

French Validation of the Compulsive Internet Use Scale (CIUS)

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Abstract The popularity of using the Internet and related applications has grown in European countries in the last two decades. Despite numerous advantages in terms of optimizing communications among individuals and social systems, the use of the Internet may be associated with excessive use and possible Internet addiction. The goals of the current study were to validate a French version of the Compulsive Internet Use Scale (CIUS) and to assess its links with common psychiatric symptoms such as depression (assessed with the Beck Depression Inventory: BDI), anxiety (assessed with the Trait Anxiety Inventory: STAI) and alcohol misuse (assessed with the Alcohol Use Disorder Identification Test: AUDIT). The French versions of the CIUS, BDI, STAI and AUDIT were administered to a sample of Internet users. Exploratory and confirmatory analyses, correlation analysis and logistic regression were performed. As previously found with the original version, a one-factor model of the CIUS had good psychometric properties and fit the data well. Excessive use of the Internet was associated with depressive symptoms.

Keywords Internet · Addiction · Internet addiction · Factor analysis · Validation · Depression

Introduction

The prevalence of Internet use has increased worldwide during the last decade. Although this provides wonderful opportunities for communication, exchange and social

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interactions, it has been accompanied by the development, in some individuals, of an excessive and uncontrolled pattern of use impacting upon daily living. This phenomenon resulted in the emergence of the concept of “Internet addiction” or “compulsive Internet use” [1–4]. The growing prevalence of excessive Internet use has been described in most industrialized countries (especially Asian, European and North American countries) [5–8]. Excessive Internet use has repeatedly been associated with psychiatric symptoms [9–11]. In particular, symptoms of Internet addiction have frequently been associated with depression [12–16], anxiety [17] and substance use [18].

In recent years, several instruments have been developed to assess problematic Internet use. Meerkerk et al. [19] developed a short, easy-to-administer, 14-item Compulsive Internet Use Scale (CIUS) that provides a dimensional score (i.e., severity) of problematic Internet use. The questionnaire was based on the seven criteria for substance dependence and the 10 criteria for pathological gambling in the fourth edition of the *Diagnostic and Statistical Manual of Mental Disorders*, as well as on the Griffiths formulated criteria for behavioral addictions. The questionnaire covers several core components of addictive behaviors such as loss of control, preoccupations, withdrawal symptoms, salience, conflict and coping (i.e., Internet use as an escape strategy). Positive correlations were reported between the amount of time spent online, self-reported problems concerning Internet use and CIUS scores [19]. Furthermore, high correlations were found with another scale assessing problematic Internet use, namely, the Online Cognition Scale (OCS) [20]. More precisely, the CIUS scores correlated significantly with two subscales of the OCS that measure diminished impulse control and loneliness/depression [19]. The CIUS was found to have high internal consistency and test–retest validity. Its structure, explored in multiple independent samples, is unifactorial [19]. The CIUS has several advantages over other instruments, such as its brevity, which makes it easier to use as a systematic screening tool in clinical settings and in online surveys. Another advantage of the CIUS is that it measures specifically Internet uncontrolled use rather than related psychosocial well-being constructs [19].

The main goal of the present study was to investigate the psychometric properties of the French-language translation of the CIUS. The second goal was to assess links between CIUS scores and psychopathology previously linked with Internet excessive use, such as depression, anxiety and alcohol misuse.

Methods

Participants and Procedure

A total of 127 persons took part in the study. Participants were volunteers from the community and students recruited through local advertising. They provided signed informed consent before completing the questionnaires. Participants were individually tested in a quiet room, where they anonymously completed the following questionnaires: (1) the CIUS; (2) the Beck Depression Inventory (BDI); (3) the Trait Anxiety Inventory (STAI); and (4) the Alcohol Use Disorder Identification Test (AUDIT). The CIUS was recorded by the whole sample. The STAI, the BDI and the AUDIT were added later to the study protocol leading to slight modification in the number of subjects who completed these assessments.

Instruments

The Compulsive Internet Use Scale

The French-language adaptation of the CIUS consisted of the 14 original items [19] translated into French using a translation and a back-translation procedure. All items were scored on a 5-point Likert scale from 0 (*never*) to 4 (*very often*). The minimum scale score is zero and the maximum is 56.

