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Original article

A Cross-cultural exploration of problematic Internet use, pathological personality traits, defense mechanisms, coping strategies, and self-esteem in 14 countries

Exploration interculturelle de l'utilisation problématique d'Internet, des traits pathologiques de personnalité, des défenses, du coping et de l'estime de soi dans 14 pays

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ABSTRACT

Objectives. – The primary objective of this study was to compare the estimates of Problematic Internet Use (PIU) from 14 countries around the world, considering gender. The second objective was to explore the relationships between PIU and personality-related variables (pathological personality traits, defense mechanisms, coping strategies, and self-esteem).
Materials and methods. – Our total sample consisted of 7726 participants (30.8% male, $n = 2378$), aged between 18 and 86 years old (M = 25.55; SD = 9.8). Recruited online, they completed several scales about their Internet use, defense mechanisms and coping strategies, self-esteem, and pathological personality traits.
Results. – The PIU accounted for between 20.5% and 75% of participants using the PIUQ-9, while "self-perception" of PIU with a single item revealed estimates from 2% to 60.1%, with gender differences. Systematically, PIU significantly correlated with two variables: borderline personality traits (from .09 at $P < .05$ to .42 at $P < .01$) and immature defense mechanisms (from .13 to .42 at $P < .01$). Dependent, avoidant, narcissistic, histrionic, and antisocial personality traits were positive predictors of PIU and self-esteem, paranoid and schizoid personalities were negative predictors.

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Conclusions. – This research highlights the many cross-cultural differences. Its design also allows for a better understanding of gender differences.

RÉSUMÉ

Objectifs. – L'objectif principal de cette étude était de comparer les estimations d'Utilisation Problématique d'Internet (UPI) dans 14 pays à travers le monde, en considérant le genre. Le second objectif était d'explorer les relations entre l'UPI et les variables de personnalité (traits pathologiques, défenses, coping et estime de soi).
Matériel et méthode. – Notre échantillon total était composé de 7 726 participants (30,8 % d'hommes, $n = 2\,378$), âgés entre 18 et 86 ans (M = 25,55 ; DS = 9,8). Recrutés en ligne, ils ont complété plusieurs échelles à propos de leurs utilisations d'Internet, leurs défenses et stratégies de coping, leur estime de soi et les traits pathologiques de personnalité.
Résultats. – L'UPI représentait entre 20,5 % et 75 % des participants en utilisant la PIUQ-9, et entre 2 % à 60,1 % en utilisant un item unique d'autoévaluation, avec des différences de genre. Systématiquement, l'UPI était corrélée significativement avec deux variables : les traits limites (de 0,09, $p < 0{,}05$ à 0,42, $p < 0{,}01$) et les mécanismes de défense immatures (de 0,13 à 0,42, $p < 0{,}01$). Les traits dépendants, évitants, narcissiques, histrioniques et antisociaux étaient des prédicteurs positifs de l'UPI ; l'estime de soi, les traits paranoïdes et schizoïdes étaient des prédicteurs négatifs.
Conclusions. – Cette recherche met en lumière les nombreuses différences interculturelles. Son design permet également de mieux comprendre certaines différences de genre.

Mots clés :
Coping
Défenses
Interculturel
Internet
Estime
Personnalité

1. Introduction

Problematic Internet Use (PIU) can be defined "as an inability to control one's use of the Internet which leads to negative consequences in daily life" [38]. Many debates have been raised on PIU, particularly since the introduction of Internet Gaming Disorder (IGD) in the third section of the DSM-5 [1] bringing a lack of clarity and differentiation between online and offline behaviors, and between Internet addiction and gaming addiction [19].

The aetiology of PIU is not clearly known. It is still on debates whether PIU is the cause or the consequence of a prior difficulty or conditions [11], such as low self-esteem [28], immature defense mechanisms and maladaptive coping strategies [20], psychopathology (e.g., depression, anxiety) or personality traits [35]. Pathological personality traits, which stabilize in early adulthood, have received scant research attention, but might be an important risk factor of PIU among adults. In previous studies, PIU has been related to schizotypal and schizoid traits of Cluster A [24,37], borderline, antisocial and narcissistic traits of Cluster B [7,8,16,17,24,41,44], and Cluster C with avoidant and obsessive-compulsive traits [7,16,17,30,41,42,44].

