Internet Addiction Test research through a cross-cultural perspective: Spain, USA and Colombia

La investigación del Internet Addiction Test desde una perspectiva intercultural: España, Estados Unidos y Colombia

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Abstract

Internet users worldwide often experience problems related to their Internet use, and although culture has an important influence over how people communicate, what they value, and therefore how they use the Internet, little cross-cultural research on the subject of problematic Internet use has been carried out. The Internet Addiction Test (IAT), the most common measurement tool for this purpose, has been used in various countries. In this study we compared and analyzed the cross-cultural results found in the most recent research on the IAT factor analysis. We found that in countries with two or more studies, results are often replicated, suggesting that cultural context influences Internet behaviors. We conducted our own IAT factor analysis studies in three countries – Spain, USA, and Colombia – with a total of 1,273 participants. We compared our results with those from previous studies in the same countries and found similar results. The most notable finding was that all the IAT factor analyses, both ours and the previous ones in the same regions, contained a factor related to loss of control/time management problems and another factor related to emotional/psychological problems, thereby suggesting that impulse control problems and unfulfilled emotional needs are the most important components in the development of problematic Internet use in various countries around the world. Future research on problematic Internet use should focus on these aspects.

Key Words: Internet addiction; problematic Internet use; cross-cultural; Internet Addiction Test; factor analysis.

Resumen

Los usuarios de Internet frecuentemente experimentan problemas relacionados con su uso de Internet y, aunque la cultura tiene una influencia importante en la forma en que las personas se comunican, en lo que valoran y, por lo tanto, en cómo utilizan Internet, hay escasas publicaciones sobre investigación intercultural del uso problemático de Internet. La herramienta más común para medir dicho uso, el Internet Addiction Test (IAT), se ha utilizado en varios países. En este estudio comparamos los resultados interculturales de las investigaciones más recientes sobre el análisis factorial del IAT. Encontramos que los resultados a menudo se replican en países con dos o más estudios, lo que sugiere que el contexto cultural influye en los comportamientos en Internet. Llevamos a cabo nuestros propios estudios de análisis factorial del IAT en tres países (España, EE. UU. y Colombia) con 1.273 participantes. Al comparar nuestros resultados con los de estudios anteriores en esos países, encontramos que nuestros resultados también fueron similares a los de estudios anteriores. El hallazgo más notable fue que todos los análisis factoriales de IAT, tanto los nuestros como los anteriores en las mismas regiones, contenían un factor relacionado con la pérdida de control/problemas de gestión del tiempo y otro factor relacionado con problemas emocionales/psicológicos, lo que sugiere que el control de impulsos y las necesidades emocionales no satisfechas son componentes importantes en el desarrollo del uso problemático de Internet en todo el mundo. La investigación futura sobre el uso problemático de Internet debería centrarse en estos aspectos.

Palabas clave: Adicción a Internet; uso problemático de Internet; intercultural; Prueba de adicción a Internet; análisis factorial.

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Although Internet use is a global phenomenon, there has been little research on the topic of problematic Internet use from a cross-cultural perspective. This is a weakness in the literature that should be addressed because people from different cultural backgrounds have very different communication practices, values and motivations, and therefore have different Internet behaviours as well. Consequently, when they experience problems associated with Internet use, the nature of those problems also differs depending on their sociocultural context.

Psychometric analyses such as factorial analysis of Internet addiction questionnaires show different results in almost every country studied, and the majority of studies comment that this variation probably exists in part due to cultural differences. However, very few studies have taken a cross-cultural approach to the study of Internet addiction and little attention is given to culture in the problematic Internet use research in general. Taking a cross-cultural approach to this subject could help identify culture's influence on problematic Internet behaviours, which would facilitate the development of customized evaluation tools and treatment practices for problematic Internet users in different populations.

