## **Original Research**



# Adaptation, translation and validation of Internet Addiction Test (IAT)-Sinhalese version to detect internet addiction disorder among 15-19-year-old adolescents in Colombo District, Sri Lanka

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## Abstract

**Introduction:** The earth has been conceptually changed by the internet into a town of high-dimensional information networks. The internet has greatly enhanced many elements of people's lives and has integrated seamlessly into daily life. Internet addiction disorder is becoming a potentially troublesome condition that coexists with behavioural issues that are already present, particularly in adolescents.

**Objectives**: To adapt, translate and validate a tool for detecting internet addiction disorder in adolescents aged 15-19 years in Colombo District, Sri Lanka

**Methods**: A cross-sectional validation study was conducted in which the Internet Addiction Test (IAT) was adapted, translated and validated into Sinhalese language (IAT-Sinhalese version). Statistical analysis was carried out with a sample size of 228 to test the construct validity using Principal Component Analysis (PCA). A total of 239 study participants were selected as the sample to test for Confirmatory Factor Analysis (CFA). Using LISREL 8.8, the statistical analysis was completed. Internal consistency and test-retest reliability methods were used to evaluate the reliability.

**Results**: IAT-Sinhalese version demonstrated a four-factor model consisting of 20 items with the model indices of RMSEA of 0.06, CFI of 0.93, NNFI of 0.91, SRMR of 0.063 and GFI of 0.77. It had an acceptable internal consistency with Cronbach Alpha value of 0.782.

**Conclusions & Recommendations**: IAT-Sinhalese version is a valid and reliable instrument to detect internet addiction disorder among 15-19-year-old adolescents in Sri Lanka.

Keywords: internet addiction, adolescents, school-based, Internet Addiction Test, validation

## Introduction

Internet addiction disorder has emerged as a global phenomenon. Although the disease has been extensively studied over the years, the scientific literature on its prevalence data, risk factors and prevention strategies is limited due to the methodological difficulties in diagnosis and heterogeneity of the diagnostic tools. Further, international estimates of its prevalence vary widely due to the use of different assessment tools and thresholds, and differences in the cultural and social backgrounds. The researchers suggest that future research should focus on explaining cross-cultural differences using tools with appropriate psychometric properties (1-2).

Several instruments have been developed to assess internet addictive behaviour, but none have emerged as a 'gold standard'. Kimberly S Young investigated the presence and intensity of internet addiction disorder in a North American population sample using the IAT. This is a 20-item tool rated on a Likert scale of 0 to 5, with equal weight given for each question, amounting to a total of 100 points. A higher score means higher intensity of internet addiction (2). Although the IAT was initially developed as a onedimensional instrument, various validation studies have shown it to be available in many other languages (3). There is no evidence of a reliable and valid tool to measure internet addiction disorder among adolescents in Sri Lanka. Therefore, there was an urgent need to develop one with acceptable psychometric properties.

## Methods

This was a cross-sectional validation study that included adaptation, translation and validation of the IAT. Prior to this validation, the definition of internet addiction disorder was formulated after extensive literature research. The following definition was selected by consensus of a multidisciplinary panel of experts as the valid case definition for internet addiction disorder; "Unsuccessful and potentially pathological behavioural pattern characterized by salience (preoccupation with online activities), tolerance (pursuing increasing time to achieve satisfaction), withdrawal symptoms (when unable to use the internet), using online activities to modify mood, conflict (within oneself, in relationships, or academic/ occupational activities because of online engagement) and relapse (unsuccessful attempts to control the behaviours)" (4). Next, the cultural appropriateness of the IAT was determined to ensure that the concepts of the tool were comparable in the context and target language using the modified Delphi technique, which made it possible to get the opinions of the expert panel. Items in the instrument were also assessed for relevance and acceptability in the target group. A set of standardized guidelines provided by Gjersing et al. (2010) were used for the methodology of cross-cultural adaptation (5). During the translation process, the aim was to achieve semantic, idiomatic, empirical and conceptual equivalence. Forward and backward translation methods were used for this purpose.