Cross-cultural investigations in Europe have revealed that less than 7% of the Internet users had PIU while a recent study in nine countries found higher estimates of around 25% [22]. A recent meta-analysis studied the prevalence rates of generalized internet addiction from 31 nations; weighted average prevalence was 7.02% [32]. Gender differences have also been demonstrated, typically with men being at high risk, whereas many recent studies have highlighted the increasing PIU rates in women, depending on the cultural setting or moderators [5]. Inconsistencies in previous results on PIU have already been explained by methodological differences [23], while cultural background undoubtedly exerts a significant impact on PIU and accounts for the observed differences [4,22,33]. Therefore, it seems particularly relevant to conduct a cross-cultural study to explore the similarities and differences between several samples.

The first objective of this study was to compare the estimates of PIU among 14 countries worldwide, including 3 South-Eastern countries (Iran, Pakistan and United Arab Emirates), 5 South-American countries (Chile, Colombia, Ecuador, Brazil, Peru) and 6 European countries (France, Greece, Turkey, Italy, Romania and Finland) and consider gender differences. The second objective was to explore the relationships between PIU and a number of variables (pathological personality traits, coping, defense and self-esteem) across samples.

2. Material and methods

2.1. Participants and procedure

Participants were recruited through an online website dedicated to the study, which was available for six months. Data were obtained through a convenience and snowball sampling procedure by each site investigator, who spread the survey site with the link within their academic institutions and through professional webpages and social media accounts and groups. The invitees were in turn encouraged to spread the survey to their own colleagues, friends, acquaintances, and social media contacts. This study included data from Italy (Italian), France (French), Colombia, Peru, Ecuador and Chile (Spanish), Brazil (Portuguese), Turkey (Turkish), Romania (Romanian), Greece (Greek), Finland (Finnish), Iran (Persian), Emirates (Arabic), and Pakistan (Urdu). Only participants aged over 18 years were recruited. Information about the aim of the study and an informed consent statement (e.g., anonymity, confidentiality, and right to withdraw) were provided at first page of the questionnaire and prior to data collection. Participants who did not give their consent were excluded and also those participants who did not complete all the scales. The final sample enumerated 7,726 participants. The detailed sociodemographic information of the overall and each sample can be seen in Table 1. This study is in conformity with the 1964 Helsinki declaration and its later amendments. A local research ethics committee approved the Brazilian form of this study. The entire study obtained the approval from the ethics committee of the University of Timisoara in Romania.

2.2. Measure

Participants responded to socio demographic questions (e.g., gender, age, professional and marital status) and a number of

Table 1
Descriptive Statistics of the Socio Demographic Variables.

	South American countries						South Eastern countries			European countries					
	Total $n = 7726$	Brazil $n = 975$	Chile $n = 386$	Colombia $n = 308$	Ecuador $n = 300$	Peru $n = 431$	Iran $n = 246$	Pakistan $n = 491$	UAE $n = 669$	Finland $n = 251$	France $n = 785$	Greece $n = 1037$	Italy $n = 871$	Romania $n = 583$	Turkey $n = 393$
Age range	18–86	18–86	18–75	18–37	18–32	18–59	18–43	18–26	18–33	18–57	18–35	18–76	18–55	18–54	18–30
Mean age (SD)	25.5 (9.8)	39.3 (13.6)	24.9 (10.1)	20 (2.5)	20.1 (2.2)	20.9 (4.3)	22.2 (5.1)	20.7 (1.6)	20.6 (2.1)	27.7 (8.9)	23.7 (4.5)	30.6 (10.6)	55.9 (4.9)	23.7 (7.8)	20.1 (1.9)
Gender, *n* (%)															
Men	2378 (31)	255 (26)	110 (28)	55 (18)	114 (38)	162 (38)	89 (36)	130 (26)	160 (24)	66 (26)	253 (32)	166 (16)	501 (57)	206 (35)	111 (28)
Women	5348 (69)	720 (74)	276 (72)	253 (82)	186 (62)	269 (62)	157 (64)	361 (74)	509 (76)	185 (74)	532 (68)	871 (84)	370 (43)	377 (65)	282 (72)
Professional situation															
Students	5787 (68)	372 (38)	257 (67)	230 (75)	255 (85)	307 (71)	222 (90)	487 (99)	533 (80)	207 (82)	551 (70)	405 (39)	619 (71)	488 (84)	354 (90)
Active	2039 (27)	518 (53)	53 (14)	74 (24)	45 (15)	115 (27)	18 (7)	4 (1)	136 (20)	44 (18)	186 (24)	515 (50)	207 (24)	95 (16)	29 (7)
Inactive	400 (5)	85 (9)	76 (20)	4 (1)	–	9 (2)	6 (2)	–	–	–	48 (6)	117 (11)	45 (5)	–	10 (3)
Marital situation															
Single	5164 (67)	455 (47)	275 (71)	255 (83)	273 (91)	363 (84)	211 (86)	483 (98)	613 (92)	129 (51)	424 (54)	477 (46)	573 (66)	242 (41)	391 (99)
In a relationship	2562 (33)	520 (53)	111 (29)	53 (17)	27 (9)	68 (16)	35 (14)	8 (2)	56 (8)	122 (49)	361 (46)	560 (54)	298 (34)	341 (59)	2 (1)