The CIUS has 14 items involving several aspects of addiction such as loss of control (items 1, 2, 5 and 9); preoccupation regarding Internet use (items 4, 6 and 7); withdrawal symptoms (item 14); coping or mood modification (items 12 and 13); and conflict, including inter- and intrapersonal conflict (items 3, 8, 10 and 11).

The Beck Depression Inventory, version 2 [21]

The BDI is a widely acknowledged tool that is well validated in the French language for the assessment of depressive symptoms. The items were rated on a 4-point Likert scale (0–3 points). Scores range from 0 to 63. A score ≥ 10 is a cutoff for the detection of depressive symptoms [21]. The French version that we used has shown strong reliability and validity in both clinical (depressed) and nonclinical samples [21].

The Alcohol Use Disorder Identification Test [22]

The AUDIT is a 10-item self-report screening instrument for alcohol-related problems. The validated French version of the AUDIT was used in the present study [23]. The AUDIT measures individual differences in patterns of alcohol use (items 1–3); difficulties in managing impulses to drink alcohol (items 4–6); and alcohol-related problems (items 7–10). Eight items (1–8) are scored from 0 to 4. Items 9 and 10 are scored 0, 2 or 4. The maximum score of the AUDIT is 40. Scores higher than 7 for men and higher than 6 for women indicate excessive drinking. Score > 13 reflect alcohol dependence. The French version of the AUDIT has been widely used and found to have good validity and reliability [23].

The French Version of the Trait Anxiety Inventory [24]

The STAI consists of 20 items designed to assess general trait anxiety, as opposed to state anxiety. Items from the scale are scored from 1 (*not at all*) to 4 (*very much so*). The French version used here was shown to have high reliability and validity in both clinical (anxious) and nonclinical samples [24].

Analyses

In this study, SPSS 18.0 (IBM, Chicago, IL) and AMOS 19.0 (Analysis of Moment Structures; SPSS Inc., Chicago, IL) software programs were used to perform the statistical analyses.

First, descriptive statistics were computed for the demographic characteristics. The factorial structure of the CIUS was then considered. Third, internal consistency, that is, the extent to which the CIUS items were interrelated, was measured by using Cronbach's alpha coefficient. This coefficient varies between 0 and 1, with values close to 1 implying good homogeneity of the items. However, we endorsed the point of view of Streiner and Norman

[25] who recall that alpha is dependent not only on the magnitude of the correlations among the items, but also on the number of the items in the scale. A scale can be made to look more homogeneous simply by doubling the number of items even though the average correlation remains the same. Consequently, they suggest that alpha be above 0.70, but not much higher than 0.90.

In order to assess the factorial structure of the CIUS, the number of factors to extract was determined by an exploratory factor analysis with Velicer's minimum average partial (MAP) test performed on the correlation matrix [26, 27]. The number of factors suggested by the MAP test was then confirmed through parallel analysis. In parallel analysis, the focus is on the number of components that account for more variance than the components derived from random data, whereas in the MAP test, the focus is on the relative amounts of systematic and unsystematic variance remaining in a correlation matrix after extractions of an increasing number of components [27]. Both procedures are statistically based, rather than being mechanical rules of thumb. To explore the fitness of using the CIUS instrument for assessing Internet addiction, we next applied confirmatory factor analysis (CFA) in a structural equation model with AMOS software. To assess the adequacy of the model, we used three fit measures as follows:

- a. The χ^2 to degrees of freedom ratio. Several researchers have recommended the use of this ratio as a measure of fit to overcome problems associated with the χ^2 test statistic. These problems include, among others, violation of assumptions, model complexity and dependence on sample size. Ratios lower than 2 seem to indicate a reasonable fit [28].
- b. The root mean square error of approximation (RMSEA). This is a measure of approximate fit in the population and is therefore concerned with the discrepancy due to approximation. The RMSEA is bounded below 0. RMSEA values less than or equal to 0.05 can be considered as a good fit, between 0.05 and 0.08 an acceptable fit and greater than 0.08 a mediocre fit, whereas values greater than 0.10 are not acceptable [29].
- c. The comparative fit index (CFI). The CFI ranges from 0 to 1, with higher values indicating better fit. A CFI greater than 0.95 may be interpreted as a good fit, whereas values between 0.90 and 0.95 are indicative of acceptable fit relative to the independence model [30].

