Exploratory Factor Analysis of Young's Internet Addiction Test Among Professionals from India: An Online Survey

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ABSTRACT

Background: Internet use has spread across the world due to easy accessibility and affordability. However, it has been creating many problems at several levels. So, there is a need to identify the suitability of psychometric properties and the factor structure of the widely used Internet Addiction Test (IAT) in the Indian settings. Our objective was to perform an exploratory factor analysis on the IAT and to test the reliability of the scale.

Methods: It was a cross-sectional study that included various professional groups. We used an online questionnaire that included sociodemographic details and Young's IAT. Exploratory factor analysis was used to identify the factor structure of Young's IAT in the Indian setup.

Results: The mean age of the sample (N = 1,782) was 27.7 years (SD = 8.74) with a predominantly male population 1040 (58.4%). In total, 1.0% (17) of the sample had significant problems with internet usage, whereas 13% (232) were in the range of frequent/occasional problems, and the mean score on IAT was 32 (SD = 16.42). Exploratory factor analysis revealed two factors that explained 49% of the variance (Kaiser–Meyer–Olkin measure of sampling adequacy: 0.95, Bartlett's test of sphericity: P = 0.000). They were "mood and relationship issues" and "duration and productivity." Cronbach's α was 0.92, which indicates a high level of internal consistency.

Conclusion: In Indian settings, IAT can be understood based on the two-factor structure. The scale has excellent reliability. Further studies are needed to replicate these results, by using confirmatory factor analysis and validity testing.

Keywords: Factor analysis, internet addiction, professionals, reliability, validity

Key Messages: Internet Addiction Test can be explained based on a two-factor model among professionals in India—mood and interpersonal issues, and duration and productivity. The two factors overall explained 49% of the variance. The tool had a high internal consistency in this sample.

Internet addiction (IA) or pathologic internet use is on the rise due to the increasing access and affordability of the services. It is supposed to be a subset of behavior addiction, and its components, like that of substance use, include salience, tolerance, withdrawal, conflict, relapse, and mood modification. Young took the first initiative for the measurement of the existence of this entity. She adapted the DSM-IV criteria for pathological gambling and designed a scale that can detect and classify IA.[1,2]

Prevalence of IA based on a worldwide review had shown that the rates range from 1.5% to 8.2%.[3] Another survey from 11 European countries, reported an overall prevalence rate of 4.4% (mean age of included students: 14 years).[4] Considering the diverse rates of IA from different studies, it is important to understand the influence of culture, education, socio-economic background, and belief systems on these rates. The previous decade has also seen a rise in the interest of researchers on IA not only in the Western world but also in countries like India. A review of Indian studies that assessed IA showed varying rates of severe/problematic addiction, ranging from 0.3% to 18.8%.[5–7] The studies included had used

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different cutoff values for the Internet Addiction Test (IAT) and different types of assessment.[5]

Most of the studies only focused on assessing the prevalence and severity of IA, whereas a few assessed co-morbidities with IA.[5] The majority of these studies focused on assessing IA in school children and adolescents; only a couple of them tried to study the severity among professionals and professional students. However, the sample size of those who studied the severity in professional groups was less; it ranged between 104 and 846.[7–9] Most of the studies done from India were pro forma based, except a few[8] that included web-based assessment. An online mode of assessment assessment would probably be a better way of identifying IA than the former techniques because it would identify people who are more vulnerable to develop IA.

According to the non-Indian studies that performed a factor analysis of the IAT, the number of factors that can explain the tool had ranged from one to six. The single factor that explained all the 20 items was dependence, and the components of the six-factor model were salience, excessive use, anticipation, dyscontrol, impairment of work, and social life. The difference is probably due to the varied sample size and degree of heterogeneity.[10,11] The other most important reasons behind the difference in factor structure are the language of the IAT and the cultural context in which the study was done.[10]

However, studies from India that assessed the psychometric properties of the IAT are rare. To our knowledge, only one study was done from India that performed factor analysis and validation of IAT. It was performed on 1,914 junior and senior high school students from India and both exploratory and confirmatory factor analyses were carried out to assess psychometric properties of IAT. Unlike the developed countries, in India, there might be certain cultural and familial factors such as constant urge for companionship, struggle with autonomy, and freedom-related issues that might affect IA differently, particularly in young adults.[12] However, we do not yet know how the pattern of IA is different in a wider group, such as professionals.

Considering the lack of validation of the IAT in Indian settings, identification of the psychometric properties of this tool in professional groups is of importance as they are more prone to develop IA, considering the access they have to the internet both at the workplace and the home environment.[9]

The objective of our study was to carry out an exploratory factor analysis of Young's IAT, to assess the reliability of the scale among professionals from India, and thus, to establish psychometric properties of Young's IAT in Indian settings.