SD: Standard deviation; UAE: United Arab Emirates.

questionnaires (see below). If no translated version was available, translation in the target language (each country's language) and back-translation into English by two bilingual persons were obtained. After comparison of the translated questionnaires with the original ones followed, modifications were made to reach consensus and produce the final translated version of each questionnaire.

PIU was assessed with the Problematic Internet Use Questionnaire-9 (PIUQ-9) [21]. Its nine items are rated on a 5-point scale, ranging from 1 (Never) to 5 (Almost always/Always). Participants scoring equal or above 22 were considered problematic Internet users. The PIUQ has good psychometric properties [23] with validated versions in French, Italian, Spanish, Greek and Turkish [22]. In the present study, the PIUQ-9 scale had satisfactory internal consistency in the overall sample ($\alpha = .87$) and for each sample; alpha coefficients ranged from $\alpha = .67$ for Pakistan to $\alpha = .90$ for Romania.

A single item was also used to assess self-perception of PIU "In your opinion, according to your online behaviour over the past year, do you feel that you have a problematic Internet use?". Rated on a 4-point scale (No, Rather No, Rather Yes, Yes), received a score from 0 to 3. A score equal or higher than 2 was used as a cut-off score to discriminate problematic users.

Self-esteem was assessed with the 10 items Rosenberg Self-Esteem Scale (RSES) [36]. Rated from 1 (totally disagree) to 4 (totally agree), self-esteem can be considered as very low (< 25), low (25–30), average (31–34), high (35–39) and very high (> 39). Scores lower than 31 suggested low self-esteem. In the present study, Cronbach' alpha was $\alpha = .81$ for the total sample.

The Defense Style Questionnaire-28 [3] was used to assess 14 defense styles (of two items each). Its 28 items are rated on an 8-point Likert scale, reduced in a 4-point scale from 1 (totally agree) to 4 (totally disagree) for the present study. Total scores ranged from 28 to 112. The higher is the score, the higher the defense is used. Cronbach alpha was $\alpha = .81$ for the total sample.

Coping strategies were examined with the 28-item Brief Coping Orientation to Problems Experienced Inventory (COPE) [12]. Items are allocated in 14 subscales (self-distraction, active coping, denial, substance use, use of emotional support, use of instrumental support, behavioral disengagement, venting, positive reframing, planning, humor, acceptance, religion, and self-blame) and are rated on a 4-point scale from 1 (not at all) to 4 (very much). Fourteen subscale scores are produced with higher scores indicating higher frequency of coping strategies use. Subscale scores range from 2 to 8, with high scores indicating higher frequency of the coping strategy used. Cronbach alpha was $\alpha = .85$ in this study.