Problematic Internet Use and Internet Addiction

Problematic Internet Use (PIU) is an important problem to study as half the world's population uses the Internet regularly and the popularization of the smartphone has made Internet access even easier and more frequent (Stevens, 2018). Studies have shown that Internet Addiction (IA) is associated with disorders such as anxiety (Ho et al., 2014; Lee & Stapinski, 2012; Younes et al., 2016), depression (Orsala, Orsalb, Unsalc & Ozalp, 2013; Younes et al., 2016), stress (Pedrero-Pérez et al., 2018; Samaha & Hawi, 2016; Younes et al., 2016), low self-esteem (Bahrainian, Alizadeh, Raeisoon, Hashemi & Khazaee, 2014; Bozoglan, Demirer & Sahin, 2013), loneliness (Bozoglan, Demirer & Sahin, 2013; Yao & Zhong, 2014), insomnia (Chen & Gau, 2016; Younes et al., 2016), suicidality (Lin et al., 2014), impulsivity (Lee, Choi, Shin, Lee, Jung & Kwon, 2012), substance abuse (Ho et al., 2014; Lee, Han, Kim & Renshaw, 2015) and ADHD (Ho et al., 2014; Weinstein, Yaacov, Manning, Danon & Weizman, 2015), among others. That being said, it is still under discussion whether problematic Internet use can be labeled as an addiction (Kardefelt-Winther, 2014; Sánchez-Carbonell, Beranuy, Castellana & Chamarro, 2008; Starcevic, 2013; Widyanto & Griffiths, 2006), and Internet addiction is not included in the DSM-V (Petry & O'Brien, 2013) nor in the ICD-11 (Bobes, Flórez, Seijo & Bobes, 2019) although specific problematic activities done online such as gambling and video gaming are included. The reluctance to definitively confirm the existence of an Internet Addiction disorder is due to issues with its theoretical development, methodology and conceptualization across studies, and because the levels of severity of problems associated with Internet "addiction" are usually not comparable with the severity of problems caused by other confirmed addictions.

The focus on an addiction framework may have contributed to problems with diagnosis and treatment of problematic Internet use because the leading tool for diagnosis, the Internet Addiction Test, has unstable structural validity. The IAT was developed by Young (1998), based on the DSM-IV (American Psychiatric Association, 1994) criteria for pathological gambling and has been the most widely used measure for the study of problematic Internet use around the world. It was designed to have unidimensional structure, however, it has been found to have varying numbers of factors, ranging from 1 to 6 (Laconi, Rodgers & Chabrol, 2014). Although its reliability is consistently strong (Laconi, Rodgers & Chabrol, 2014; Panayides & Walker, 2012), its factorial structure differs in almost every study, thus making it difficult to identify which components of problematic Internet use are more relevant to address in diagnosis and treatment. Many of the studies in the IAT factor analysis literature mention the potential role of culture in the psychometric differences found across studies, however IAT research with a cross-cultural perspective is scarce.

Culture

Although there have been few studies on the subject of Internet Addiction/Problematic Internet Use (PIU) with a cultural focus (Lopez-Fernandez, 2015), those that exist have found interesting cultural differences in Internet use.

Durkee et al. (2012) studied pathological Internet use in Austria, Estonia, France, Germany, Hungary, Ireland, Israel, Italy, Romania, Slovenia, Spain, and Sweden, and found that the highest rate of maladaptive Internet use (18.2%) and pathological Internet use (11.8%) was found in Israel and the lowest rates were found in Italy (8.8% and 1.2%). They also found that when comparing metropolitan and micropolitan areas, adolescents living in metropolitan areas showed a higher risk for PIU. They highlighted the importance of this finding and indicated that there must be a significant difference in metropolitan vs micropolitan culture which should be further investigated.

Tsitsika et al. (2014) found that prevalence rates of Internet Addictive Behaviour were higher in the Southern and Eastern/Middle European countries and lower in the Northern European countries. More specifically, they found that the country with the highest rate of dysfunctional Internet behaviour was Spain with a rate of 23% and the lowest was Iceland with 8%. These results contradict the results of another cross-cultural Internet study by Laconi et al. (2018) which compared problematic Internet use in Italy, Germany, France, Poland, Spain, Turkey, Hungary,

England and Greece and found that the Spanish sample had one of the lowest rates of PIU.

Seabra et al. (2017) found an interesting paradox in their comparison between Portuguese and Brazilian Internet users. They expected to find more problematic use among Portuguese users as they had more Internet users per capita and easier access to the Internet than the Brazilians. However, they found that Brazilian users had higher levels of Internet Addiction, thereby demonstrating that ease of access and usage prevalence in a country are not sufficient to predict problematic Internet use.

To facilitate cross-cultural comparison of IAT factor analysis research from around the world, we organized the latest meta-analysis findings on IAT's factor analysis (Moon et al., 2018) according to geographical region and identified similarities/differences of interest (Table 1). One aspect of the research we found interesting to note was the different ways that research teams labeled the factors they identified. There is no standard for factor naming, therefore the factor names selected by each team indicate how they summarized the combination of items within that factor. This offers insight on how the teams from different countries interpret the factors and what aspect of them they see as most significant.