Materials and Methods

Sample Collection and Study Design

This was a cross-sectional web-based (www.surveymonkey.com) survey done over two months (January–February 2018) through a predesigned online questionnaire, using convenience sampling. The included sample was 18–65 years of age, of either gender, and comprised of students (nursing and MBBS), nurses, and doctors (professionals). The study was conducted in the Psychiatry and Psychology departments of five colleges in India (Hi Tech Medical College and Hospital, Bhubaneshwar, Odisha; Pt. J.N.M Medical College, Raipur, Chhattisgarh; Amity University, Ranchi, Jharkhand; Central Institute of Psychiatry, Ranchi, Jharkhand). The primary center for data collection was All India Institute of Medical Sciences, Raipur. Approval was taken from the institutional ethics committee.

The questionnaire included an assessment of sociodemographic details and scores on the IAT. The survey was pretested in All India Institute of Medical Sciences, Raipur before the actual study was done, and the questions were modified based on the feedback received. The questionnaire was circulated using emails, WhatsApp, and Facebook to the contacts of the investigators. They were provided details of the time taken to complete the survey and information that filling in the survey implies the provision of informed consent by the participants. No personal identification details like name, place of work, or designation were collected as a part of the survey.

It was an open and voluntary survey as the participants had the freedom to decide at the first instance to fill or not to fill the responses. They were not provided any incentives for participation in the survey. Participants were able to check the completeness of their responses after filling the questions. They were able to review and change their answers through a review option. No responses were excluded for the reason of a variation in the time taken to fill the survey, unless the responses were incomplete. Participants could only fill the survey once through a device, that is, the users with the same IP address were not able to access the survey twice, thus preventing a duplication of responses. Those who did not fill the survey initially were sent one reminder to complete the survey.

We used the English version of the IAT for this study. It includes 20 items that are rated on a Likert scale ranging from 0 to 5: does not apply, rarely, occasionally, frequently, often, and always. Based on the scores generated, the participants are classified into four categories by the cutoff values as indicated by Young: <20: below average users; 20–49: average users; 50–79: occasional/frequent problems with internet use; and 80–100: significant problems with internet use.[13] It is a subjective assessment by the participants. IAT takes an average of 5–10 minutes for completion.

Analysis

The responses collected were manually entered into an SPSS database, and the results were analyzed. A total of 2,015 responses were received; 233 were excluded as they were incomplete. So, the final sample size was 1,782. The appropriateness of the current sample for performing factor analysis was assessed using the Kaiser–Meyer–Olkin measure of sample adequacy and Bartlett's test of sphericity.[14] For sampling adequacy, values >0.80 and 0.90 are considered excellent, values between 0.50 and 0.60 marginally acceptable, and values <0.50 unacceptable. The cutoff for loading of items was chosen as 0.4; items with values <0.4 were excluded from the final analysis.

The criteria set for retainment of factors are as follows: Eigenvalues >1 and the point of inflexion in the scree plot.[15]

Sociodemographic Characteristics of the Study Sample

Variables		Frequency (%)/Mean (SD)
Age (in years)		27.76 (8.74)
Gender	Female	742 (41.6)
	Male	1,040 (58.4)
Occupation	Doctor	489 (27.4)
	Nursing professionals	611 (34.3)
	Students	682 (38.3)
Residence	Alone	102 (5.7)
	Home	876 (49.2)
	Hostel	545 (30.6)
	Private accommodation	259 (14.5)
Gadget most commonly used to access the internet	Desktop/laptop	171 (9.6)
	Mobile phone	1,611 (90.4)

Results

Sociodemographic Details of the Sample

Fifty-eight percent of the sample were males, and the mean age was 27.7 years (SD = 8.74). In total, 27.4% were doctors (Post MBBS, Postgraduates), 38.3% were students, and 34.3% were nurses (**Table 1**). Almost half of the participants were living in their home, and mobile phone was the most common gadget used to access the internet.

Scores on IA Test and the Results of Factor Analysis

The mean score of participants on IAT was 32, i.e., within the average user range (SD = 16.42). One percent of the sample had severe IA causing significant problems, whereas 13% had mild–moderate severity with frequent/occasional problems. In total, 63% were average internet users.

Before performing the exploratory factor analysis, we computed Bartlett's test of sphericity (χ^2 = 13145.42; P = 0.000) and Kaiser–Meyer–Olkin measure of sampling adequacy (0.957: cutoff >0.50).