The Personality Diagnostic Questionnaire 4+ (PDQ-4+) [18] was used to assess pathological personality traits, according to three clusters: Cluster A (paranoid, schizoid, and schizotypal), Cluster B (antisocial, borderline, histrionic, and narcissistic) and Cluster C (avoidant, dependent, and obsessional-compulsive). The PDQ-4+ has 99 true/false items, which receive a 1 or 0 score. In the present study, the threshold of 30 was used. Cronbach' alphas of the whole scale were ranged from $\alpha = .89$ and $\alpha = .94$ in the present study.

2.3. Data analysis

Chi-square tests were used to assess gender differences for Internet use, as mean comparison. One way ANOVA was performed to compare PIUQ-9 mean scores across samples. Correlational analyses (Pearson r given the normality of the data) were conducted to examine relationships between the study variables for the whole sample. Similarly, independent and unique predictors of PIU (stepwise method) were studied among

pathological personality traits, adaptive and non-adaptive coping strategies, mature, neurotic, immature, denial and autistic for defense mechanisms, and last, self-esteem for the total sample and each sample separately. Total adjusted R^2 were reported. Internal consistency was examined with Cronbach' alpha; a coefficient between .70 and .79 was considered "satisfactory", between .80 and .89 "good", and from above .90 "excellent" [13]. SPSS v. 23 was used to perform all analyses.

3. Results

3.1. Descriptive results and comparisons

Descriptive statistics of the demographic variables (age, gender, professional and marital status) for each sample are presented in Table 1. Table 2 presents gender differences in the PIUQ-9 and self-assessment of PIU across each sample. Significant mean PIUQ differences were found among the 14 samples ($F_{(13,\ 7712)} = 88.285$, $P < .001$) with the French (16.68), Finnish (17.87) samples having the lowest mean scores and the Arabic (26.98) and Iranian (23.94) samples having the highest scores.

3.2. Correlation and regression analyses

In the total sample, PIUQ-9 scores were significantly correlated with all variables and the coefficients ranged from $r = -.14$ for self-esteem to $r = .41$ for dependent personality traits ($P < .01$). Two variables consistently and significantly correlated with PIUQ-9 in all samples: borderline traits (from .09, $P < .05$ to .42, $P < .01$) and immature defense mechanisms (from .13 to .42, $P < .01$) (Table 3).

Multiple linear regression analyses explaining the contribution of a number of predictors in PIU for the whole and for each sample are presented in Table 4. There were some significant differences between samples. The total variance ranged between 27.5% and 61.5% at $P < .001$.

4. Discussion

4.1. Psychometrics

A fair to excellent internal consistency suggested good psychometric properties for the PIUQ-9, as previous studies have demonstrated in European samples: France, Germany, Greece, Hungary, Italy, Lithuania, Poland, Spain, and United Kingdom [10,25] and in the Persian language [15,34]. Internal consistency was not satisfactory for Pakistan. To our knowledge, there are no other psychometric exploration of the PIUQ in samples coming from the countries of the present study. One validation study has been published using the Brazilian data of the present research [39].

4.2. Prevalence estimates

Our first objective was to compare the estimate rates of PIU among Internet users from 14 countries around the world and explore gender differences. PIUQ-9 rates ranged from 20.5% for France to 75% for United Arab Emirates. These rates are higher than those reported in previous studies but in line with those rates (14 to 55%) found by a more recent cross-cultural study among nine European samples [22], which used the same measure for PIU. This study reported PIU at around 38% (Greece), 33% (Turkey), 26% (Italy) and 25% (France). In the present research, they were 34% (17% for self-assessment), 44% (32%), 33% (18%) and 21% (28%), respectively.

Table 2
Differences in Problematic Internet Use Assessments across Gender (Chi^2 and *T*-tests).