Comparison of IAT factor analysis studies around the world

Asia and Europe had the highest number of IAT factor analysis studies, so we compared their factors to identify if there were interesting similarities and/or differences. There were a couple of things to note about the factor names themselves. Firstly, Asia was the only continent in which the word "withdrawal" (in the sense of withdrawing from people) was used in the labeling of factors and 50% of the studies contained a mention of "neglect of work/duty" whereas only one other study in all the other papers around the world mentioned such a construct (Tsimtsiou et al., 2014). From a cultural perspective, these two differences may be because of the collectivist nature of most Asian communities. Being an active part of society is very important and highly valued, therefore withdrawing from the group or neglecting one's role in the community is seen as a sign of a problem. On the other hand, in the European studies, the word "emotion/mood" was used in the factor labeling of almost 60% of the studies, whereas it was not used at all in the factor labeling of Asian studies. This could be because the personal, internal experience of the individual receives more attention in European countries, which tend to be more individualistic, than it does in Asian countries (Hofstede, 1983). There is not enough data to make conclusions in this regard, therefore more research is recommended to explore these potential cultural differences more in depth.

There was too much variation in the results among studies to make reliable conclusions about broader geographical regions, and since it is unwise to rely on any single study to accurately represent a population, we instead examined countries for which two or more IAT factor analysis studies had been conducted in order to see if results were replicated, which would add support to the theory that cultural context influences Internet behaviours. We identified the three countries from the meta-analysis in which two or more studies were conducted – South Korea, Italy, and Turkey – and we compared their findings to see how closely the results were replicated.

In the South Korean studies the findings were similar: both studies had a primary factor centered around time management, with almost all the items from Sung, Shin and Cho (2014) Factor 1 included in Lee et al. (2013) Factor 1. Both studies also had a Withdrawal factor, with all of the items in Lee et al. Withdrawal factor included in Sung et al.'s Withdrawal Factor. The studies had different samples, with Sung et al. using teenage participants aged 13-15 and Lee et al. using university students. This age difference may be an important contributor to the findings that they did not share such as that Sung et al. found four factors and Lee et al. found three.

The three studies from Italy (Faraci, Craparo, Messina & Severino, 2013; Fioravanti & Casale, 2015; Servidio, 2017) all showed nearly the same findings. Each study used university students in the sample (Fiorvanti & Casale used university students as well as high school students), and each had a two factor structure with the primary and secondary factors containing almost the same items across all studies; one factor was related to emotional/psychological problems and the other factor was related to loss of control of time and interference with daily life.

The results from Turkey (Boysan et al., 2017; Kaya, Delen & Young, 2016) were different: although both studies explained nearly the same percent variance (46% in Kaya et al. and 45% in Boysan et al.), Boysan et al. found a unidimensional structure whereas Kaya et al. identified four separate factors. As the samples were very similar culturally and demographically, differences may be attributed to the fact that different statistical analyses were used.

Hypothesis

Considering that two of the IAT factor analysis replication studies within-country showed very similar results (Korea and Italy) and one replication study did not show similar results as the original (Turkey), we wanted to further investigate whether IAT factor analysis results would be replicated within-country. Considering that IAT factor analyses are so different between countries with number of factors found ranging from 1 to 5, our hypothesis was that if IAT factor analysis studies within-country show very

Table 1. *Chart of International IAT Factor Analysis Studies*.

