IJBMC International Journal of Body, Mind and Culture

Volume 12, Issue 2, pp 175-187
DOI: 10.61838/ijbmc.v12i2.953

Article type:
Original Research

Adaptation and Validation of Moroccan Dialect Compulsive Internet Use Scale: Validity and Reliability

Samiha. Imrani[1*], Bouzekri. Touri[1]

1 Laboratory of Sciences and Technologies of Information and Education (LASTIE), Faculty of Sciences Ben M'SICK, University Hassan II, Casablanca, Morocco.

Corresponding author email address: samiha.imrani-etu@etu.univh2c.ma

Article history:

Received 21 July 2024
Revised 14 Oct 2024
Accepted 24 Oct 2024
Published online 26 Feb 2025

How to cite this article:
Imrani, S., & Touri, B. (2025). Adaptation and Validation of Moroccan Dialect Compulsive Internet Use Scale: Validity and Reliability. International Journal of Body, Mind and Culture, 12(2), 175-187.

ABSTRACT

Objective: The current study aimed to examine the factor structure and reliability of Arabic version of Compulsive Internet Use Scale (CIUS) among a sample of Moroccan high school students.

Methods and Materials: 334 students from three public High school of Casablanca Region (Morocco) were included. 40.9% of boys and 59.1% of girls (M=17.15, SD=1.328) responded to an Arabic translated version of CIUS. Descriptive, exploratory, and confirmatory factor analyses were performed on the collected data, by measuring the ratio Chi-square and degree of freedom χ2 /DF, Comparative Fit Index (CFI), The Normed Fit Index (NFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA).

Findings: The exploratory and confirmatory factor analyses support a model with 14 items showing the three-dimensional structure of this scale: Absorption, priorities and mood regulation. The Arabic CIUS follows a three-dimensional structure, demonstrates measurement invariance with respect to sex and age, and exhibits excellent reliability (ω = .94). The values of validity indexes were: χ2 /DF= 3.26, CFI = 0.971, NFI = 0.937, TLI = 0.938, and RMSEA = 0.043.

Conclusion: These subscales indicate generally satisfactory psychometric qualities. These results show that the Arabic translated CIUS instrument has an excellent factor structure and internal consistency.

Keywords: Compulsive Internet Use Scale, Validity, Morocco, Internet addiction, psychometric properties, High school students.

Introduction

The Internet has become a daily practice that facilitates communication, education, entertainment and the exchange of goods or services (Jorgenson et al., 2016). Also, remote and real-time communication between friends, parents or relatives has become a reality. Education has been rethought (distance learning, electronic tutoring, etc.) and knowledge is at our fingertips. In terms of entertainment, it offers a wide range of games, videos, social media, dating communities and many other things to make life enjoyable (Jorgenson et al., 2016). In addition, millions of jobs have been generated worldwide thanks to the Internet, which has helped reduce the unemployment rate. All this leads some people to spend most time on the Internet and find themselves unable to disconnect and control their impulses: this is Internet addiction (Young, 1998). The latter, like other forms of addiction without substances (gambling, video games, screens, sex, food, etc.) (Picard et al., 2021), has long been neglected by the scientific

community to the detriment of other forms of addiction known as psychoactive substances (tobacco, alcohol, drugs, medication, etc.). But the considerable increase in the number of Internet users in recent years has partly motivated several research projects on the subject (Picard et al., 2021).

In recent years, the global prevalence of Internet addiction (IA) was increased (Cheng & Li, 2014; Endomba et al., 2022; Meng et al., 2022). Despite the ever-growing prevalence of the disease, it is its manifestations and consequences that give it the status of a public health problem on a par with addictions to psychoactive substances (Canan et al., 2014; Kaess et al., 2014; Padmanathan et al., 2018; Tahir et al., 2021). Like drug addiction, IA is manifested by the repeated inability to reduce or stop and by daily life disorders on the physical (nutritional disorders, greatly impaired sleep quality, dry eyes, neglect of personal hygiene, carpal tunnel syndrome, lower back pain, etc.), social (decreased interest in offline activities, relationship difficulties, social isolation, dwindling financial resources, etc.) and psychological levels (feeling of well-being during Internet use, obsessive thoughts about the Internet, anticipation of future Internet sessions, feeling of emptiness, worsening of pre-existing depression or anxiety disorder, irritability offline or when Internet access becomes impossible, suicidal ideation and suicide attempts, etc.). These consequences thus strongly affect performance, health and, by extension, the development of a country. Since adolescence is a transitional stage between childhood and adulthood (Mastorci et al., 2024), the fact that young people are constantly in contact with the Internet through games, videos, course materials, and social networks adds to their psychological instability and makes them more vulnerable to the consequences of IA (Dufour et al., 2019). Africa, whose population is predominantly made up of young people, is no exception to this reality.