	Total $n = 7726$	Brazil $n = 975$	Chile $n = 386$	Colombia $n = 308$	Ecuador $n = 300$	Peru $n = 431$	Iran $n = 246$	Pakistan $n = 491$	UAE $n = 669$	Finland $n = 251$	France $n = 785$	Greece $n = 1037$	Italy $n = 871$	Romania $n = 583$	Turkey $n = 393$
Problematic users	3255 (42.1%)	351 (36%)	173 (44.8%)	151(49%)	177 (59%)	170 (39.4%)	145 (58.9%)	316 (64.4%)	502 (75%)	65 (25.9%)	161 (20.5%)	356 (34.3%)	291(33.4%)	224 (38.4%)	173 (44%)
Women	2269 (69.7%)	262 (74.6%)	122 (70.5%)	119 (78.8%)	107 (60.4%)	97 (57.1%)	99 (68.3%)	228 (72.1%)	387 (77.1%)	49 (75.4%)	100 (62.1%)	291 (81.7%)	141 (48.5%)	139 (62%)	128 (74%)
Men	986 (30.3%)	89 (25.4%)	51 (29.5%)	32 (21.2%)	70 (39.6%)	73 (32.9%)	46 (31.7%)	88 (27.9%)	115 (22.9%)	16 (24.6%)	61 (37.9%)	65 (18.3%)	150 (51.5%)*	85 (38%)	45 (26%)
Self-perceived problematic userss	2161 (28%)	368 (37.7%)	232 (60.1%)	155 (50.3%)	141 (47%)	143 (33.2%)	139 (56.5%)	10 (2%)	79 (11.8%)	45 (17.9%)	222 (28.3%)	172 (16.6%)	156 (17.9%)	172 (29.5%)	127 (32.3%)
Women	1505 (69.6%)	276 (75%)	167 (71.9%)	124 (80%)	86 (61%)	80 (55.9%)	102 (73.4%)	9 (90%)	59 (74.7%)	34 (75.5%)	142 (64%)	137 (79.6%)	89 (57%)***	105 (61.1%)	95 (74.8%)
Men	656 (30.4%)	92 (25%)	65 (28.1%)	31 (20%)	55 (39%)	63 (44.1%)	37 (26.6%)	1 (10%)	20 (25.3%)	11 (24.5%)	80 (36%)	35 (20.4%)	67 (43%)	67 (38.9%)	32 (25.2%)
PIUQ															
Women	20.63 (7.51)	19.59 (6.75)	21.38 (6.64)	21.68 (6.49)	22.8 (6.55)	19.09 (6.62)*	24.73 (8.53)	23.02 (6.26)	27.08 (7.51)	17.75 (6.57)	16.2 (6.61)	19.6 (7.52)	20.23 (6.75)***	19.8 (7.65)	21.24 (7.43)
Men	20.49 (7.37)	19.36 (6.74)	21.91 (7.18)	23.25 (6.91)	23.3 (5.7)	20.56 (6.32)	22.54 (8.85)	24.35 (6.65)*	26.67 (8.19)	18.2 (6.53)	17.69 (6.62)**	19.11 (7.08)	18.47 (6.69)	20.51 (6.99)	20.38 (7.19)

SD: Standard deviation; PIUQ: Problematic Internet Use Questionnaire.
* $P < .05$.
** $P < .01$.
*** $P < .001$; the first two panels present percentages of whereas the last panel presents mean scores.

Table 3
Correlational Analysis between the PIUQ and Personality-Related Variables.

