use across the domains of the mobile phone addictive behaviors. It has limitations, as it has been developed only in the English language and not in other regional languages of India. The applicability of the test for individuals below 18 years and beyond 40 years of age may also be limited. This may be a task for future research along with confirmatory factor analysis to assess the model fit in additional samples.

CONCLUSIONS

The MUST can be used for the ages between 18 and 40 years and has cutoff scores which are established for identification of mild, moderate, and excessive/problematic mobile phone use among adolescent and young adult group. In the future, attempts would be made to further reduce the test items, develop the scale (MUST) in other regional Indian languages and evaluate it for additional psychometric properties such as convergent and concurrent validity.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

REFERENCES

1. Grant JE, Potenza MN, Weinstein A, Gorelick DA. Introduction to behavioral addictions. Am J Drug Alcohol Abuse 2010;36:233-41.
2. Lane W, Manner C. The impact of personality traits on smartphone ownership and use. Int J Bus Soc Sci 2011;2:22-8.
3. Lin YH, Lin YC, Lee YH, Lin PH, Lin SH, Chang LR, et al. Time distortion associated with smartphone addiction: Identifying smartphone addiction via a mobile application (App). J Psychiatr Res 2015;65:139-45.
4. Pedrero Pérez EJ, Rodríguez Monje MT, De Leon JR. Mobile phone addiction or abuse. Literature review. Adicciones 2012;24:30-6.
5. Roberts J, Yaya L, Manolis C. The invisible addiction: Cellphone activities and addiction among male and female college students. J Behav Addict 2014;3:254-65.
6. Taneja C. The psychology of excessive cellular phone use. Del Psychiatr J 2014;17:448-51.
7. Internet and Mobile Association of India & IMRB. Number of Internet Users in India Could Cross 450 Million by June: Report. Available from: https://telecom.economictimes.indiatimes.com/news/indias-internet-user-base-to-reach-450-465-million-by-june-2017-iamai-imrb-report/57410229. [Last Accessed on 2020 Aug 27].
8. Travasso C. India opens clinic to help people “addicted” to mobile phones and video games. BMJ 2014;349:g4439.
9. Carl V, Durkee T, Wasserman D, Hadlaczyk G, Despalins R, Kramarz E, et al. The association between pathological internet use and comorbid psychopathology: A systematic review. Psychopathology 2013;46:1-3.
10. Yen JY, Ko CH, Yen CF, Wu HY, Yang MJ. The comorbid psychiatric symptoms of internet addiction: Attention deficit and hyperactivity disorder (ADHD), depression, social phobia, and hostility. J Adolesc Health 2007;41:93-8.
11. Toda M, Monden K, Kubo K, Morimoto K. Cellular phone dependence tendency of female university students. Nihon Eiseigaku Zasshi 2004;59:383-6.
12. Bianchi A, Phillips JG. Psychological predictors of problem mobile phone use. Cyberpsychol Behav 2005;8:39-51.
13. Billieux J, Van Der Linden M, Rochat L. The role of impulsivity in actual and problematic use of the mobile phone. Appl Cogn Psychol 2008;22:1195-210.
14. Walsh SP, White KM, Young RM. Needing to connect: The impact of self and others on young people’s involvement with their mobile phone. Aust J Psychol 2010;62:194-203.
15. Merlo LJ, Stone AM, Bibbey A. Measuring problematic mobile phone use: Development and preliminary psychometric properties of the PUMP scale. J Addict 2013;2013:912807.
Mobile Use Screening Test (MUST)

Instructions: Please answer the following question about your usage of mobile phone in the last 1 month and indicate them accordingly from never to always (never, rarely, occasionally, frequently, always).

Example:

(This means the response chosen is frequently)

| Sample Item | Never | Rarely | Occasionally | Frequently | Always |
|-------------|-------|--------|--------------|------------|--------|
| I keep my smartphone with me during sleep also |  |  |  |  | ✓ |

1. I start my day with the use of smartphone
2. I wish I had my smartphone in my hand round the clock.
3. I am uncomfortable without my smartphone.
4. I can manage the day without my smartphone.
5. I experience problems in school, college, or work due to excessive use of smartphone.
6. I experience problems at workplace due to the usage of my smartphone.
7. I experience problems in relationships due to my preoccupation with smartphone.
8. I can reduce the usage of my smartphone.
9. I experience sleep disturbance due to late-night usage of smartphone.
10. Reduction of battery power on my smartphone disturbs me.
11. Whenever I have a smartphone with me, it is difficult to stop using it.
12. I indulge in smartphone usage for longer than earlier.
13. I use smartphone to feel good.
14. Smartphone use helps me to overcome my stress.
15. I feel more confident while using my smartphone.
16. I use my smartphone as the only enjoyable activity of the day.
17. When I can't use my smartphone, I feel like I have lost my connection with others.
18. I use smartphone to escape or avoid day to day problems.