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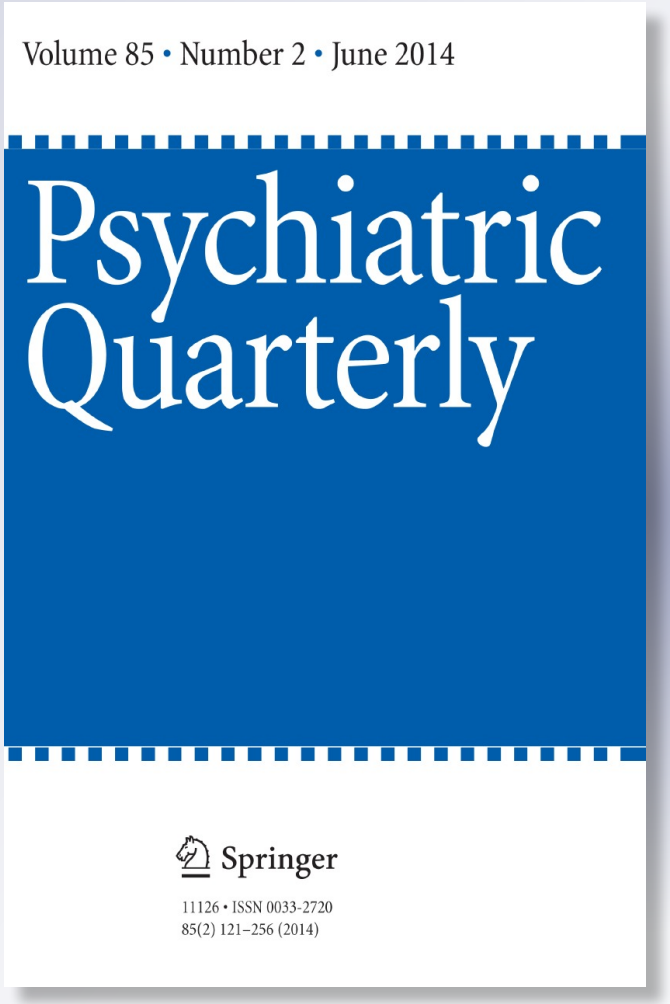

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ORIGINAL PAPER

Greek Version of the Internet Addiction Test: A Validation Study

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Abstract The aim of this project was to translate, culturally adapt and validate the Internet Addiction Test (IAT) in Greek adults. Twenty-one post-graduate medical students participated in the cultural adaptation procedure and 151 both post- and under-graduate medical students in the validation process. The internal consistency shown by a Cronbach's alpha was 0.91. Two-week test–retest reliability was $r_{tt} = 0.84$, $p < 0.001$. Face validity was affirmed by 83.6 % of the students. In terms of convergent validity, the hours of daily internet use were positively correlated with IAT score (rho = 0.48, $p < 0.001$). Moreover, IAT scores were higher in students that reported use of online gambling (40.5 vs 29.2, $p = 0.004$), pornographic sites (36.5 vs 28.0, $p = 0.003$) and online games (35.6 vs 28.2, $p = 0.009$). Exploratory factor analysis revealed three interpretable factors for the IAT, "Psychological/Emotional Conflict", "Time Management" and "Neglect Work", that showed good internal consistency and concurrent validity, explaining 55.3 % of the variance. The Greek version of IAT has shown good psychometric properties, comparable with the original IAT and the previously published translated versions, and can be a useful tool in future studies on internet addiction.

Keywords Internet addiction · Validation · Questionnaire · Medical students

Introduction

Excessive internet use is widely reported in young people with increasing tendency even in children and adolescents worldwide. Recent epidemiological studies in Greece have

Z. Tsimtsiou (✉) · A.-B. Haidich · S. Kokkali · T. Dardavesis · M. Arvanitidou
Department of Hygiene, School of Medicine, Aristotle University of Thessaloniki, 54124 Thessaloníki, Greece
e-mail: zoitsimtsiou@yahoo.gr

K. S. Young
The Center for Internet Addiction Recovery, St. Bonaventure University, Russell J. Jandoli School of Journalism and Mass Communication, St. Bonaventure, NY 14778, USA

shown high internet use, especially related to socialization and game playing, increasing the concern for underlying internet addiction behaviors [1–4]. Few data exist in Greek university students and young adults [5], although college students have been reported to be particularly vulnerable to Internet addiction [6]. Although, the need for measurement of the presence and severity of internet dependency is becoming a necessity, there is no screening tool for adults, widely used in an international context, validated in the Greek language.