	Population Studied	No. of Participants	No. of Factors	Total Variance (%)	Name of Factors (and number of items)
East Asia					
1. **South Korea:** Sung et al. (2014)	Middle school students	1,722	3	50.0	1. Time management (6), withdrawal behaviours (8), neglect work (4).
2. **Malaysia:** Guan et al. (2015)	College medical students	162	5	64.0	2. Lack of control (8), neglect of duty (7), problematic use (2), social relationship disruption (2), e-mail primacy (1).
3. **India:** Dhir et al. (2015)	High school students	1,914	1	41.4	3. –.
4. **Bangladesh:** Karim et al. (2014)	University students	172	4	55.7	4. Neglect of duty (6), online dependence (4), virtual fantasies (5), privacy and self-defense (3).
5. **South Korea:** Lee et al. (2013)	University students	279	4	58.9	5. Excessive Internet use (9), dependence (5), withdrawal (3), avoidance of reality (3).
6. **China:** Lai et al. (2013)	Middle and high school students	844	3	-	6. Withdrawal and social problems (9), time management and performance (6), reality substitute (3).
Europe					
1. **Italy:** Servidio (2017)	University students	659	2	41.0	1. Interpersonal, emotional, and obsessive conflict as a result of Internet use (11), online time management and compromised personal well-being (7).
2. **Turkey:** Boysan et al. (2016)	College students	453	1	44.9	2. –.
3. **Turkey:** Kaya et al. (2016)	University students	407	4	46.0	3. Mood (8), relationship (4), responsibilities (5), duration (3).
4. **Polish:** Hawi et al. (2015)	College students	1.245	2	44.6	4. Mental disorder (11), time management disorder (9).
5. **Italy:** Fioravanti et al. (2015)	Students aged 14-26	840	2	45.6	5. Emotional and cognitive preoccupations with the Internet and social consequences (11), loss of control and interference with daily duties (9).
6. **Spain:** Fernandez-Villa et al. (2015)	College students	851	2	55.0	6. Emotional investment (11), time management and performance (8).
7. **Greek:** Tsimtsiou et al. (2014)	College medical students	151	3	55.3	7. Psychological/emotional conflict (10), time management (6), neglect work (4).
8. **Portugal:** Pontes et al. (2014)	High school and university students	593	–	–	8. –.
9. **Italy:** Faraci et al. (2013)	College students	485	2	42.2	9. Emotional and cognitive preoccupation with the Internet (11), loss of control and interference with daily life (7).
10. **Portugal:** Conti et al. (2012)	University students	77	–	–	10. –.
11. **Germany:** Barke et al. (2012)	College psychology students	1,041 online, 841 offline	2	46.7 online, 42.0 offline	11. Preoccupation (12), loss of control (8).
12. **United Kingdom:** Widyanto et al. (2011)	General population (Internet users)	12.225	12. 3	12. 56,3	12. Emotional/psychological conflict (9), time management issues (5), mood modification (6).
North America					
1. **Canadá:** Watters et al. (2013)	High school students	1,948	–	–	1. –.
2. **USA:** Jelenchick et al. (2012)	University students aged 18-20	215	2	91.0	2. Dependent use (12), excessive use (8).
South America					
1. **Colombia:** Puerta-Cortés et al. (2012)	General population (Internet users)	1,117	3	47.8	1. Consequences for the use of the Internet (7), cognitive and emotional dimension (10), control of time (3).
Africa	–	–	–	–	–
Middle East Asia					
1. **Pakistan:** Waqas et al. (2018)	College students (medical and dental)	522	1	34.1	1. –.
2. **Persia:** Mohammadsalehi et al. (2015)	College students (medical sciences)	254	3	55.8	2. Personal activities disorder (11), emotional and mood disorder (6), social activities disorder (3).
3. **Jordan:** Ahmad et al. (2015)	University students	587	4	52.7	3. Excessive use (6), loss/suffer (6), attached to (4), impaired social relations (4).
4. **Lebanon:** Hawi (2013)	Middle and High school students	817	1	40.6	4. –.

similar results, this adds support to the claim that culture influences IAT behaviours. We selected three countries in which IAT factor analyses had been conducted previously and which are substantially diverse in geographic region, socioeconomic status and culture: USA (Midwest region), Spain (Barcelona) and Colombia (Ibagué).

Why USA, Spain and Colombia?

Each of the countries used in this study is special in Internet use research; the USA is one of the top three countries in the world as regards Internet penetration, Colombia has Internet use rates that are representative of all of South America as its Internet penetration rates are exactly at the average level of all Latin American countries (Economic Commission for Latin America and the Caribbean, 2017), and Spain is representative of European Internet use because its penetration rates are exactly at the average of all European countries ("Netherlands Leads Europe," 2018). We conducted IAT factor analyses for a sample of university students in each country to see if the results would be similar to the results of the factor analysis study previously done in that country. We used university students because the previous studies were conducted with university samples (The previous Colombian study was conducted with a general populations sample, however the average age was 20.93, and the vast majority of participants were university-age).

Methods

Participants

The participants were 1,516 university students from 3 universities, one in each country, who filled out an online questionnaire. After dropping the incomplete responses, 451 were left from the USA, 467 from Spain and 355 from Colombia. The American participants were 64.9% female, the Spanish participants were females 79.2% female and the Colombian students were 64.2% female. The mean age of American students was 19.59 (SD = 1.43; range 18-30), the mean age of Spanish students was 21.45 (SD = 2.41; range 18-30), and the mean age of Colombian student was 19.95 (SD = 2.00; range 18-30). The Spanish participants were slightly older than the other two groups ($F=111.05$; $p<.001$).