Adolescents are particularly vulnerable because the Internet has several characteristics that meet their need for social contact, independence, and experimentation. According to a meta-analysis carried out by Zewde *et al.* on IA among African students, an overall prevalence of 34.54% was observed. The associated factors that have been identified are gender, place of residence and daily duration of Internet use (Zewde et al., 2022). Although studies have been conducted in some West African countries such as Ghana, Nigeria, and Côte d'Ivoire to specifically measure Internet addiction among young people, Benin, to date, has no data to estimate the extent of this phenomenon. A better understanding of the extent of this phenomenon and its associated factors is essential to guide the implementation of effective and sustainable prevention and treatment strategies.

Addiction is defined by a high consumption of internet media each day. This criterion of time spent is not recognized by all. A person can spend little time on the internet but be obsessed all day by what they are going to do there. Internet addiction can concern the media itself as well as the activities that can be practiced there (online games, gambling, shopping, etc.). The Internet is a medium of addiction. This is one of the reasons why the population addicted to the internet does not constitute a homogeneous group. The use of social networks could indeed be similar to the use of the telephone or television. Young people who spend a lot of time on the phone or sending messages to their friends are not considered addicted but nevertheless practice the same activity on a social network like Facebook, which is a real vector of "addictive behavior." It is therefore difficult to speak of real addiction to social networks. Here, the term "fashion phenomenon" would be much more appropriate.

Reliable and validated tools would help to better identify addictive behaviors in Moroccan adolescents. However, in Morocco, Arabic dialect scales to study IA are lacking. Therefore, it is of crucial importance to develop measurement tools to study symptomatology in specific samples of individuals who may be particularly vulnerable to this phenomenon. The Compulsive Internet Use Scale (CIUS) has been introduced as a tool to evaluate the severity of Internet addiction and compulsive or pathological online behaviors. In a previous study, several scales were identified as measuring internet addiction at that time (Laconi et al., 2014). However, the CIUS was considered one of the shortest questionnaires compared to other scales measuring compulsive internet use severity, while having good psychometric properties at the same time. Thus, this scale could be particularly useful for assessing IA in secondary school students, as it takes approximately 3 to 5 minutes to complete.

The CIUS was designed with reference to the Diagnostic and Statistical Manual of Mental Disorders-IV

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(DSM-IV) criteria for addiction and also including general characteristics of behavioral addictions that were added based on Griffiths study (Griffiths, 1999) and the results of a psychometric study conducted by Meerkerk (Meerkerk et al., 2003). The CIUS includes typical symptoms related to compulsive Internet use, such as problems with control Internet use, agitation associated with inability to go online, behavioral and mental preoccupation with online activities, changes in mood etc (Meerkerk et al., 2009). The scale was adapted and psychometrically tested in different languages and with specific groups of individuals with good psychometric properties (Dhir et al., 2015; Khazaal et al., 2022; Lopez-Fernandez et al., 2019). However, a debate still raised about the factor structure of the CIUS, with some studies proposing the CIUS as a unidimensional instrument (Aonso-Diego et al., 2024; Fernandes et al., 2021; Guertler et al., 2014; Pérez-Sáenz et al., 2023) and others finding it better suited to a three-factor model composed of Priorities, Absorption and Mood Regulation (Alavi et al., 2011; Yong et al., 2017). Also, a study conducted by Lopez-Fernandez et al. (2019) found that the short scales (CIUS-5, CIUS-7, and CIUS-9) offer an even better one-factor structure than the original 14-item scale. In Morocco, the psychometric properties of the CIUS have not been analyzed among Moroccan adolescents (Lopez-Fernandez et al., 2019).

In this study, we propose to validate an Arabic-language tool for measuring IA, by adapting the English Compulsive Internet Use scale developed by Meerkerk et al. into Moroccan Arabic by examining the factor structure and reliability of Arabic version of Compulsive Internet Use Scale (CIUS) among a sample of Moroccan high school students.

Methods and Materials

Study Design and Participants

To ensure a representative sample of high school students in Mohammedia region, a random sampling method was used to select three public high schools from the Education direction of Mohammedia, a province of the region of Casablanca, Morocco (Figure 1) including two high schools from urban area (85,93% participants) and one from rural area (14.07% participants). A total of 381 students participated in the study. However, after data cleaning (removing responses with missing values or incoherent answers) a final sample of 334 students (48% males and 52% females) was retained for analysis. Participants were volunteers aged from 14 to 19 years (M = 16, SD = 1.1) and were enrolled in various academic tracks, ensuring a broad representation of study fields.

