

## Rapid Communication

# French Validation of the Internet Addiction Test

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### Abstract

The main goal of the present study is to investigate the psychometric properties of a French version of the Internet Addiction Test (IAT) and to assess its relationship with both time spent on Internet and online gaming. The French version of the Young's Internet Addiction Test (IAT) was administered to a sample of 246 adults. Exploratory and confirmatory analyses were carried out. We discovered that a one-factor model of the IAT has good psychometric properties and fits the data well, which is not the case of a six-factor model as found in previous studies using exploratory methods. Correlation analysis revealed positive significant relationships between IAT scores and both the daily duration of Internet use and the fact of being an online player. In addition, younger people scored higher on the IAT. The one-factor model found in this study has to be replicated in other IAT language versions.

### Introduction

INTERNET USE WAS ACCOMPANIED by the development in some individuals of an excessive pattern of use associated with significant negative consequences leading to the emergence of the concept of "Internet addiction."<sup>1</sup> Young<sup>2</sup> developed an Internet Addiction Test (IAT). Positive correlations were reported between the amount of time spent on line and IAT score.<sup>3,4</sup>

The IAT received a psychometric evaluation for its English<sup>3</sup> and Italian<sup>4</sup> versions. The exploratory factor analysis carried out in these studies revealed six factors. These factors did, however, not correspond to the same items in the two studies. Furthermore, it was reported that the six IAT factors all significantly correlated with each other, with correlations values up to  $r = 0.62$ .<sup>3</sup>

In this context, the main goal of the present paper was to investigate the psychometric properties of a French version of the IAT. To this end, this study aimed (a) to establish the factor structure of the IAT using an exploratory factor analysis, and (b) to confirm the derived factor structure using confirmatory factor analysis, which has not been done in previous studies having explored the factorial structure of the IAT.<sup>8,9</sup> Relationships between Internet use and both time spent online and usage of online games as a potentially addictive application were also considered.<sup>5</sup>

### Materials and Methods

#### Participants and procedure

A total of 246 participants (age:  $M = 24.11$ ,  $SD = 9$ , range 18–54 years) took part in the study (165 women and 81 men). Participants are undergraduate medical students ( $N = 195$ ) and volunteers from the community who participated on a debate concerning cyberaddictions ( $N = 51$ ). All participants were assessed using the French version of the IAT. The French adaptation of the IAT consisted of the 20 original items<sup>2</sup> translated into French using translation and back-translation procedures. All items are scored on a Likert scale (never, rarely, occasionally, often, always) corresponding to scores of 1 to 5. The maximum score is 100. A score  $\geq 50$  suggests frequent problems due to Internet usage.

A part of the sample ( $N = 195$ ) also had to respond to two questions: (a) how much time they spent daily online, and (b) if they play online games or not. The time daily spent online ranged from 0 to 390 minutes ( $M = 60.42$ ,  $SD = 62.85$ ) and 20 out of the 195 participants (10.26%) reported to practice online gaming.

#### Analyses

The number of factors to extract was determined by a Velicer's Minimum Average Partial (MAP) test performed

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TABLE 1. LOADINGS OF THE EXPLORATORY FACTOR ANALYSIS

Items	Loadings	Question: How often . . .
Item 1	0.51	Do you feel that you stay online longer than you intend?
Item 2	0.54	Do you neglect household chores to spend more time online?
Item 3	0.49	Do you prefer excitement of the internet to intimacy with your partner?
Item 4	0.58	Do you form new relationships with fellow online users?
Item 5	0.72	Do others in your life complain to you about the amount of time you spend online?
Item 6	0.66	Does your work suffer because of the amount of time you spend online?
Item 7	0.36	Do you check your e-mail before something else that you need to do?
Item 8	0.68	Does your job performance or productivity suffer because of the internet?
Item 9	0.68	Do you become defensive or secretive when someone asks what you do online?
Item 10	0.78	Do you block disturbing thoughts about your life with soothing thoughts of the internet?
Item 11	0.72	Do you find yourself anticipating when you go online again?
Item 12	0.62	Do you feel that life without the Internet would be boring, empty and joyless?
Item 13	0.65	Do you snap, yell, or act annoyed if someone bothers you while you are online?
Item 14	0.71	Do you lose sleep due to late night log-ins?
Item 15	0.81	Do you feel preoccupied with the Internet when off-line or fantasise about being online?
Item 16	0.69	Do you find yourself saying "just a few more minutes" when online?
Item 17	0.79	Do you try to cut down the amount of time you spend online and fail?
Item 18	0.81	Do you try to hide how long you've been online?
Item 19	0.73	Do you choose to spend more time online over going out with others?
Item 20	0.70	Do you feel depressed, moody, or nervous when you are offline, which goes away once you are back online?