Measures

Internet Addiction Test (Young, 1998): a 20-item self-report questionnaire based on the DSM-IV criteria for pathological gambling. Respondents are asked to rate items on a 5-point Likert scale covering the degree to which their Internet use affects their daily routine, social life, productivity, sleeping pattern, and feelings. The minimum score is 20 and the maximum is 100. The higher the score, the greater the problems caused by their use of the Internet. Young suggested that a score ranging from 20 to 39 is a typical online user who has no problems with their Internet usage. A score ranging from 40 to 69 signifies frequent problems due to Internet usage. Finally, a score ranging from 70 to 100 signifies that the Internet is causing significant problems for the user. The IAT was designed as a unidimensional instrument, however, subsequent studies have found between one and six factors (see Moon et al. 2018). In online applications, reliability varies between 0.83 and 0.91(Korkeila, Karlaas, Jääskeläinen, Vahlberg & Taiminen, 2010; Barke, Nyenhuis & Kröner-Herwig; Jelenchik, Becker & Moreno, 2012). The reliability (Cronbach's Alpha) for the present study was .91.

Procedure

In the universities in Spain and Colombia, students were emailed by the researchers requesting participation in the study, and participants were recruited via the Subject Pool website in the United States university (used by students to find and participate in research projects). Participants who chose to complete the study clicked the link provided to them either from the email or the Subject Pool website (USA) and were redirected to the questionnaires on the web host Qualtrics. When a participant accessed the questionnaire, they were presented with a document explaining the study and were asked to provide their informed consent in order to continue. No identifying information was collected from the participants and their responses were encoded as a set of random numbers and letters. IP numbers were not tracked. Some data collected were not related to the Internet focus of the current study and will therefore be presented elsewhere.

Data Analysis

Principal components analysis with Varimax rotation was used for factor extraction. Prior to exploratory factor analysis, data were inspected to ensure items were significantly correlated, using Bartlett's Test of Sphericity. In addition, in order to evaluate whether items shared sufficient variance to justify factor extraction, KMO's Test of Sampling Adequacy was used. Factor loadings resulting from the Varimax rotation were evaluated using the threshold of 0.40. If an item loads on more than one factor, then it is bonded with the factor with the highest loading unless there is a compelling reason to attach it to another factor in order to improve factor interpretability. The IAT factor structure that emerged from exploratory factor analysis was verified using confirmatory factorial analysis (CFA Least Square, which is applicable when data do not meet the assumption of multivariate normality, was selected as the procedure for estimation). Model fit was evaluated based on the comparative fit index (CFI), Tucker-Lewis index (TLI), root-mean-square error of approximation (RMSEA), and standardized root mean square residual (SRMR). CFI and TLI > .90, RMSEA < .08 and SRMR <

.1 typically reflect acceptable fit, and CFI and TLI > .95, RMSEA < .06 and SRMR < .08 indicate excellent fit (Brown, 2006). In addition, descriptive and correlational analyses were performed. To test country and sex differences in the study, a bifactorial (sex by country) analysis of variance (General Linear Model procedure) was performed. When main effects were significant, post-hoc comparisons (with Bonferroni adjustment for multiple comparisons) were computed. SPSS 19.0 was used for descriptive statistics, General Linear Model and exploratory factor analysis. EQS 6.1 (Bentler, 2006) was used for CFA.

Results

Descriptive analysis

In the total sample, 72% of respondents showed scores ranging from 20 to 39, meaning no problems with their Internet usage. 27% scored from 40 to 69, meaning frequent problems due to Internet usage, and 1% scored from 70 to 100, for whom the Internet may be a significant problem. Regarding country differences, Spanish participants showed lower scores on the IAT (Mean = 33.50; DT = 9.44) than USA participants (Mean = 36.82; DT = 10.82) and Colombian participants (Mean = 36.70; DT = 11.05). Differences were statistically significant (F = 12.55; p = .000).

Factor Analysis

The KMO's Test of Sampling Adequacy was .94 and Bartlett's Test of Sphericity (χ = 9490.9) was significant (P=.000), indicating that the IAT items were appropriate for a factor analysis. For both USA and Spain, this criterion resulted in a three-factor solution whereas in the case of Colombia there were two underlying factors. Table 1 shows the factor loadings of the items for the USA, Spain, and Colombia respectively.