In the absence of a gold standard to assess criterion validity, the translated version was then subjected to the judgmental and construct validation process. Judgment validity assessments included face validity, content validity and consensual validity; and involved a multidisciplinary panel of experts composed of consultant community physicians, psychiatrists, psychologists and paediatricians. Construct validity that refers to the extent to which a particular variable is related to other specified variables that are consistent with theoretically derived hypotheses, concerning the concepts or constructs that are being measured (6), was performed using Exploratory Factor Analysis (EFA) and CFA. This was performed because the original version was modified during the process of translation and cultural adaptation. The EFA, which is a family of multivariate statistical methods that can explain the observed covariation among a set of measured variables (6), was performed initially to

assess the factor structure underlying the IAT-Sinhalese version. The CFA was performed next to determine whether the underlying factor structure was reproducible in the data by checking the goodness of fit.

For the EFA and CFA, two separate samples were collected in January 2021 from six Sinhala medium secondary schools in Galle District. A study unit was defined as an adolescent who had completed his/her 15<sup>th</sup> birthday and not yet reached the 20<sup>th</sup> birthday. After considering a minimum item-to-participant ratio of at least 10:1 for the 20-item IAT Sinhalese version, the minimum sample size required for each analysis was 200 (7). Simple random sampling was used to select the six schools from the list of Sinhala medium secondary schools in Galle District.

The reliability of the tool was determined by readministering the tool to a sub-sample of 33 adolescents after two weeks.

### Data analysis

Bartlett's test of sphericity was carried out to assess whether the matrix is significantly different from an identity matrix. The factor analysis is appropriate once Bartlett's test shows a significant result. The Kaiser-Meyer-Olkin (KMO) test was conducted to determine the sampling adequacy for each variable in the model and the complete model. Eigenvalues and Cattell's scree test were analysed to determine the number of factors. Factors that had Eigenvalues more than one were selected. A scree plot was used to determine the number of factors to keep by examining the shape of the resulting curve and identifying the bend (elbows) in the curve to indicate the appropriate number of factors to select (8).

The EFA was conducted to determine the latent factor structure using the Statistical Package for Social Sciences (SPSS) version 21. The intercorrelation and anti-image correlation matrices were analysed to assess the factorability of data. Next, the PCA was performed to assess the underlying factor structure of the IAT-Sinhalese version. The pattern matrix showed factor loading of each item on the factor and indicated whether the items are labelled together. The identified factors were then rotated to optimize the interpretability of the scale. Factor eigenvalues were used to determine the number of factors to rotate, and eigenvalues greater than or equal to 1.0 were retained for the analysis.

The CFA was done using LISREL statistical software package version 8.8 to identify the extent to which the final model was replicable in data. Normality and multicollinearity of the data were studied to assess the compatibility of data for CFA. Assessment of the appropriateness of the model was determined based on several fit indices (9).

Reliability of the tool was assessed by assessing internal consistency using Cronbach alpha and testretest reliability using Pearson correlation coefficient.

### Results

During the process of translation and judgment validation, all the experts agreed upon all original items in the original IAT. However, sentence patterns for questions numbers 2, 3 and 8 were modified to suit the Sri Lankan culture and adolescents (Table 1).

A total of 228 adolescents participated in the EFA study (99% response rate). The KMO measurement which was 0.864 was well above the required value of 0.6, while the Bartlett Sphericity Test gave a significant result ( $\chi^2$ =4344.7; df=190; p<0.001). In the correlation matrix, there should be a significant number of large correlations (8). Significant levels of correlations were observed in the correlation coefficients between items, and factor analysis was considered appropriate. Four factors were extracted and their eigenvalues ranged from 9.36 to 1.18. The extracted factors could explain 75.32% of the variance. The oblique rotation (Promax rotation) was

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used because there was some degree of correlation between the factors found in the component correlation matrix. The pattern matrix showed satisfactory factor loadings of 0.4 or higher on all factors. The four elements identified were consistent with the original IAT, which included all 20 items. The identified factors were salience, excessive use, lack of control and neglect of work (Table 2).

A total of 239 study participants participated in the CFA study (99% response rate). The model indices were RMSEA of 0.06, CFI of 0.93, NNFI of 0.91, SRMR of 0.063 and GFI of 0.77. These model fit index values were compared with the desired values.

The Cronbach alpha coefficient ( $\alpha$ ) for each subscale of the tool was 0.898, indicating good internal consistency. Also, the four subscales showed strong positive correlations, which were statistically significant (p<0.001). The correlation coefficient across the IAT scale was 0.85, indicating good interrater reliability.