Extraction method: MLM

on the correlation matrix.<sup>6</sup> Then, exploratory and confirmatory factor analyses were computed. For this latter analysis, goodness-of-fit was tested with chi-square (a nonsignificant value corresponds to an acceptable fit). But the chi-square is known to increase with sample size and model complexity. The chi-square is therefore inappropriate to confirm the factor organization of questionnaires.<sup>7</sup> For these reasons, the chi-square was complemented by examining other indices that depend on a conventional cut-off. Thus, to assess the general fit of the model, we used the chi square ( $\chi^2$ ) to degrees of freedom (*df*) ratio. A model can be considered to fit well the data if its  $\chi^2/df$  ratio is inferior to 2. Next to the  $\chi^2/df$ , two other indices that depend on conventional cut-off<sup>8</sup> have also been computed: the Root Mean Square Error of Approximation (RMSEA) and the Standardized Root Mean Square Residual (SRMR). The combination of these two indices is valuable because the RMSEA is sensitive to the misspecification of the factors "loadings" and the SRMR is sensitive to the misspecification of the factor "co-variances." An RMSEA between 0 and 0.05 indicates a good fit and that between 0.05 and 0.08 an acceptable one. An SRMR between 0 and 0.05 indicates a good fit and that between 0.05 and 0.10 an acceptable one.<sup>9</sup> The Comparative Fit Index (CFI)

is commonly used in confirmatory factor analyses and we also report this index. A CFI > 0.90 is generally interpreted as an acceptable fit. Comparative fit indices were also used to compare nested models. To this aim, software (FITMOD) providing point interval estimates for RMSEA difference<sup>10</sup> was employed. A CFA to compare males and females was not undertaken because of the imbalance between males and females in the sample. Finally, correlation analysis were done to analyze the relationships between IAT scores, age, gender, time daily spent online, and online gaming. Pearson's point-biserial correlations ( $r_{pb}$ ) for dichotomous variables were used to evaluate the relationships between gender and online gaming with the other variables. Correlations are given within the 95% Confidence Interval (CI).

## Results

### Exploratory and confirmatory factor analysis of the 20-item IAT

Of the 246 participants (8 with IAT score  $\geq 50$ : 3.25%), 13 had one item or more with missing values and were excluded. A MAP test<sup>6</sup> recommended extracting only one factor. A factor analysis was then performed. The maximum

TABLE 2. FIT INDICES OF THE CONFIRMATORY FACTOR ANALYSES (ONE-FACTOR MODELS)

Model	$\chi^2$	<i>df</i>	$\chi^2/df$	RMSEA	SRMR	CFI
Model 1A	332.30***	170	1.95	0.064	0.057	0.89
Model 1B	290.56***	169	1.72	0.056	0.054	0.92

Model 1B had the best fit and was retained.  
\*\*\* $p < 0.001$ .

loading of each item was greater than 0.30 (Table 1), and the factor analysis explained 45% of the total variance. This result is not in accordance with previous studies highlighting a six-factor solution based on a basic scree-test and Kaiser criterion (eigenvalue at  $>1$ ). However, we did not find a six-factor solution even when applying the same criteria (i.e., scree plot, Kaiser criterion) as in previous exploratory factor analyses<sup>3,4</sup> made on the IAT.