The Internet Addiction Test (IAT) by Young is one of the most popular screening instruments for the assessment of Internet addiction, that consists of 20 items and has shown to be reliable and valid [7, 8]. The original version was structured in American English, and it has already been translated and psychometrically evaluated in Italian, French, German, Finnish, Chinese, Arabic and Korean [9–15]. Previous validation studies of IAT in different languages did not reach consensus on factor analysis results and one to six factors have been identified [8, 10–16]. The purpose of the present paper is to present the methodology used for the translation and cultural adaptation of the Greek version of IAT, as well as its psychometric properties, exploring internal consistency, test–retest reliability, face validity, and construct validity by exploring convergent validity and factor structure.

Methods

Translation Procedure

Two bilingual native speakers of Greek language performed independently the forward translation into Greek. A meeting between the two forward translators was arranged in order to reach a consensus, reconciling differences in the forward translations and obtaining a unified Greek version. A third bilingual speaker, who was not involved in the translation stage and has never seen before the English version of IAT, performed the back-translation into English. The back-translated version was reviewed by the developer of IAT in order to check its correspondence with the original instrument and was approved.

Cultural Adaptation Procedure

The Greek version of IAT was administered to 21 post-graduate medical students in order to ensure that each item of the Greek IAT was perfectly understood by Greek native speakers. One of the translators acted as a moderator, reading out each of the 20 items, while the participants were also simultaneously reading the questionnaire. They were asked to consider each question, to note down possible problems of comprehension, language and cultural relevance and they were encouraged to give suggestions. The groups' remarks were discussed between the researchers and minor revisions were performed in four items, leading to the final version of the Greek IAT. Since there were no substantial changes from the initial back-translated revision, the equivalence between the original and translated versions was considered retained, and back-translation was not repeated.

Validation Procedure

Participants

A total of 151 medical students participated in the validation study (21 were post-graduate and 130 undergraduate, 22 from semester 1, 36 from semester 3 and 72 from semester 5). The participants were scheduled to attend at least twice labs with an interval of 14 days during December 2012. They were asked to participate voluntarily and anonymously in the validation study, completing a paper/pencil version of the study tool at the end of their class in the university campus. The matching of their answers for the purposes of the test–retest analysis was achieved by the last five digits of their mobile phones that were optionally completed by them on their questionnaires.

Approval by the ethics committee of the Medical School of Aristotle University of Thessaloniki was obtained for this study.

Study Tool

The participants were requested to complete the 20-item Greek IAT. The IAT total score ranges from 0 to 100, with the higher the score representing the higher level of severity of Internet compulsivity and addiction. According to the developer, total scores that range from 0 to 30 points are considered to reflect a normal level of Internet usage; scores of 31 to 49 a mild level of Internet addiction; 50 to 79 a moderate level; and scores of 80 to 100 a severe dependence upon the Internet. Additionally, two demographic questions (age, gender) and three questions concerning their internet habits (hour of daily internet use, years of internet use, whether they spend time in online games, online gamble and pornographic sites) were included. Finally, they were asked whether they think that Greek IAT was a valid measure of internet addiction and they were requested to rate the extent of validity from 0 to 10.

Psychometric Tests

Tests of reliability (internal consistency, test–retest reliability) and validity (face validity, construct validity-factor analysis and convergent validity), were used for the validation of the Greek IAT.

Internal consistency refers to the extent to which the 20 items within IAT are related to each other. A Cronbach's alpha in excess of 0.7 is usually considered to show adequate internal consistency. Test–retest analysis assesses stability, by examining whether the questionnaire measures the same sort of things in the same person over a period of time. In order to examine test–retest reliability the Greek IAT was given to the same students twice, with an interval of 2 weeks, so that their internet habits were unlikely to have changed and responders would not be able to remember their first responses.