## Discussion

Internet addiction disorder is a complex process that may reflect many psychopathology areas in internet use. This study revealed a four-factor model with 20 items as the validated IAT-Sinhalese version. The identified factors were salience, excessive use, lack of control and neglect of work. A total of 75.32% of the variance could be explained by the four components that were retrieved. The internal consistency was also satisfactory and comparable to the internal consistency of the original version. The model exhibits good to excellent characteristics to be used as a tool to detect internet addiction disorder among 15-19-year-old adolescents. It is also useful for designing internet prevention strategies and helping policymakers and administrators in the prevention, diagnosis, and treatment.

The operational definition of internet addiction

disorder adopted in the current study is congruent with the factor structure of the IAT. The validated tool is a self-administered instrument that typically requires an individual to complete the questionnaire within 10 minutes. The study population could easily understand the individual statements because they were clear and concise. Additionally, this format ensured the secrecy of respondents and reduced interviewer bias, making it helpful in gathering truthful and accurate information.

Globally, psychometrics plays a significant role in measuring health outcomes. The scales must be correctly modified to be used in a particular culture. Standard adaptation practices and reliability and validity assessments are necessary for the cultural adaptation process. In the current study, there was cross-cultural adaptation of the original IAT. In addition to ensuring that the ideas in the instrument were equivalent in the source and target languages, time, and context, this approach also decreased the possibility of adding bias to the study. Although the phrase structure of questions 2, 3, and 8 was changed towards better fit, the basic structure of IAT has not been altered. There are established standards for the validation of cross-cultural assessment instruments that were followed during the translation process of the questionnaires to achieve semantic, idiomatic, experiential and conceptual equivalence in the translation (5).

The four-factor model of IAT-Sinhalese version showed better model fit statistics than the other evaluated factor models. This result partially agrees with previous IAT validation studies conducted in other languages that used various multi-dimensional solutions and approaches. The identified factors of the present study were salience (seven items), excessive use (six items), lack of control (three items) and neglect of work (four items). The fourfactor model of the IAT-Sinhalese version has good psychometric properties and fits the data well than the previously reported six-factor model which explained 68.16% of the total variance (10). In the present study, the reliability measure of Cronbach's alpha was 0.782. However, a validation study with a four-factor solution revealed the respective score of the scale as 0.914 (11). This latter study has considered university students as its target population and therefore, generalizing the findings to teenage or young adult populations has not been recommended.

There were a few limitations that were noted. Even though the model took into account all the parameters, some components look out of place in the current situation. For instance, item 7 discusses how frequently people check their email before performing crucial tasks (How often do you check your e-mail before something else that you need to do). Nowadays, teenagers choose to communicate with people and build relationships on other wellknown social platforms rather than emails. As a result, the item might no longer be indicative of internet addiction disorder.

## **Conclusions & Recommendations**

The IAT-Sinhalese version is a valid and reliable tool for identifying internet addiction disorder among Sri Lankan 15-19 aged adolescents. Given its validity and reliability, it is advised to employ this tool to assess internet addiction disorder in the target group.

 Table 1: Modified sentences patterns of the IAT- original questionnaire

Item No.	Item in the original version	Item in the modified version
2	"Household chores"	"Educational activities"
3	"Intimacy with your partner"	"Enjoying with your family members"
8	"Job performances"	"Educational performances"

Table 2	• Identified	factors	number	of items	and items	included	for each	factor
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Identified factor	No. of Items	Included items
Salience	7	15, 12, 7, 19, 10, 11, 4
Excessive use	6	18, 20, 14, 1,2, 13
Lack of control	3	17, 16, 5
Neglect of work	4	6, 8, 3, 9

### **Public Health Implications**

- Based on the study findings, IAT-Sinhalese version is recommended in future preventative campaigns and to encourage policymakers and administrators to adopt initiatives for the treatment of internet addiction disorder.
- It is also recommended for upcoming observational studies among various adolescent populations. This will allow researchers to further examine internet addiction disorder among them.

## **Author Declarations**

Availability of the tool: The tool IAT-Sinhalese version is available upon request from corresponding author.

*Competing interests:* The authors declare that they have no competing interests.

*Ethics approval and consent to participate:* Ethics clearance was granted by the Ethics Review Committee of the Faculty of Medicine, University of Colombo, Sri Lanka. Informed written consent was obtained from each participant before data collection.

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*Author contributions:* GA participated in the design of the study, coordinated data collection, performed the statistical analysis, and drafted the first version of the manuscript. CDS participated in the design of the study. NG performed the statistical analysis and interpreted the data All authors read and approved the final manuscript.

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