The determinant value was 0.001, which suggests that a factor analytic solution can be met (cutoff>0.0001). The findings suggest that our sample met the requirement for generation of distinct and reliable factors. Exploratory factor analysis,[16] with the 20 items of IAT, resulted in three factors with eigenvalues >1. The first factor had an eigenvalue of

7.8, followed by 1.13 and 1.02 for the second and third factors, respectively. They were extracted after varimax rotation with Kaiser's standardization. These three factors explained 50% of the variance. However, the inflexion in the scree plot suggested the presence of only two factors (**Figure 1**).

Thirteen items loaded onto the first factor—mood and relationship issues, followed by five items onto the factor duration spent, and two items onto impaired productivity.

As only two items loaded on the third factor and because of the scree plot

findings and the cutoff of 0.4 for retaining of items based on previous studies, the analysis was run again after removing items 3, 4, and 5 from the scale (**Table 2**). Exploratory factor analysis generated two factors with eigenvalues >1, and the scree plot also showed inflexion at two factors (**Figure 1**). The first factor was named "mood and relationship issues." It had an eigenvalue of 7.2 and explained 42.4% of the variance. The second factor was named "duration and productivity." Its eigenvalue was 1.11 and it explained 6.6% of the variance (Cumulative: 49% of variance). Ten items from the scale loaded on-to the first factor, followed by seven items on the second factor.

Mean Scores and Correlation analyses

The mean score on items that loaded onto factor 1 was 14.62 (SD = 9.05), out of a maximum score of 50. On factor 2, it was 13.94 (SD = 6.79) out of a maximum score of 35. Both factors were significantly positively correlated with each other. Pearson's product correlation value was 0.74 (P = 0.000).

Test of Reliability

Cronbach's α measures internal consistency and construct reliability. The

Scree Plot Showing Two Factors
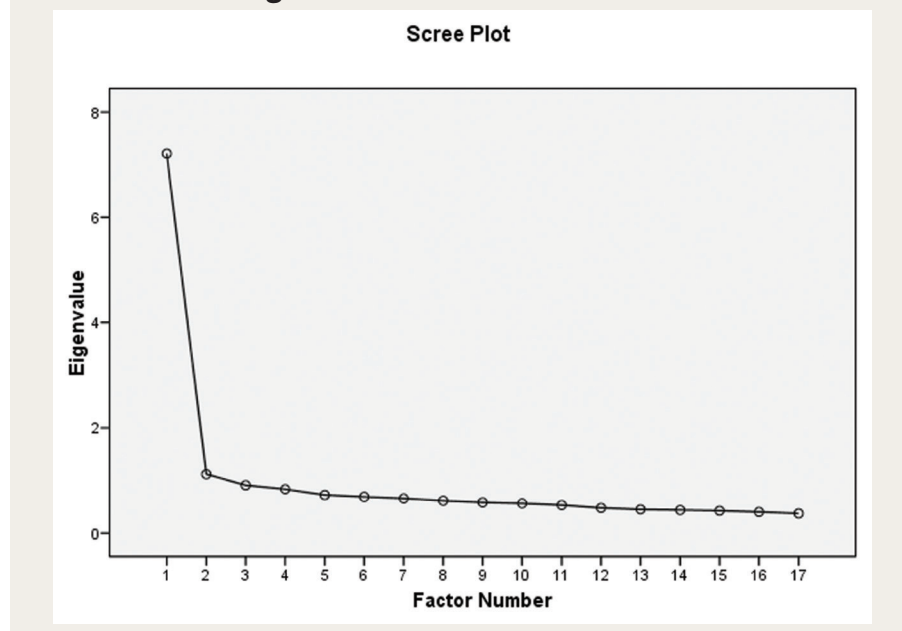
TABLE 2.