	Total $n=7726$	Brazil $n=975$	Chile $n=386$	Colombia $n=308$	Ecuador $n=300$	Peru $n=431$	Iran $n=246$	Pakistan $n=491$	UAE $n=669$	Finland $n=251$	France $n=785$	Greece $n=1037$	Italy $n=871$	Romania $n=583$	Turkey $n=393$
Cluster A traits															
Paranoid	.243**	.279**	.188**	.222**	.211**	.262**	.248**	.030	.053	.287**	.190**	.213**	.270**	.233**	.272**
Schizoid	.183**	.170**	.177**	.071	.113	.140**	.111	.017	.155**	.243**	.138**	.154**	.155**	.052	.177**
Schizotypal	.292**	.278**	.213**	.197**	.243**	.253**	.294**	.001	.084*	.308**	.279**	.274**	.331**	.262**	.317**
Cluster B traits															
Antisocial	.309**	.232**	.285**	.194**	.204**	.308**	.196**	.025	.264**	.248**	.219**	.255**	.199**	.278**	.309**
Borderline	.344**	.366**	.355**	.251**	.387**	.417**	.304**	.111*	.094*	.352**	.293**	.379**	.346**	.336**	.363**
Histrionic	.345**	.260**	.219**	.303**	.299**	.242**	.309**	.058	.229**	.302**	.268**	.299**	.248**	.273**	.267**
Narcissistic	.324**	.308**	.201**	.247**	.247**	.260**	.217**	.030	.220**	.315**	.272**	.289**	.234**	.266**	.375**
Cluster C traits															
Avoidant	.320**	.332**	.311**	.344**	.348**	.366**	.266**	.046	.152**	.334**	.217**	.405**	.343**	.318**	.373**
Dependent	.408**	.410**	.319**	.391**	.386**	.346**	.271**	.050	.342**	.469**	.324**	.437**	.342**	.355**	.424**
Obses.-compulsive	.237**	.221**	.226**	.234**	.216**	.234**	.365**	.022	.323**	.367**	.205**	.291**	.272**	.205**	.311**
Coping															
Adaptive	.132**	.188**	.095	.114*	.103	.120*	.178**	−.015	−.027	.085	−.003	−.031	.157**	−.020	.102*
Non-adaptive	.287**	.115**	.464**	.311**	.371**	.376**	.395**	−.009	.301**	.285**	.220**	.363**	.303**	.422**	.331**
Defense															
Mature	.085**	−.080*	.030	−.074	−.092	.066	.093	.198**	.008	−.047	.024	−.050	.034	.040	.114*
Neurotic	.218**	.222**	.206**	.162**	.094	.188**	.259**	.111*	.189**	.015	.077*	.099**	.204**	.190**	.069
Immature	.380**	.271**	.345**	.208**	.276**	.423**	.364**	.132**	.310**	.277**	.218**	.343**	.397**	.323**	.289**
Denial	.138**	−.046	.257**	.077	.034	.165**	.191**	−.014	.030	−.002	.037	.001	.055	.060	.219**
Autistic	.381**	.344**	.335**	.284**	.382**	.450**	.383**	.066	.287**	.440**	.221**	.379**	.365**	.415**	.179**
Self-esteem	−.140**	−.319**	.113*	.233**	.244**	.215**	−.170**	−.022	−.028	−.304**	.054	−.324**	−.339**	−.339**	−.245**

PIUQ: Problematic Internet Use Questionnaire.
* $P<.05$.
** $P<.01$.

The three South-Eastern countries had the highest mean scores of PIUQ-9 (23.37 to 26.98), while European countries had the lowest scores (16.68 to 20.99). South American countries had scores ranged from 19.53 to 22.99. These results highlight important cross-cultural differences, which have been explained by a previous study in terms of the different psychological needs between individualist (USA) and collectivist societies (Turkey) [4]. Individualist countries would be more at risk of PIU, while in our study South-Eastern countries were more concerned. However, in a recent meta-analysis, prevalence of PIU was higher in Eastern society compared to Western countries [32]. Therefore, other variables might better explain this result.

Self-perception of PIU revealed a higher proportion of problematic users than the PIUQ for France, Colombia, Brazil, and Chile. PIU ranged from 2% for Pakistan to 60.1% for Chile. On the other hand, the PIUQ-9 assessed much more potential problematic users than what was self-reported for the overall sample and particularly for Pakistan and UAE, followed by Greece, Italy, and

Table 4
Multiple Regression Analyses Predicting Problematic Use (β statistics).