For the USA, the three factors explained 51.91% of the variance (see Table 1). Factor 1 (twelve items) accounted for 25.65 % of the variance and appeared to measure psychological conflict. Factor 2 (five items) accounted for 16.67% of the variance and appeared to measure inability to control use. Factor 3 (three items) accounted for 9.66% of the variance and appeared to measure social and work dysfunctions. The fit of this model was excellent (CFI= .985; TLI= .983, RMSEA= .027; SRMR= .042). For Spain, the three factors explained 46.68% of the variance. Factor 1 (7 items) accounted for 18.16% of the variance and measured social/work dysfunctions and difficulties with time management. Factor 2 (8 items) accounted for 15.55 % of variance and measured psychological conflicts related to Internet use. Factor 3 (4 items) accounted for the 13.14% of variance and measured affective reaction. Item 14 did not charge at any factor. The fit of this model was excellent (CFI= .989; TLI= .987, RMSEA= .023; SRMR= .040). For Colombia, the two factors explained 54.7% of the variance. Factor 1 (11 items) accounted for 30.72% of variance and measured psychological conflicts. Factor 2 (8 items) accounted for 23.97% of variance and measured inability to control Internet use. Item 7 didn't charge at any factor. The fit of this model was acceptable (CFI= .978; TLI= .975, RMSEA= .033; SRMR= .049).

In Summary

Below we have included the simplified and full name of the factors for each country:

- **USA:**
  - **Factor 1**: Emotional Need (Satisfaction of Emotional Needs and Dependence): 3, 4, 5, 9, 10, 11, 12, 13, 15, 18, 19, 20.
  - **Factor 2**: Loss of Control (Inability to Control use and Neglect of Important Activities): 1, 2, 14, 16, 17.
  - **Factor 3**: Neglect of Duty (Neglect of Duties in Favour of the Internet): 6, 7, 8.
- **Spain:**
  - **Factor 1**: Loss of Control (Inability to Control Use and Neglect of Duties): 1, 2, 6, 7, 8, 16, 17.
  - **Factor 2:** Emotional Need (Satisfaction of Emotional Needs): 3, 4, 9, 10, 13, 18, 19, 20.
  - **Factor 3:** Dependence**:** 5, 11, 12, 15.
- **Colombia:**
  - **Factor 1**: Emotional Need (Satisfaction of Emotional Needs and Dependence): 3, 4, 9, 10, 11, 12, 13, 15, 18, 19, 20.
  - **Factor 2**: Loss of Control (Inability to Control use and Neglect of Duties): 1, 2, 5, 6, 8, 14, 16, 17.

Discussion

Comparing the IAT factor analyses

When we compare our findings to the previous IAT factor analyses in the same countries, we see many similarities. We found three factors in the US sample: 1. Satisfaction of Emotional Needs and Dependence, 2. Inability to Control Use and Neglect of Important Activities and 3. Neglect of Duties in Favour of the Internet. The previous IAT factor analysis in the US (Jelenchick, Becker & Moreno., 2012) found two factors, titled 1. "Dependent Use" and 2. "Excessive use." When we compare our findings to theirs, we find that both studies have an identical Factor 1 and very similar Factor 2 (all the items from our study's Factor 2 were included in Jelenchick's Factor 2). The main difference was that the three additional items in Jelenchick's Factor 2 appeared as a separate Factor in our study – those items that related to neglect of work or studies in favour of the Internet. The shared items in the Emotional Need factor relate to dependence on the Internet for positive affect and preference for the Internet over reality. The shared items in the Loss of Control factor

Table 2. *Factor analysis of the IAT in the three countries.*

	USA			Spain			Colombia	
	1	2	3	1	2	3	1	2
Q1	-.013	**.709**	.342	**.584**	-.050	.398	.039	.767
Q2	.182	**.569**	.380	**.725**	.170	.260	.299	.731
Q3	**.561**	-.068	.355	.022	**.435**	-.001	**.569**	.131
Q4	**.522**	.090	.080	.193	**.474**	.120	**.629**	.303
Q5	**.626**	.146	.118	.250	.264	**.464**	.277	**.673**
Q6	.301	.336	**.600**	**.707**	.278	.081	.540	**.555**
Q7	-.087	.167	**.661**	**.466**	-.035	.260	.225	.253
Q8	.347	.232	**.657**	**.725**	.247	.006	.482	**.612**
Q9	**.595**	.139	.204	.207	**.615**	.177	**.651**	.349
Q10	**.407**	.349	.346	.165	**.502**	.286	**.679**	.356
Q11	**.588**	.403	.029	.245	.190	**.649**	**.667**	.368
Q12	**.566**	.425	-.050	.095	.083	**.701**	**.626**	.436
Q13	**.697**	.084	.016	.173	**.538**	.408	**.713**	.223
Q14	.246	**.647**	.104	.357	.353	.305	.355	**.587**
Q15	**.732**	.389	-.024	.215	.249	**.715**	**.700**	.377
Q16	.154	**.806**	.102	**.680**	.210	.251	.283	**.707**
Q17	.254	**.688**	.203	**.655**	.330	.112	.374	**.651**
Q18	**.709**	.194	.152	.407	**.514**	.123	**.571**	.488
Q19	**.669**	.225	.192	.100	**.765**	.099	**.796**	.211
Q20	**.772**	.093	.084	.114	**.554**	.450	**.812**	.222