Following official approval, school administrators and teachers were approached for collaboration. Students were informed about the study objectives and provided written informed consent, ensuring voluntary participation and confidentiality.

Data collection was conducted using a paper-based questionnaire, administered during school hours to maximize response rates. To control for potential biases related to Internet usage fluctuations during holidays, questionnaires were distributed at least one week after any school vacation. This precaution was taken to prevent seasonal variations in students' screen time from affecting the findings. The data collection period extended from September to December 2024.

The survey included sociodemographic characteristics (i.e., sex and age), and other addictive behaviors to internet use CIUS.

The14-item CIUS was subjected to a double-blind translation. The adolescent is questioned about the frequency of these attitudes and behaviors related to Internet use. For each of the items, the five response modalities were then rated from 0 to 4. The total score ranges from 0 to 56; the higher it is, the more compulsive the Internet behavior can be described.

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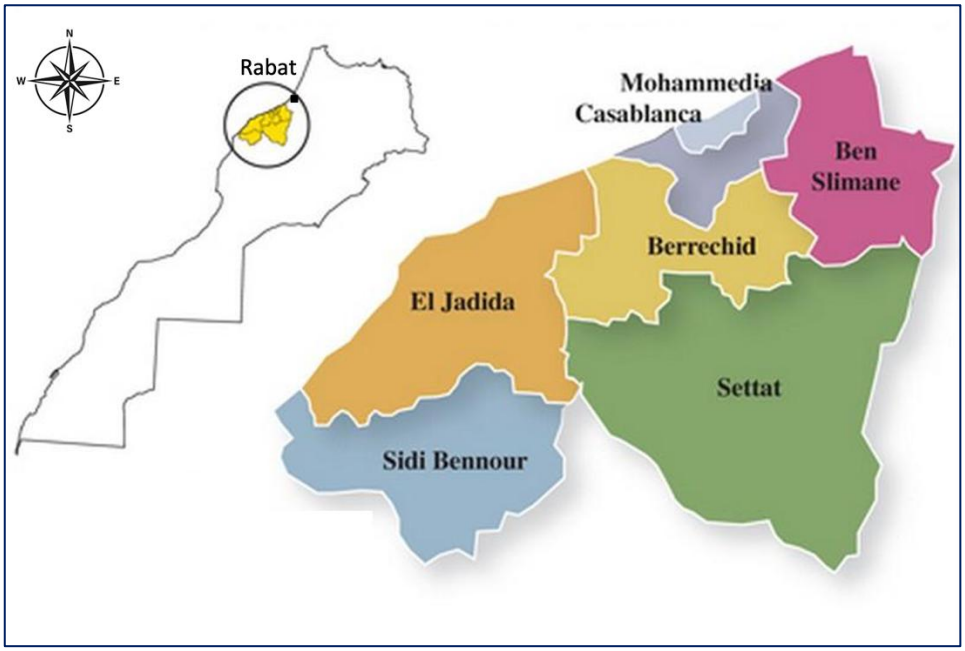
Figure 1

Region study location.



Instruments

Compulsive Internet Use Scale. The CIUS scale consists of 14 items using a five-point Likert-type scale (0 = totally disagree, 4 = totally agree), with scores ranging from 0 to 56. Its reliability in the original version was 0.8 (Meerkerk et al., 2009), while in a Spanish adult population it was 0.95. The Arabic version used in this study was based on the validation of Sarmiento which was back-translated and carefully reviewed by native speakers (Sarmiento et al., 2021).

Data Analysis

In this study, R software program was used to perform the statistical analyses. First, descriptive statistics were calculated to analyze demographic characteristics. The factorial structure of the CIUS was then examined, with the number of factors determined through an exploratory factor analysis. Velicer's minimum average partial (MAP) test was applied to the correlation matrix to guide factor extraction (O'ConnorFollowing official approval, school administrators and teachers were approached for collaboration. Students were informed about the study objectives and provided written informed consent, ensuring voluntary participation and confiden-tiality.

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The survey included sociodemographic characteristics (i.e., sex and age), and other addictive behaviors to internet use.

Findings and Results

A total of 334 observations were retained. The time weekly spent online ranged from 4 to 10 hours per day (M = 2.545, SD = 1.075). Only 41.5% of the participants had a computer at home. The time spent daily on the internet was distributed as follows: less than 10 hours, 19.2%; between 10 and 30 hours, 33.2%; between 20 and 30 hours, 21.6%; and more than 30 hours, 26.0%. The characteristics of the participants are reported in Table 1.

Our study employed a methodological approach centered on statistical analysis to discern sociodemographic and clinical characteristics. The

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outcomes stemming from this approach unveil that the distribution based on gender has been meticulously established. Among the 334 individuals comprising the total sample, 161 (48.2%) were male, while 173 (51.8%) were female (Table 1). This balanced distribution is important in ensuring the impartial generalizability of the study's conclusions to the targeted population.