Factor Loadings on Different Items of IA Test

Serial Number	Items of the IA test	Factors	
		1	2
Item 1	How often do you find that you stay online longer than you intended?		0.57
Item 2	How often do you neglect household chores to spend more time online?		0.58
Item 6	How often do your grades or schoolwork suffer because of the amount of time you spend online?		0.60
Item 7	How often do you check your email/WhatsApp/Facebook/YouTube, etc., before something else that you need to do?		0.50
Item 8	How often does your job performance or productivity suffer because of the internet?		0.57
Item 9	How often do you become defensive or secretive when anyone asks you what you do online?	0.46	
Item 10	How often do you block out disturbing thoughts about your life with soothing/calming thoughts of the internet?	0.45	
Item 11	How often do you find yourself anticipating when you will go online (check Facebook/WhatsApp, etc.) again?	0.49	
Item 12	How often do you fear that life without the internet would be boring, empty, and joyless?	0.53	
Item 13	How often do you snap, yell, or act annoyed if someone bothers you while you are online?	0.58	
Item 14	How often do you lose sleep due to late-night logins?	0.50	
Item 15	How often do you feel preoccupied with the internet when off-line, or fantasize about being online?	0.65	
Item 16	How often do you find yourself saying "just a few more minutes" when online?		0.58
Item 17	How often do you try to cut down the amount of time you spend online and fail?		0.55
Item 18	How often do you try to hide how long you have been online?	0.58	
Item 19	How often do you choose to spend more time online over going out with others?	0.57	
Item 20	How often do you feel depressed, moody, or nervous when you are off-line, which goes away once you are back online?	0.69	

Extraction method: principal axis factoring; rotation method: varimax with Kaiser's normalization. IA: internet addiction.

reliability statistics table (**Table 3**) provides the actual value of Cronbach's α (α = 0.92). This indicates a high level of internal consistency for the IAT in our sample.

Discussion

We tried to replicate the factor analysis of IAT in Indian settings by a cross-sectional online survey. Our study adds to the existing literature about the factor structure of the IAT.

A recent systematic review and meta-analysis tested the validity, internal consistency, and reliability of IAT.[17] A total of 25 studies conducted between 2011 and 2018 were included. It concluded that the IAT has acceptable internal consistency, test–retest reliability, and convergent validity in specific groups. Our findings showed that the IAT can be subdivided into two factors—mood and relationship issues, and duration and productivity issues and that they explain 49% of the variance. This is supported

by the results of this meta-analysis, which had shown that the total variance explained by the factors ranged from 34.1% to 91%.[17] Among the factors studied, time spent was the commonest, followed by impairment of social relations and work.[17] We found that mood and relationship issues is the factor with the highest loading, followed by duration spent and impaired productivity. This might be partly due to the inclusion of a higher age group and the professionals.

Replication of the psychometric properties of this diagnostic tool is of special importance because the disorder has not gained its place in the nosological systems yet.[18] However, the applicability of the scale in the settings of different countries needs to be further assessed. It needs special mention that this meta-analysis had no study from India.[17]

Based on studies from different countries like Spain, Italy, Bangladesh and Turkey, Cronbach's α of IAT ranged 0.83–0.91, suggesting good–excellent reliability of the scale across different settings.[19–21] Our study also found that IAT has excellent reliability among professionals in Indian settings. This is in line with the previous Indian study that performed factor analysis.[12]

That previous Indian study had shown that IAT can be explained based on a one-factor model.[12] In contrast, we found a two-factor solution. This might be due to the inclusion of participants with a mean age of 27 years compared to the mean age of 14 years in the previous study.[12] As per the age, the area affected by IA can vary, in adults the main effect of IA would be on mood and relationship issues compared to duration and productivity, which might be affected across ages.

However, the previous study had certain drawbacks: it included solely the adolescent population and was geographically restricted to North India. So, the generalization of the study to the entire country is not possible. Our study tried to overcome this limitation through the online mode of the survey and the inclusion of a heterogeneous population. The inclusion of a heterogeneous sample is better than a homogenous sample as heterogeneous samples do not lower the variance and factor loadings.[22] For

TABLE 3.

Reliability Statistics

Cronbach's α	Cronbach's α Based on Standardized Items	No. of Items
0.92	0.92	20

a valid factor analysis, the recommended sample size is at least 300 or a ratio of 10:1 for respondents to variables. Another positive thing about our study is the inclusion of relatively large sample size, because exploratory factor analysis works better with larger samples.[23]

The difference in the number of factors obtained depends on many factors like the sample size, the number of variables in the instrument, the type of factor analysis used (principal component analysis, exploratory factor analysis, or confirmatory factor analysis), the method used in retaining the number of factors, and whether the rotation technique was used or not. The setting in which the study was done and the population upon which the scale was applied have large effects.[23,24]

Our study has certain limitations. Being a web-based survey, the results might have been affected to some extent by the volunteer effect and a low response rate. We conducted only the exploratory factor analysis and did not perform confirmatory factor analysis. We also did not test for test–retest reliability or concurrent validity. Further studies need to be conducted considering these aspects in their methodology.

Conclusions

IAT has good internal consistency and can be understood based on a two-factor structure in various professionals' groups and students in Indian settings. More well-designed studies need to be undertaken, targeting a varied group of subjects. This would help in understanding the reliability and validity of IA in a better way.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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