Face validity is the assessment of whether a questionnaire makes sense to those being measured. The students were requested to answer with a binary response (yes/no) whether they thought that the Greek IAT is a valid measure of internet addiction and to rate from 0 to 10 the extent of face validity they thought it has. Convergent validity relates to the relationships between a questionnaire and underling theories, including how closely the questionnaire is related to other measures of the same construct. Hours of internet use and usage of online games, pornographic sites and online gambling were expected to correlate positively with higher scores of Greek IAT in the students that completed the Greek IAT

[8–11]. Finally, construct validity was further tested with exploratory factor analysis that explored the dimensionality of the Greek IAT, by finding the smallest number of interpretable factors needed to explain the variance in the observed variables.

Statistical analysis

Data were entered independently by two researchers and were cross-checked by a third to avoid data entry errors. For the evaluation of internal consistency Cronbach's alpha coefficient was calculated for the total score, eliminating one item at a time, and checking whether any items significantly increased or decreased alpha. For the exploratory factor analysis, the number of factors to be extracted was determined through visual examination of a scree plot in combination with the conventional cut-off of eigenvalues greater than one. The suitability of the data for factor analysis was tested with the Kaiser–Meyer–Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. In order to distinguish independent underlying constructs, varimax rotation was employed to determine factor loadings. Items were assigned to the factor that produced the highest factor loading. The internal consistency of each factor was confirmed by calculating Cronbach's alphas. For the test–retest-reliability the IAT-scores at initial completion were correlated with those completed after 2 weeks, using Pearson coefficient (r_{tt}), since IAT scores were normally distributed. Spearman correlation coefficient (rho) was used for the correlation of IAT scores with the hours daily spent online. Finally, independent samples t-tests were employed for comparing the means of IAT scores for the students that use online games, gambling and adults entertainment sites with those that did not. Data were analyzed using the IBM/SPSS (version 20.0). All p values were two-tailed.

Results

Descriptives

Although all of the 151 students started completing the study tool, 140 fully completed questionnaires were returned (response rate 92.7 %). Completion time of IAT was 8–10 min. The characteristics of the participants are presented in Table 1. In terms of the online activities, 26 (17.2 %) participants reported online gambling, 59 (39.1 %) online gaming, 53 (35.1 %) adult entertainment sites. The mean IAT score was 31.2 (SD = 16.4), ranging from 1 to 73. According to IAT categories, 52.9 % (74/140) presented a normal level of Internet usage [Mean Score (MS) = 18.4, SD = 0.9], 31.4 % (44/140) a mild level of Internet addiction (MS = 38, SD = 0.8) and 15.7 % (22/140) reflected the presence of a moderate level (MS = 59.4, SD = 1.6).

Psychometric Tests

Reliability Tests

The Cronbach's alpha for Greek IAT was 0.91. The internal consistency was not changed when the items were eliminated one item at a-time. For the test–retest reliability test, 79 students attended a class twice after 14 days in the school and completed the tool twice. The rest of the students (N = 72) had attended their second class before this study was

Table 1 Characteristics of the study sample

	Mean ± SD	N = 151
Age (years)	21.1 ± 3.5	
Males		53.6 %
Undergraduate students		
Semester 1st		14.6 %
Semester 3rd		23.8 %
Semester 5th		47.7 %
Postgraduate students		13.9 %
Residency conditions		
With family		32.4 %
With roommate		11.9 %
Alone		48.3 %
With partner		4.6 %
Internet access areas		
Home		94.6 %
Cafes		10.6 %
School		26.0 %
Elsewhere		17.3 %
Years of internet use	7.6 ± 3.1	
Hours of daily internet use	2.4 ± 1.8	

launched. The mean score for the first IAT completion was 24.3 (SD = 13.4) and the second was 23.5 (SD = 15.2). The Pearson correlation coefficient, that reflected the test–retest reliability, was $r_{tt} = 0.84$, $p < 0.001$.