relate to inability to control time online and prioritization of Internet time over other tasks.

We found three factors in our Spanish sample as well: 1. Inability to Control Use and Neglect of Duties, 2. Satisfaction of Emotional Needs, and 3. Dependence. The previous IAT factor analysis in Spain (Fernández-Villa et al., 2015) found two factors titled: 1. "Emotional Investment" and 2. "Performance and Time Management." When we compare our results to theirs, we again see similarities. Nearly all of the items in our Factor 2 were included in Fernández-Villa et al.'s Factor 1, although their Factor 1 had an additional 4 items, 3 of which composed our Factor 3. Additionally, our Factor 1 was almost identical to Fernández-Villa et al.'s Factor 2. Although the two factors are in switched positions for the two studies, their similarities are important to note; as in the US sample, one factor common in both studies was centered around psychological/emotional problems and the other common factor was centered around loss of control/time management problems. The shared items in the Emotional Need factor primarily related to dependence on the Internet for positive affect. The shared items in the Loss of Control factor related to inability to control time online and neglect of important duties in favor of the Internet.

We found two factors in our Colombian sample: 1. Satisfaction of Emotional Needs and Dependence, and 2. Inability to Control use and Neglect of Duties. The previous IAT factor analysis in Colombia (Puerta-Cortés, Carbonell & Chamorro., 2012) found three factors, titled 1. "Consequences of Internet use," 2. "Cognitive-Emotional Dimension" and 3. "Time control." Once again, when we compare our findings to theirs, we see many similarities. Puerta-Cortés' Factor 2 and our Factor 1 are nearly identical, with only one item difference. Puerta-Cortés' Factor 1 also shares a majority of its items with our Factor 2. The shared items in the Emotional Need factor were nearly the same as those in the US sample, related to dependence on the Internet for positive affect and preference for the Internet over reality. The shared items in the Loss of Control factor related to excessive time spent online and neglect of important duties in favour of the Internet.

Considering that all of our IAT factor analysis replications showed very similar findings to the previous studies conducted in those countries, our hypothesis was supported - since within-country replication of IAT factor analyses are similar whereas between-country analyses around the world often differ, it appears that culture has an influence over how problematic Internet use manifests. We must therefore keep culture in mind when we research Internet use and we should conduct further research on how culture influences Internet behaviours. However, it is also important to note that in all three countries we studied, we found the same two fundamental categories present, indicating a universal pattern that underlies problematic Internet use.

The Shared Factors and Implications for IA Research

All of our samples and the studies we compared them to contained one of their top two factors focused on loss of control/time management problems and the other of the top two factors focused on emotional/psychological problems, although these factors manifested somewhat differently between countries. This finding confirms the finding from Moon et al.'s meta-analysis (2018) which determined that when considering only the studies that strictly follow the factor analysis guidelines, the IAT most likely has one or two real factors. Two items in the Loss of Control factor were shared among all six studies: questions 1 and 2. Six items in the Emotional Need factor were shared among all six studies: questions 3, 9, 10, 13, 19 and 20.

The Italian studies all showed these same two factors and so did the Korean studies (despite the fact that Lee et al. (2012) found four factors and Sung et al. (2014) found three). Therefore, we can conclude that although there are differences in the IAT factor analysis findings

around the world with factors ranging from 1-5 in the most recent meta-analysis (Moon et al., 2018), there are usually two primary factors that emerge: one related to emotional problems/dependence and another related to loss of control/time management problems regarding the Internet. Future diagnosis and treatment efforts should focus on these two factors if more detailed information is not available about the specific population being studied. Additionally, considering the plausibility of a two factor structure, future studies using modern statistical analysis, such as Exploratory Structural Equation Modeling (ESEM; Asparouhov & Muthen, 2009), that allows for the possibility of cross-loadings (i.e., that an item can be an indicator of two latent factors), should be used to test the structure and the cross-cultural invariance of the IAT.