	Total $n=7726$	Brazil $n=975$	Chile $n=386$	Colombia $n=308$	Ecuador $n=300$	Peru $n=431$	Iran $n=246$	Pakistan $n=491$	UAE $n=669$	Finland $n=251$	France $n=785$	Greece $n=1037$	Italy $n=871$	Romania $n=583$	Turkey $n=393$
Cluster A traits															
Paranoid	−.036**	.040	−.149*	.035	−.041	−.031	−.055	−.120	−.128**	.067	−.041	−.066*	−.024	.095*	.006
Schizoid	−.047***	.021	.032	−.066	−.010	−.150**	−.005	−.001	−.105*	−.065	−.004	−.052	−.021	−.136**	−.027
Schizotypal	.004	−.020	−.088	−.028	−.003	.018	−.024	−.144	−.021	.028	.079	.014	.090*	−.010	.031
Cluster B traits															
Antisocial	.054***	.045	.092	.010	−.014	.060	.047	−.039	.089	−.086	.107**	.054	.041	.075	.032
Borderline	−.004	.062	.098	−.073	.138	.130*	−.051	.102	−.139**	−.023	.008	.018	−.049	−.093	.056
Histrionic	.059***	.016	.063	.112	.037	−.026	.060	.090	.103*	.075	.064	.010	.029	.068	−.048
Narcissistic	.079***	.082*	−.022	.124*	.092	.017	.102	.064	.071	−.081	.083*	.064	.070	.113*	.129
Cluster C traits															
Avoidant	.082***	.020	.171*	.087	0050	.111	−.015	.121	−.014	−.003	.042	.130***	.082*	.009	.110
Dependent	.153***	.218***	.056	.161*	.117	.055	.287***	.048	.168**	−.020	.152***	.203***	.096*	.065	.168*
Obses.-compulsive	.013	−.006	.002	.049	.024	.027	.153*	.071	.137**	.269**	.039	.090**	.012	.001	.032
Coping															
Adaptive	.023	.070	.037	.089	.138*	−.012	.110	−.044	−.061	−.064	−.050	.010	.022	−.003	.135*
Non-adaptive	.078***	.032	.270***	.102	.089	.137*	.007	−.007	.132**	.290***	.074*	.063	.009	.157**	.115*
Defense															
Mature	−.013	−.034	−.009	−.110	−.101	−.110	−.006	.173***	−.074	−134	−.003	−.003	−.068	−.022	−.101
Nevrotic	.031*	.072*	.016	.114	−.018	.017	−.080	.067	.002	.053	−.023	−.019	.062	.066	−.064
Immature	.178***	.045	.047	.022	.055	.234***	.103	.046	.253***	.120	.104**	.108**	.225***	.069	.090
Denial	.019	−.076*	.155**	.010	.009	.048	.003	−.042	−.003	.030	−.002	.028	.001	−.023	.084
Autistic	.139***	.119**	.068	.042	.225***	.183***	.302***	.051	.071	.203**	.097**	.151***	.083*	.182***	.009
Self−esteem	−.069***	.001	.020	.157**	.099	.067	−.092	−.034	.006	−.035	.022	.051	−.163***	−.145**	−.071
Total R^2	.548***	.508***	.558***	.522***	.546***	.590***	.615***	.275**	.514***	.569***	.452***	.554***	.539***	.548***	.526***

* $P<.05$.
** $P<.01$.
*** $P<.001$.

Turkey. Nevertheless, it would be interesting to explore beliefs, attitudes and knowledge on PIU among general population in a cross-cultural way.

4.3. Gender differences

In six samples, the mean PIUQ-9 scores were higher among women than among men (Greece, Italy, Turkey, Iran, UAE, and Brazil), though only one (Italy) statistically significant. Given that gender difference in Brazilian sample was very low, it can be suggested that among South America, there are not or few gender differences. Italian women had significant higher PIUQ-9 scores than men whereas PIUQ screened more male problematic users than females in the Italian sample. Among Italian users, it could be argued that the cut-off of the PIUQ-9 should be gender-related, meaning lower for women. In this sample, more women admitted self-assessed problematic use than men, suggesting they felt exposed to PIU.

Significant gender differences were revealed in three other samples. Among the Peruvian, French and Pakistani samples, our results suggested men had higher PIUQ-9 scores than women. This could be related to the change of women profiles in Internet related activities and the raise of PIU scores among of these groups during the past years [5,26,27]. Besides, it can support that women do not use Internet as much as men [2,14], maybe suggesting the necessity of a gender-specific assessment.

4.4. Relationships with personality traits

All personality traits significantly correlated with PIU (as assessed with the PIUQ-9) in the total sample. Narcissistic, histrionic, antisocial (Cluster B), dependent and avoidant (Cluster C) personality traits were positive predictors of PIU while schizoid and paranoid traits (Cluster A) were negative predictors. Given that schizotypal traits were not predictor of PIU, we can assume that Cluster A personality traits are not as much related to PIU than the other Clusters [44].