Validity Tests

According to the Kaiser–Meyer–Olkin criterion, sampling adequacy for the factor analysis was high (KMO = 0.883) and Bartlett's test for sphericity showed that the correlation matrices were suitable for factor analyses ($\chi^2 = 1{,}361.33$, df = 190, $p < 0.001$). Three interpretable factors were generated for the IAT that explained 55.3 % of the variance (Table 2). Factor 1 loaded on 10 items 3, 4, 10–13, 15, 18–20 and explained 39.6 % of the variance and the internal consistency of the factor was 0.88. This factor might be characterized as "Psychological/Emotional Conflict". Factor 2 loaded on 6 items 1, 2, 5, 14, 16, 17 and explained 8.5 % of the variance and the internal consistency of the factor was 0.81. This item might be characterized as "Time Management". Factor 3 loaded on the remaining 4 items 6–9 and explained 7.1 % of the variance and the internal consistency of the factor was 0.75. This factor might be characterized as "Neglect Work".

Face validity was affirmed by 83.6 % (117/140) of the students, rating it with a mean of 7.1 (SD = 2.0). In terms of convergent validity, correlation with internet use parameters revealed that the hours of daily internet use were positively correlated with IAT score (Spearman's rho 0.48, $p < 0.001$). Moreover, IAT scores were higher in students that reported use of online gambling (40.5 vs 29.2, Mean difference [MD]: 11.27, 95 % confidence interval [CI]: 4.34, 18.20; $p = 0.002$), pornographic sites (36.5 vs 28.0, MD: 8.42, 95 % CI 2.92, 13.91; $p = 0.003$) and online games (35.6 vs 28.2, MD: 7.32, 95 % CI 1.86, 12.79; $p = 0.009$).

Table 2 Corrected item-total correlations, internal consistencies if individual items are removed and factor loadings

Item abbreviation	Corrected item-total correlation	Alpha without item	Factor loadings		
			Factor 1	Factor 2	Factor 3
Q1: Stays online longer than intended	0.32	0.91	−0.082	**0.794**	0.003
Q2: Neglect household chores to spend more time online	0.66	0.91	0.364	**0.653**	0.196
Q3: Prefers excitement of the Internet to intimacy with partner	0.55	0.91	**0.512**	0.067	0.477
Q4: Forms new relationships with fellow online users	0.54	0.91	**0.643**	0.034	0.235
Q5: Others in life complain about amount of time spent online	0.54	0.91	0.438	**0.494**	0.015
Q6: Grades or schoolwork suffer because of time online	0.65	0.91	0.254	0.482	**0.619**
Q7: Checks email before something else that needs to be done	0.25	0.92	−0.028	0.059	**0.698**
Q8: Job performance suffers because of the Internet	0.68	0.91	0.289	0.406	**0.713**
Q9: Defensive or secretive when asked about online activities	0.46	0.91	0.393	0.029	**0.512**
Q10: Blocks out disturbing thoughts by thinking of the Internet	0.55	0.91	**0.659**	−0.025	0.343
Q11: Anticipates going online again	0.61	0.91	**0.560**	0.296	0.219
Q12: cFears life without the Internet would be empty or joyless	0.60	0.91	**0.715**	0.163	0.110
Q13: Snaps, yells or acts annoyed if when bothered while online	0.49	0.91	**0.571**	0.382	−0.188
Q14: Loses sleep due to late night log-ins	0.61	0.91	0.449	**0.515**	0.144
Q15: Feels preoccupied with the Internet when offline	0.71	0.91	**0.672**	0.293	0.246
Q16: Says "just a few more minutes" when online	0.57	0.91	0.288	**0.652**	0.153
Q17: Tries to cut down time spent online	0.60	0.91	0.181	**0.733**	0.297
Q18: Tries to hide time online	0.70	0.91	**0.740**	0.316	0.073
Q19: Chooses online time over time with others	0.59	0.91	**0.655**	0.192	0.158
Q20: Feels depressed offline, which goes away once back online	0.67	0.91	**0.711**	0.282	0.094
Standardized alpha			0.88	0.81	0.75
Eigenvalue			7.93	1.70	1.42
Explained variance			39.64 %	8.51 %	7.11 %

The higher of the three-factor loadings are printed in bold

Factor 1: Psychological/Emotional Conflict; Factor 2: Time Management; Factor 3: Neglect Work

Discussion

This study developed a Greek version of IAT, that went through cultural adaptation and tested its psychometric properties. It was found to have high internal consistency, test–retest reliability and face validity. Correlation with internet use parameters was described, associating IAT scores with hours of internet use and with the use of online activities previously described as addictive, indicating the convergent validity of the translated instrument. Exploratory factor analysis revealed three interpretable factors for the IAT, that showed good internal consistency and concurrent validity.