The IAT was then submitted to a confirmatory factor analysis utilizing maximum likelihood estimation with robust standard errors and a mean-adjusted chi-square statistic test (MLM). In this prospect, we first computed a one-factor model in which the 20 items of the IAT were hypothesized as a unique latent factor representing Internet problematic use. The  $\chi^2$  statistic of the one-factor model was significant,  $\chi^2(170) = 332.30$ ,  $p < 0.001$ , and the  $\chi^2/df$  ratio is equal to 1.95 (model 1A, Table 2). The maximum modification indices in the  $\theta$ - $\Delta$  matrix (covariance between errors on observed variables) were found between items 6 and 8. Thus, we chose to let the errors of these two items covariate because they are semantically very similar (both are related to the neglecting of work). The  $\chi^2$  of this new model (model 1B, Table 2) was significant,  $\chi^2(169) = 290.56$ ,  $p < 0.001$ , and the  $\chi^2/df$  ratio is equal to 1.72. For the other fit indices, we obtained a RMSEA = 0.056 and a SRMR = 0.054. Their combination indicated an acceptable fit. The CFI of 0.92 was also satisfactory. Comparisons between RMSEA of model 1A and model 1B indicated that model 1A is better (see Table 2 for the absolute fit indices). The reliability coefficient (Cronbach's alpha) of the scale is equal to 0.93, which confirms the good internal reliability of the questionnaire.

Then, we tested an alternative model resulting from Widyanto and McMurrans' work<sup>3</sup> on the original English IAT. Indeed, using exploratory factor analysis, these authors suggested that the IAT revealed six factors. Therefore, a six latent factor model based on the six components previously found<sup>3</sup> was tested. However, this model could not be computed because its latent variable co-variance matrix is not positively definite due to the very high correlations between the factors. Consequently, the present results indicate that a one-factor model of the IAT has good psychometric properties and fits the data well, which is not the case of a six-factor model.

#### *Correlations between IAT, Internet use, and gender*

Correlation analysis revealed positive significant relationships between IAT scores and both the daily duration of Internet use,  $r = 0.53^*$ ,  $CI = (0.41, 0.62)$ , and the fact of being an online player,  $r_{pb} = 0.18^*$ ,  $CI = (0.04, 0.31)$ . In addition, a significant negative correlation appeared between IAT scores and age,  $r = -0.23^*$ ,  $CI = (-0.35, -0.11)$ . No significant relationship took place between IAT scores and gender,  $r_{pb} = 0.09$ ,  $CI = (-0.04, 0.21)$ . Finally, it should also be pointed out that online gamers reported longer daily Internet use than participants who did not play online games,  $r_{pb} = 0.18^*$ ,  $CI = (0.04, 0.32)$ .

#### **Discussion**

The present study examined the psychometric properties of a French version of the IAT.

In concordance with previous studies, a significant positive correlation was found between IAT scores and the daily duration of Internet use.<sup>4</sup> As previously shown,<sup>5</sup> online gamers reported longer daily Internet use than other participants which could be explained by the fact that more synchronous and interactive applications could be more "addictive." This correlation was not constantly found.<sup>3,11</sup> No significant relationship took place between IAT scores and gender which is in accordance with some studies<sup>4</sup> but in opposition with others.<sup>5</sup> Variability across the literature is probably explained by differences in sample characteristics. Consistently with results of other studies carried out on larger age range population,<sup>3,4</sup> younger users are more at risk for Internet addiction.

The main results of the present study is that the confirmatory factor analysis indicate that a one-factor model of the IAT has good psychometric properties and fits the data well, which is not the case of a six-factor model previously reported.<sup>3,4</sup> Differences in the technical procedures adopted for analysis are probably responsible for differences in findings rather than differences across countries. This finding may explain the high variability of the items content factors (same number of factors but different factors) found in previous studies<sup>3,4</sup> and improve the usefulness of the scale. Further studies using similar analyses are necessary in other versions of the IAT such as the original English version.

The main limitations of the present study are sampling of participants which was not an overall addictive sample, as well as lack of complementary measures to test the external validity of the scale.

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#### **Disclosure Statement**

The authors have no conflict of interest.

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