On the topic of the disputed existence of Internet Addiction as a disorder, judging from the two most common factors identified in the IAT, it appears that there are two primary underlying components of problematic Internet use – impulse control problems and the presence of unsatisfied emotional needs that the Internet is employed to satisfy. It would appear that the comorbidity of these two components manifests as problematic Internet use in the modern technological age. With this in mind, it may be more beneficial from a diagnostic and treatment perspective to focus on these two cognitive-emotional components rather than on "Internet Addiction" as a single construct, which continues to be a somewhat vague concept with various interpretations.

As seen from the factor analyses conducted around the world, although the IAT may have been designed as a unidimensional measure, this unidimensionality has not been proven. Therefore, perhaps Internet Addiction should also not be considered as a single construct, but rather problematic Internet behaviours should be viewed as the modern-day manifestation of a combination of cognitive-emotional disorders (Starcevic, 2010) that manifested in different ways before the existence of the Internet, but maintain the same basic constructs independently of it. As "Internet Addiction" has been difficult to describe psychometrically due to the instability in diagnostic measures, since problematic Internet use presents differently in people around the world, and since clinical cases of Internet addicts are scarce, perhaps there is insufficient support for the diagnosis of Internet "addiction" at this time. It may benefit the prevention, diagnosis and treatment of those suffering from problematic Internet use more if research explores what cognitive-emotional profiles are susceptible to Internet use problems and why, what motivations problematic users have for their use, and what benefits people receive from their Internet use which reinforces it so much that it leads to its prioritization over other aspects of daily life (Grande, Martínez & Fernández, 2019; Kardefelt-Winther, 2014).

Limitations

This study is not without limitations. Firstly, the IAT is a self-report measure which means results may not be fully accurate, as respondents often have a mistaken perception of their own Internet behaviours. Secondly, in all samples the participants were university students, which means caution should be taken when generalizing results to a more diverse population. Third, as factorial invariance has not been verified, conclusions about differences between countries must be taken with caution. There exists the possibility that the factorial structure of the IAT may not be comparable across countries because there is not a common structure.

Regarding the comparative analysis of Moon et al.'s IAT meta- analysis (2018), this paper did not aim to analyze the statistical procedures associated with each study included in that paper, therefore some of the differences found between or within countries could be attributed to different statistical procedures used, not culture.

One must also take into account how the passage of time may have affected the effectiveness of the IAT to measure problems with Internet use. The IAT was developed in 1998 before the extensive use of the Internet around the world. These past 22 years of development have probably affected the relevance of the questionnaire and the importance of certain items. Therefore, it would benefit the literature on this subject if the IAT, being the most popular questionnaire in the field, was updated to better reflect Internet behaviours that are popular and problematic today.

Conclusion

The findings of our three factor analysis studies, in the USA, Spain and Colombia, showed similar results as the previous findings in those same regions. In the USA we found 3 factors: 1) Emotional Need (Satisfaction of Emotional Needs and Dependence), 2) Loss of Control (Inability to Control use and Neglect of Important Activities) and 3) Neglect of Duty (Neglect of Duties in Favour of the Internet). In Spain we also found 3 factors: 1) Loss of Control (Inability to Control Use and Neglect of Duties), 2) Emotional Need (Satisfaction of Emotional Needs), and 3) Dependence. And in Colombia we found 2 factors: 1) Emotional Need (Satisfaction of Emotional Needs and Dependence), and 2) Loss of Control (Inability to Control Use and Neglect of Duties). Spanish participants were found to have the lowest IAT scores among the three countries studied, consistent with a previous study by Laconi et al. (2018).

All factor analyses contained a factor related to emotional/psychological problems and another factor related to loss of control/time management problems, thereby suggesting that impulse control problems and

unfulfilled emotional needs are the most important components in the development of problematic Internet use around the world. We therefore suggest a move away from the addiction framework in problematic Internet use research, which puts the focus on the Internet as a kind of addiction-causing entity like a drug, and instead shift the focus onto the motivations and gratifications of Internet users when engaging with the Internet, and re-conceptualizing PIU as the technological age's manifestation of an interaction between impulse-control problems and unfulfilled emotional needs.

Conflict of interests

The authors declare no conflict of interest.

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