The Greek version of IAT has shown very high internal consistency, being congruent with previous validation studies in other languages [8–15]. Similarly, test–retest reliability was satisfactory, being in line with the earlier findings [11, 14]. Correlation of IAT scores with the time spent daily online was also revealed being within the range reported in the literature [8–11]. Moreover, being congruent with previous reports [5], higher scores of IAT were found to students that spent time online in games, gamble and pornographic sites, providing further evidence of construct validity of the Greek IAT and further opportunity for research regarding problematic internet usage and online games [17].

As mentioned above, other studies reported factor solutions that range from one to six [18–21]. Our results suggest that Internet addiction symptoms, as measured by the IAT, cluster into three distinct factors which have been named "Psychological/Emotional Conflict", "Time Management" and "Neglect Work". These factors together accounted for 55.3 % of the total variance. Interestingly, our two factors consist of very similar items to the ones that comprise the two components found in the validation study in US college students ("dependent use," and "excessive use") and the recent validation of the German version ("Emotional and Cognitive Preoccupation with the Internet" and "Loss of Control and Interference with Daily Life") [11, 16]. We also tried a two-factor model, but item 7 had a low loading. Item 7, "check email before anything else", is considered normal for most individuals as internet communication is widely applicable [19]. Other studies have found similar problems in Item 4 [16, 21]. We also tried a five-factor model, which contributed only another 10.6 % in the total variance. Moreover the four items, that clustered within the third factor show broad overlap with one of the six factors identified in the first validation study of IAT, named "neglecting work" [8]. The above findings reinforce the construct validity of Greek IAT, suggesting that it is a valid instrument to assess Internet Addiction.

Our study is the first to provide a culturally adapted and validated Greek version of a widely used screening instrument for the assessment of Internet addiction in adults. The main limitation of the study is that the study sample came from medical students and not from general population. The reason for that was that the authors plan the first study on the prevalence of internet addiction on medical students, population in which intense Internet use is expected and therefore this was the ideal population for the validation study. However, there are no indications that the psychometric properties of the Greek IAT would be different in a sample coming from the general population, since they are in line with the previously reported validation studies of both the original American IAT and its translations in other languages [8–16].

In conclusion, the Greek version of IAT has shown high internal consistency, good test–retest reliability, high face validity. IAT scores were positively related with the hours spent on internet and significantly higher scores were found in participants who reported use of online games, gamble and pornographic sites, suggesting convergent validity. Factor analysis revealed three factors: Psychological/Emotional Conflict", "Time Management"

and "Neglect Work", indicating the construct validity of the translated instrument. Therefore, the Greek version of IAT has shown good psychometric properties, comparable with the original IAT and the previously published translated versions, and can be a useful tool in future studies on internet addiction.

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Conflict of interest The authors declare that they have no conflict of interest.

Disclosure None.

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Author Biographies

Zoi Tsimtsiou, MD, MSc, PhD is a General Practitioner, Research Fellow, Department of Hygiene, School of Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece.

Anna-Bettina Haidich, PhD is a Statistician, Assistant Professor, Department of Hygiene, School of Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece.

Stamatia Kokkali, MD, PhD is a General Practitioner, Research Fellow, Department of Hygiene, School of Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece.

Theodoros Dardavesis, MD, PhD is an Associate Professor, Department of Hygiene, School of Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece.

Kimberly S. Young, PhD is a Psychologist and Professor at St. Bonaventure University, Founder and Director of the Center for Internet Addiction Recovery, Bradford, Pennsylvania, USA.

Malamatenia Arvanitidou, MD, PhD is a Professor, Director of the Department of Hygiene, School of Medicine, Aristotle University of Thessaloniki, Thessaloniki, Greece.