Table 1

Characteristics of participants (n=334).

variable	Number	Percentage (%)
Sex		
Male	161	48.2
Female	173	51.8
Internet at home		
Yes	233	69.8
No	101	30.8
Time spent daily on internet (hours)		
< 10	64	19.2
10 - 20	111	33.2
20 - 30	72	21.6
> 30	87	26.0
Period of Internet use (years)		
<1	49	14.7
1-3	87	26.1
3-5	14	37.7
> 5	72	21.5

Table 2 shows the statistics for each CIUS item, including mean, standard deviation, and correlation between each item and the CIUS total score. According to Kaiser's criterion, the eigenvalue plot (Fig. 1) supports a one-factor structure that explained 42% of the model variance. Factor loadings were generally satisfactory (≥ 0.5), except for item 14, which had a slightly lower loading (0.48), indicating a weaker association with the factor. The internal consistency of the CIUS was excellent (α = 0.93, McDonald Omega = 0.96).

Table 2

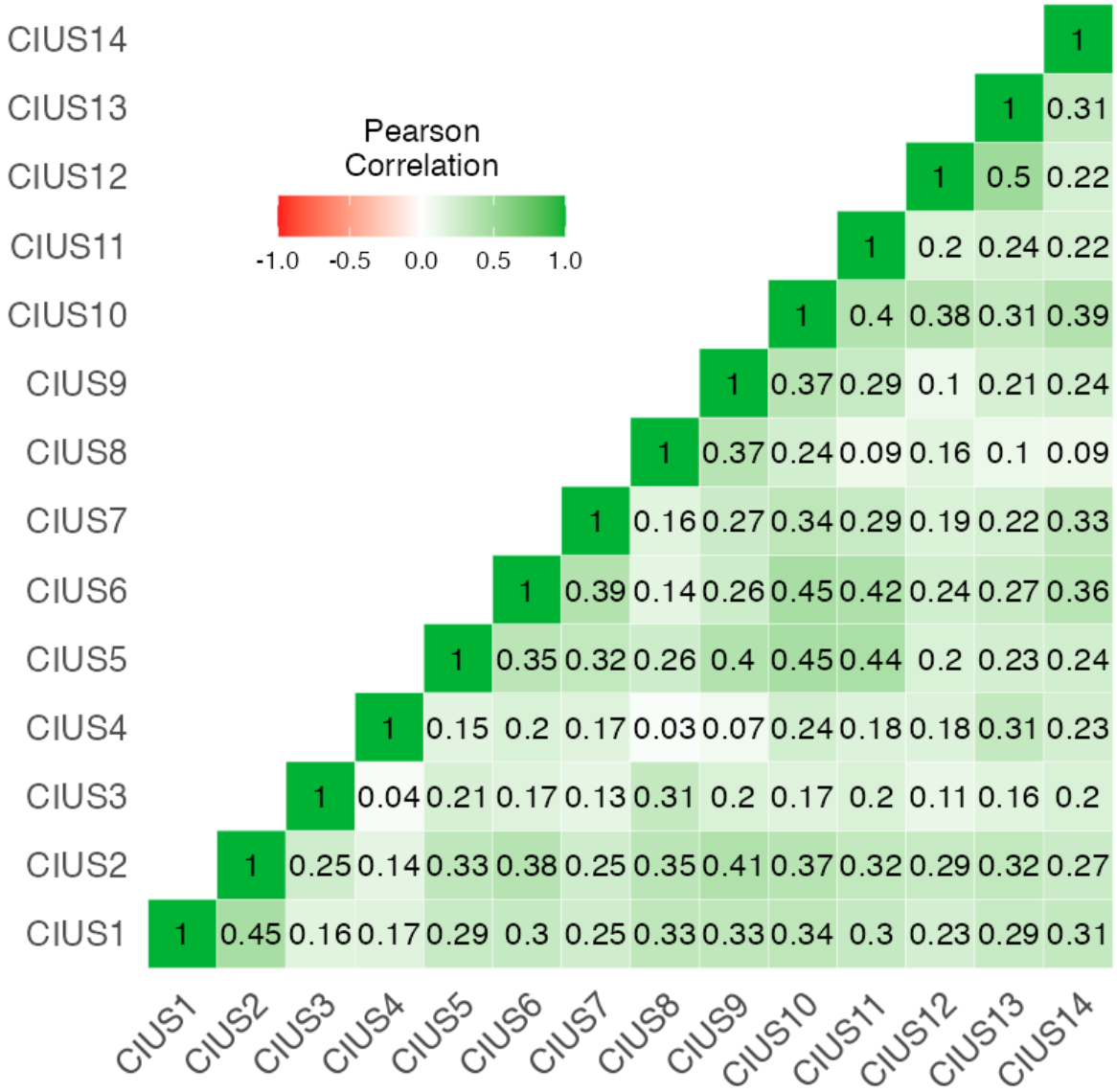
Descriptive data of Moroccan CIUS-14.