Exploration of the data revealed that CIUS, BDI and AUDIT were not normally distributed. Thus two-tailed Spearman's correlation was used to establish potential associations between the CIUS total score and the AUDIT, BDI and STAI scores. Next, to examine the contribution of sociodemographic variables and psychiatric symptoms to Internet excessive use, we used a binary logistic regression, as preliminary graphical analyses showed that multiple linear regression was not suitable for the data. Hence, the dependent variable—the total CIUS score—was dichotomized as follows: <50% of total score and \geq 50% of total score.

Moreover, BDI scores were also categorized as <10 and \geq 10 (a BDI score \geq 10 is associated with depression [21]). Finally, we fitted a logistic regression model that included the dichotomized addiction to the Internet variable as the dependent variable and age, BDI, STAI and sex as the independent variables. Goodness of fit was assessed by the Hosmer–Lemeshow test, which determines whether or not the observed event rates match expected event rates in subgroups of the model population. A large p value indicates a good match. The AUDIT variable was not included in the model, as it was not found to be associated with the dependent variable in preliminary analyses and as its inclusion in a previous logistic regression model worsened the Hosmer–Lemeshow goodness-of-fit test. As another indication of the predictive power of the model, a classification table was generated.

Results

Of the original 127 observations initially recorded, listwise deletion resulted in dropping one of them because of missing data, hence leaving a sample size of 126 participants with CIUS. Among them, 104 completed the AUDIT, 98 the BDI and 96 the STAI. The sample size that was used for the logistic regression consisted of 95 persons. Participants' mean age was 23.3 years ($SD = 5.9$). Most of them were women (84.3%). Their full characteristics are reported in Table 1.

Exploratory factor analysis by Velicer's MAP test suggested a one-factor solution. This finding was successfully confirmed by parallel analysis. This one-factor model was then evaluated in CFA. Loadings ranged from 0.55 to 0.80. The χ^2 to degrees of freedom ratio was equal to 2.57, indicating a discrepancy between the data and the hypothetical model. Furthermore, the other CFA statistics, such as RMSEA (0.11) and CFI (0.84), did not meet

Table 1 Participants' characteristics

Characteristic	Statistical data
Age (year), M (SD); range	23.3 (5.9); 16–45
Female (%)	84.3
CIUS total score, M (SD); range	13.6 (9.7); 0–42
BDI total score, M (SD); range	7.7 (6.3); 0–29
STAI total score, M (SD); range	39.6 (8.3); 24–63
AUDIT total score, M (SD); range	4.4 (3.6); 0–16

Table 2 Factor loadings and goodness-of-fit measures

Item	Question	Model 1	Model 2
Item 1	Do you find it difficult to stop using the Internet when you are online?	0.70	0.67
Item 2	Do you continue to use the Internet despite your intention to stop?	0.66	0.63
Item 3	Do others (e.g., partner, children, parents) say you should use the Internet less?	0.60	0.59
Item 4	Do you prefer to use the Internet instead of spending time with others (e.g., partner, children, parents)?	0.61	0.61
Item 5	Are you short of sleep because of the Internet?	0.68	0.67
Item 6	Do you think about the Internet, even when not online?	0.67	0.71
Item 7	Do you look forward to your next Internet session?	0.55	0.58
Item 8	Do you think you should use the Internet less often?	0.71	0.71
Item 9	Have you unsuccessfully tried to spend less time on the Internet?	0.64	0.64
Item 10	Do you rush through your (home) work in order to go on the Internet?	0.65	0.68
Item 11	Do you neglect your daily obligations (work, school, or family life) because you prefer to go on the Internet?	0.57	0.57
Item 12	Do you go on the Internet when you are feeling down?	0.80	0.77
Item 13	Do you use the Internet to escape from your sorrows or get relief from negative feelings?	0.64	0.56
Item 14	Do you feel restless, frustrated, or irritated when you cannot use the Internet?	0.56	0.58
χ^2/df		2.57	1.84
RMSEA		0.11	0.08
CFI		0.84	0.92