Narcissistic, antisocial, avoidant traits have been frequently found as related to PIU in previous studies [7,8,16,41]. Unexpectedly, borderline traits were not predictive of PIU in this paper while dependent traits concerned eight samples (even if systematically correlated). In only one study, dependent personality (Cluster C) was found to relate to PIU, among Asian girls [41]. A previous study also highlighted that smartphone addiction was significantly related to dependent personality [31].

These exploratory results are certainly influenced by gender and culture and are consequently hard to clearly explain. For example, in Ecuador and Pakistan, no personality traits were significant, suggesting that other variables better explain PIU. In the Finnish sample, only one trait (obsessional-compulsive) was a predictor. Among Greek users, all and almost exclusively Cluster C traits were predictors of PIU scores.

4.5. Relationships with defense and coping

In the total sample, the PIUQ-9 correlated positively with the seemingly contradictory adaptive and non-adaptive coping strategies, and also with mature and immature defences. As expected [29], non-adaptive coping strategies and immature, autistic and neurotic defense mechanisms were the only positively predictors of PIU.

Differences across subsamples showed that PIU was related more to non-adaptive coping since non-adaptive coping correlated with PIU in all but Pakistan sample, whereas adaptive coping significantly correlated with PIU in six out of 14 subsamples (Brazil, Colombia, Peru, Iran, Italy, and Turkey). Trying to explain the link between PIU and adaptive coping, studies have shown potential benefits of internet use, such as sense of self-expression, competence, communication, entertainment, connectedness and belongingness within a social network, issues that may be a challenge in the offline world [6,40].

Subsample differences were observed in the relationship between PIU and defense mechanisms. Autistic traits were predictor of PIU in nine sample and particularly in European countries. Neurotic defense was predictive of PIU only in the Brazilian sample, while mature defense only Pakistani. In Turkey, both adaptive and non-adaptive coping were significant.

4.6. Relationships with self-esteem

In the total sample, the PIUQ-9 correlated negatively with self-esteem. Interestingly, self-esteem did not significantly correlate with PIU among Pakistan, UAE, and France whereas positive correlations were found for Chile, Colombia, Ecuador and Peru. Self-esteem was a poor negative predictor of PIU among the total sample by being only significant in Colombia (negatively) and in Romania and Italy (positively). Longitudinal findings revealed that low and high self-esteem have been described as risk and protective factors, respectively, depending on cultural differences [2]. Our findings confirmed this hypothesis.

5. Limitations

Some limits were related to sampling and recruitment bias (e.g., self-selection, online recruitment) and evaluating methods (e.g., validity of the used scales and their cut-off scores, self-report measures, lack of diagnosis). Some samples were not homogeneously distributed (gender, homogeneity of age, sample size, ...). This non-probability study did not aim to estimate the prevalence of PIU, but to use the prevalence for cross-cultural comparison purposes. This study should be replicated in more consistent and homogeneous samples. Besides, a number of other variables that were not included in the present paper could have provided a clearer picture of the PIU phenomenon (performed activities, time of exposure, depressive symptoms, ...).

6. Conclusions

To our knowledge, this is the first large cross-cultural study on PIU among adults. This highlights the relationships between several pathological personality traits and PIU like no other previous study tried to. Besides, our results on the relationship between PIU and personality bring a new piece of evidence of what could influence PIU, and how cultural difference is a major concern. Personality traits appear to have a significant impact on PIU.

These results should be confirmed in further studies, particularly longitudinal ones. As many studies raised the importance of gender in PIU and given our results, recommendations for future practice would be to consider gender in research and clinical practice. Differences in terms of other psychopathology among them, as anxiety or depression are additional arguments. There is a need for empirical research to explore which factors impact PIU scores, trying to use a same assessment tool to allow comparisons.

Compliance with Ethical Standards

This study is in conformity with the 1964 Helsinki declaration and its later amendments. The Brazilian form of this study was approved by the Research Ethics Committee of the Hospital de Clínicas de Porto Alegre (protocol number 89702318.2.0000.5327). The entire study obtained the approval from the ethics committee of the University of Timisoara in Romania (number UVT8170/16.04.2018).

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Disclosure of interest

The authors declare that they have no competing interest.

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