Item	Mean	SD	Skewness	SE	Kurtosis	SE
CIUS-1	2.82	1.318	-0.027	0.134	-1.109	0.268
CIUS-2	2.79	1.388	0.121	0.134	-1.222	0.268
CIUS-3	3.08	1.523	-0.112	0.134	-1.443	0.268
CIUS-4	2.30	1.461	0.715	0.134	-0.901	0.268
CIUS-5	2.00	1.339	1.044	0.134	-0.266	0.268
CIUS-6	2.14	1.290	0.866	0.134	-0.428	0.268
CIUS-7	2,.30	1.324	0.637	0.134	-0.807	0.268
CIUS-8	3.13	1.347	-0.279	0.134	-1.083	0.268
CIUS-9	2.47	1.445	0.493	0.134	-1.130	0.268
CIUS-10	2.48	1.445	0.505	0.134	-1.116	0.268
CIUS-11	1.94	1.219	1,166	0.134	0.353	0.268
CIUS-12	2.64	1.508	0.347	0.134	-1.337	0.268
CIUS-13	3.22	1.560	-0.254	0.134	-1.439	0.268
CIUS-14	2.18	1.284	0.866	0.134	-0.373	0.268

The correlation matrix presented gives a comprehensive overview of the interrelationships and potential associations between the CIUS-14 items studied (Figure 2). Positive correlation coefficients (r > 0) highlight variables that tend to exhibit simultaneous increases. Notable instances of positive correlations include the good association between CIUS-1 and CIUS-2 (r = 0.45), CIUS-5, CIUS-6 and CIUS-10 (r = 0.45), CIUS-5 and CIUS-11 (r = 0.44).

Figure 2

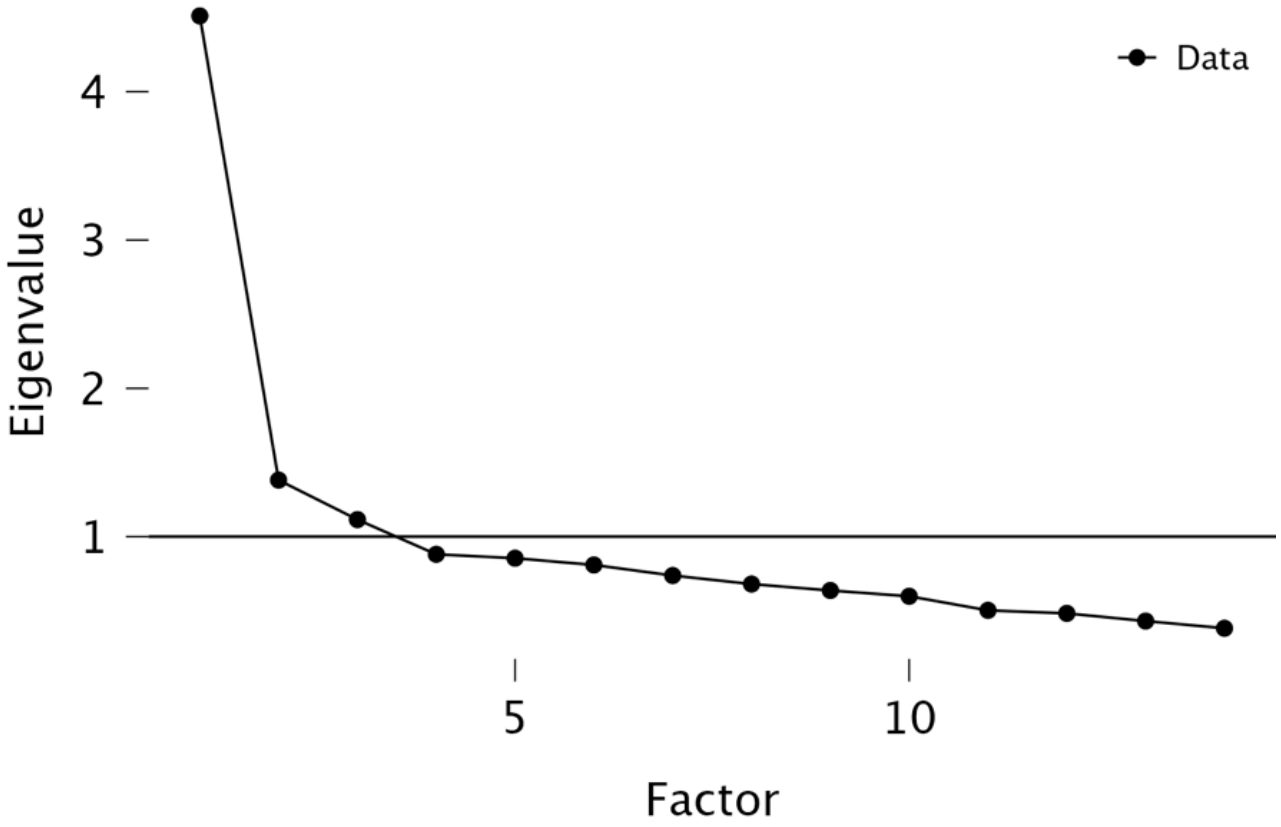
Pearson correlation matrix between the 14 items of the Moroccan dialect version of CIUS.