goodness-of-fit criteria (see constrained model 1 in Table 2). An inspection of the standardized residuals revealed two significant residuals, i.e., >1.96 in absolute value. This suggested that the most substantive change in the model in terms of improvement of fit would arise from correlating the respective error variances. Following this suggestion, an unconstrained model, in which the variance errors of items 1 and 2 (problem with stopping use of the Internet) and of items 12 and 13 (escape) were allowed to correlate, resulted in acceptable goodness-of-fit measures (see unconstrained model 2 in Table 2). Furthermore, all new standardized residuals fell below the 1.96 cutoff. The internal consistency of the CIUS is high as reflected by a Cronbach's coefficient of 0.91.

Bivariate correlation analyses showed that the CIUS total score was poorly associated with BDI ($\rho = 0.21$ and $p = 0.04$) and STAI scores ($\rho = 0.21$ and $p = 0.04$). No significant association was found with either AUDIT scores ($\rho = -0.004$ and $p = 1$) or age ($\rho = -0.151$ and $p = 0.09$). Similarly, non-parametric Mann–Whitney test showed no difference between males and females on CIUS total scores. The logistic regression model fits the data well, as indicated by the large p value of the Hosmer–Lemeshow test ($p = 0.5$). The classification table (Table 3) shows that, overall, 83.2% of the cases were correctly classified, with an excellent prediction for the low scores.

The results of the regression show that older people were less likely to have high CIUS scores [odds ratio (OR) = 0.59 and confidence interval (CI) = (0.40; 0.89)] and that people with a BDI score ≥ 10 were more likely to have high CIUS scores [OR = 7.29 and CI = (1.86; 28.53)]. STAI score and gender were not found to have a statistically significant effect.

Discussion

The present study examined the psychometric properties of the French version of the CIUS. In concordance with the findings of Meerkerk et al. [19], the CFA indicates that a one-factor model of the CIUS has good psychometric properties and fits the data well.

One of the main findings of the present study is the link found between depressive symptoms and CIUS scores. People with a BDI score ≥ 10 were more likely to have high CIUS scores [OR = 7.29 and CI = (1.86; 28.53)]. Depressive symptoms should be thus a target of preventive scheduling of Internet addiction and should be assessed and treated in people with Internet excessive use. Indeed, a growing number of data indicated that the excessive engagement in online activities is associated with the desire to escape from real life and negative affect [7]. In the context of this cross-sectional study, it is not possible to explain the causal nature of this association (Excessive Internet use to cope with depressive

Table 3 Classification of the observed and predicted cases by logistic regression

Observed	Predicted		
	Excessive Internet use		Percentage correct
	≤50% of total score: 0	≥50% of total score: 1	
Excessive Internet use			
<50% of total score: 0	72	4	94.7
≥50% of total score: 1	12	7	36.8
Overall percentage			83.2

symptoms? Excessive Internet use leading to depressive symptoms? Common factors such as loneliness leading to both disorders?). Longitudinal studies are needed to elucidate this association. Nevertheless, the study highlights the necessity of assessing depressive symptoms in people with excessive Internet use and vice versa. The findings also urge studies on the effect of Internet use, excessive use and addiction on the course or prognosis of depression.

In this sample, mainly composed of young French-speaking participants, no significant relationship was observed between CIUS scores and gender. Heterogeneous findings have been found concerning gender differences in problematic Internet use: Certain studies found men to be more addicted than women to the Internet [7], whereas other studies failed to find any differences according to gender [31]. This heterogeneity could be attributed to the absence of consideration of problematic online behaviors per se (e.g., online games, social networks, cybersex). However, further research with a gender-balanced design is needed before drawing firmer conclusions about gender differences. Older people in the present study were less likely to have high CIUS scores. This result is consistent with those of other studies performed on a population with a wider age range [31–33], showing that younger users were at higher risk for excessive Internet use, possibly due to a higher level of involvement in technology.

Conclusion

Despite the limitations, our findings emphasize that the French language version of the CIUS has good psychometric properties. The scale is possibly a good self-report for measuring problematic Internet use as suggested by the previous studies of Meerkerk et al. [19] and as highlighted by similarities between the scale construct and clinical characteristics reported in case studies [34].

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Conflict of interest No competing financial interests exist.

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