The Exploratory factorial analysis (EFA) revealed a three-factor solution, determined based on eigenvalues greater than one (Figure 3). These factors together capture 50.05% of the total variance in the data. Factor 1 (absorption) primarily explains the underlying structure with a share of 32.22% of the variance, Factor 2 (priorities) contributes with a slightly lower percentage, at 9.86% while factor 3 (Mood regulation) contributes with a percentage of 7.96. Combining these three factors retains a significant portion of the information in the original data. The analysis highlights the core results obtained through factor contributions, identifying the key factors explaining data variance and providing insight into their relative importance in describing the underlying structure.

Figure 3

Scree plot with three eigenvalues above one.



In this study, EFS (Table 3) explored factor contributions comprehensively for better understanding the intricate relationships between absorption (Ab), priorities (P) and mood regulation (MR) variables. The results, obtained using the 'Residual Minimum' extraction method and a "Varimax" rotation, revealed three fundamental dimensions within our model.

Factor 1: Absorption

Absorption variables played a predominant role in shaping Factor 1. Specifically, variables CIUS-5, CIUS-6, CIUS-7, CIUS-10 and CIUS-11 exhibited substantial factor loadings of 0.631, 0.689, 0.633, 0.596, 0.697 respectively. These high loading values signify a strong association between these variables and the satisfaction dimension elucidated by Factor 1. The variable CIUS14 also contributed to Factor 1, but with a relatively lower loading of 0.483 compared to other absorption variables (Table 3).

Factor 2: Priorities

Priority variables emerged as the principal contributors to Factor 2, underscoring the significance of this dimension in our analysis. Variables CIUS-8, CIUS-2, CIUS-3 and CIUS-9 exhibited noteworthy factor loadings of 0.814, 0.593, 0.574, and 0.557, respectively, on this factor. The variable CIUS-1, although presenting positive loading on Factor 2 (0.499), contributed less prominently compared to other priority variables (Table 3).

Factor 3: Mood regulation

variables associated with mod regulation contribute to Factor 3, underscoring the significance of this dimension in our analysis. Variables CIUS-13 and CIUS-12 exhibited noteworthy factor loadings of 0.785 and 0.762, respectively, on this factor. The variable CIUS-4, although presenting positive loading on Factor 3 (0.532), contributed less prominently compared to other MD variables (Table 3).

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Table 3

Factors loadings Factor structure and percentage of the explained variance of each item of the CIUS (N=334). Rotation method: Promax with Kaiser normalization.

Items	One-factor-model	Three-factor-model		
		F1	F2	F3
CIUS-1	0.611		0.499	
CIUS-2	0.667		0.593	
CIUS-3	0.384		0.557	
CIUS-4	0.360			0.532
CIUS-5	0.636	0.631		
CIUS-6	0.647	0.689		
CIUS-7	0.552	0.633		
CIUS-8	0.441		0.814	
CIUS-9	0.586		0.574	
CIUS-10	0.717	0.596		
CIUS-11	0.599	0.697		
CIUS-12	0.500			0.762
CIUS-13	0.558			0.785
CIUS-14	0.562	0.483		
Eigen value	4.511	4.511	1.381	1.115
% of variance	32.22	32.22	9.86	7.96
Cumulative % of variance	32.22	32.22	42.09	50.05
Cronbach alpha	0.815	0.832	0.793	0.773

Respecting the quality of the fit indices of the Schermelleh-Engel et al. (Schermelleh-Engel et al., 2003) (Schermelleh-Engel K, the confirmatory factor analysis (CFA) performed by the maximum likelihood estimation method on our sample data showed that our tested three-dimensional model presents satisfactory fit indices (fig. 3), a comparative analysis of the two models in relation to the goodness of fit index showed: all metrics derived from the Confirmatory Factor Analysis for the model comprising two factors meet the standards for an acceptable fit (RMSEA=.043; CFI=.971; TLI=.942) , as mentioned on Table 4.

Table 4

Fit indexes of the two models tested for the Arabic Moroccan CIUS.

	χ^2/dl(p-value)	RMSEA	RMSEA 90% confidence	SRMR	TLI	CFI
Model with one factor	3.14(0.000)	0.079	0.068-0.091	0.063	0.816	0.845
Model with three factors	1.85(0.001)	0.043	0.026 - 0.06	0.030	0.942	0.971

SRMR: standardized root mean square residual; RMSEA: Root mean square error of approximation; CFI: comparative fit index; TLI : Tucker-Lewis index.

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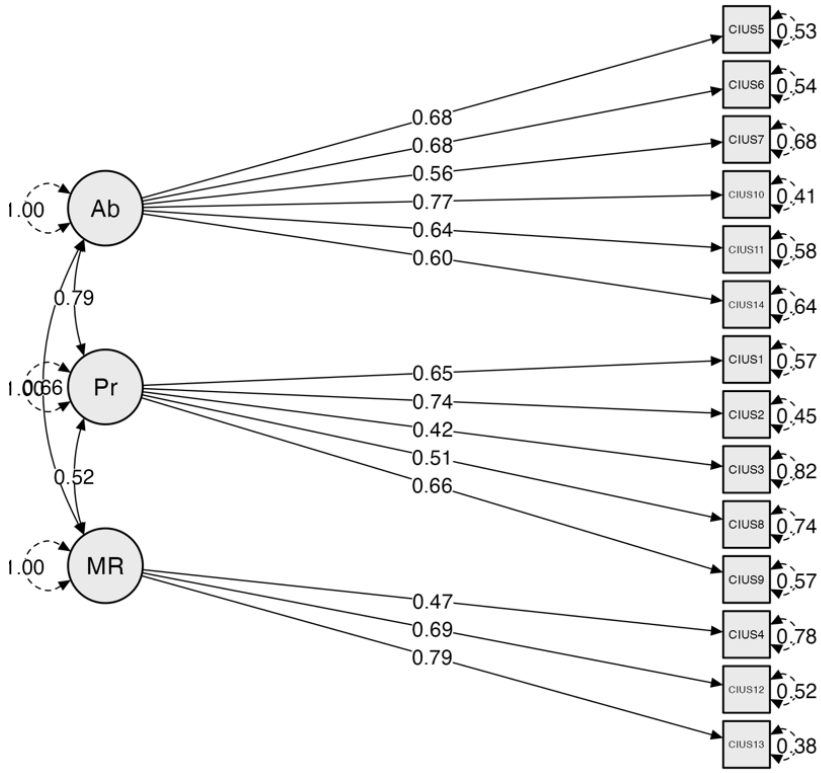
Figure 4

Standards estimates for the three-factor CIUS model (N = 334).



The item numbers refer to the items shown in Table 3. Ab: Absorption; P : Priorities; MR: Mood regulation

The index measuring reliability, Cronbach's alpha coefficient (α), was used to calculate reliability. According to this index, the overall reliability of the CIUS scale was acceptable (α = 0.815). Specifically, for the absorption dimension, α = 0.832, for the priorities dimension α = 0.793; and for the regulation dimension α = 0.773) (Table 5). Overall, the scale can be considered as adequate.

Table 5

Average variance extracted (AVE) and composite reliability (CR) of each factor in the CFA.

Factor	AVE	CR
Absorption	0.442	0.785
Priorities	0.369	0.693
Mood regulation	0.437	0.598

Participants were classified into two categories based on a threshold defined according to the procedure described by Meerkerk (Meerkerk et al., 2009). Thus, since the response scale is five-point, we can qualify as compulsive a behavior that occurs sometimes, often or very often, i.e. a score on the CIUS scale greater than or equal to 28 (14 items × 2). According to this principle, 30.23% of our participants (23.6% for girls and 36.4% for boys) can be considered at risk of compulsive behavior in Internet use (Table 6). 74.26% have access to Internet at home and the majority of compulsive adolescents (41.58%) spent more than 30 hours per day.

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Table 6

Compulsive behavior and its association with sex and internet use.

Variable	Compulsive	Non compulsive	p-value
Sex			
Male	38	123	0.02*
Female	63	110	
Internet at home			
Yes	75	158	0.147
No	26	75	
Time spent daily on internet (hours)			
< 10	9	55	0.000
10 - 20	25	86	
20 - 30	25	47	
> 30	42	45	

Discussion and Conclusion

The objective of the present study was to evaluate the psychometric properties of the CUIS in a population from Casablanca region, Morocco, and to test its reliability and validity in a sample of secondary school students.

The results show that the fit supported the three factors model of the CUIS better than the single factor model. A great convergence has shown with those from previous research in the secondary school from other countries (Yong et al., 2017), and with many studies in the university. Nevertheless, it is concluded that the CIUS can be used to measure compulsive behavior among Moroccan students.

As EFA and eigenvalue suggested the three-factor solution, we compared the one-factor solution with the three-factor solution using CFA. As in previous studies (Aonso-Diego et al., 2024; Fernandes et al., 2021; Guertler et al., 2014; Pérez-Sáenz et al., 2023), the one-factor solution showed acceptable validity for both men and women, as well as for the general population. However, our analysis revealed that the three-factor model provided the best fit for the Moroccan population. Convergent validity indicates that these three factors are separate and distinguishable from one another. We conclude that the scale represents compulsivity, where "compulsivity" in Morocco can be recognized as a combination of "over-absorption", "difficulty prioritizing", and "mood regulation". With reference to the construct validity results where we found a higher correlation between tension, time killing and CIUS scores, 'compulsivity' as 'mood regulation' seems self-evident. Consistent with previous studies (Alavi et al., 2011; Yong et al., 2017). Although the factor structure found with the EFA and CFA is acceptable for the general population, regardless of gender, our sample size is too small to test whether the same psychometric properties are applicable to different age groups. The Cronbach alpha for each of the CIUS components complies with the criteria with values greater than 0.70.

Regarding the generalization of these results in the Arab world, we should be cautious especially in the Middle East countries, which present more cultural differences among secondary school students than the North Africa countries.

Despite the questionnaire was translated by linguistics in both Arabic and English language, the item 10 gave a significance in absorption in Moroccan context (Meerkerk et al., 2009), this item needs more reformulation and explanation to be clearly understood by secondary school students. These results are not in line with Arabic CIUS study conducted by Khazaal et al., (2022) who found a model with one factor (Khazaal et al., 2022).

Our results do not show a significant difference between girls and boys in the degree of compulsive behavior associated with the Internet, which means that the underlying processes are of the same nature. The activities considered potentially the most problematic and the most specific to this new technology are, on the one hand, those that promote instant communication and, on the other hand, those that engage users in network games (Meerkerk et al., 2009; Wan & Chiou, 2007). However, it would seem that the first type of use concerns more adolescent girls and the second, more adolescent boys (Lin & Yu, 2008). It would therefore be appropriate to associate the CUIS-9 scale with other

investigation instruments to reveal the type of activities favored on the Internet (Weiser, 2001).

The determination of a threshold from which a behavior can be qualified as compulsive remains pending but, as a first step in a screening process, a score higher than 28 can constitute an indication before a more in-depth clinical diagnosis (Meerkerk et al., 2009). In any case, a high score on this scale constitutes a sign of malaise whose underlying causes remain to be identified. In the same way, the CIUS can be a rapidly mobilizable additional investigation even if the reason for the consultation or the report does not a priori concern problematic use of the Internet (for example, in situations of school dropouts). Nevertheless, additional studies are still necessary to confirm the interest of the tool. Its discriminatory power must be examined using different profiles of Internet users, in particular pathological consumers who are led to consult in specialized centers or not.

Moroccan dialect CIUS is a reliable and valid instrument for assessing Internet use addiction among Moroccan adolescents. Adolescents are particularly vulnerable because the Internet has several characteristics that meet their need for social contact, independence and experimentation. The construction of scientific knowledge in this area can benefit from an effective tool such as the CUIS. In addition, a better understanding of the risk and protective factors would help to strengthen the prevention of this disorder to preserve the well-being of adolescents at school.

Acknowledgments

Great thanks to all who helped us doing this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

The study was conducted in accordance with the Declaration of Helsinki and approved by the regional academy of education under reference number 54/10/24 and approved by ethics committee of the Hassan II University of Casablanca.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

Funding

This research was carried out independently with personal funding and without the financial support of any governmental or private institution or organization.

Authors' Contributions

The research methodology was designed by both researchers, they participated in data collection, writing and editing the manuscript, analyzing and interpreting the collected data and revising the data analysis. All contributors read the final manuscript and approved it.

Abbreviations

The following abbreviations are used in this manuscript:

Ab: Absorption
CFA: Confirmatory Factor Analysis
CFI: Comparative Fit Index
CIUS: Compulsive Internet Use Scale
DSM-IV: Diagnostic and Statistical Manual of Mental Disorders-IV
IA: Internet Addiction
MAP: Minimum Average Partial
MR: Mood Regulation
P: Priorities
RMSEA: Root Mean Square Error of Approximation
SD: Standard Deviation
SEM: Structural Equation Model
SRMR: Standardized Root Mean Square Residual
TLI: Tucker-Lewis Index

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