

Research Article

Fear of Missing Out in an Online Context and Dysfunctional Risks in Adolescents

Jessica Ortega-Barón¹, Joaquín González-Cabrera¹, Adoración Díaz-López¹,
Raquel Escortell², María J. Arroyo-González³ and Juan M. Machimbarrena⁴

¹Faculty of Psychology, Universitat de València (UV), Valencia, Spain

²Instituto de Transferencia e Investigación (ITEI), Universidad Internacional de La Rioja (UNIR), Logroño, Spain

³Faculty of Education, Universidad Internacional de la Rioja (UNIR), Logroño, Spain

⁴Faculty of Psychology, University of the Basque Country (UPV/EHU), San Sebastián, Spain

Correspondence should be addressed to Juan M. Machimbarrena; juanmanuel.machimbarrena@ehu.eus

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Fear of missing out (FoMO) is a problematic kind of attachment related to the distress caused by knowing that others are having rewarding experiences of which one is not a part. Although this feeling can negatively impact the lives of adolescents, the relationship between FoMO and other risks of dysfunctional use of the Internet in this age range is little explored. Furthermore, there is a gap in the online FoMO assessment instruments for this age bracket. Therefore, the primary objective of this study was to evaluate the relationships between FoMO and problematic social networking site (PSNS) usage, nomophobia, and Internet gaming disorder (IGD). A secondary objective was to validate the Fear of Missing Out in the Online Context in Adolescent (FoMO-OA) scale. Differences according to sex and academic course were also analysed. An instrumental, analytical, and cross-sectional study was conducted with 3569 students aged 11–14 years (1794 males, 50.3%). The results indicate significant and positive relationships between FoMO, PSNS, nomophobia, and IGD. Users of social networks experienced significantly more FoMO ($p < 0.001$). Moreover, the FoMO-OA was validated with sufficient guarantees of validity and reliability. We obtained higher scores for girls and students in higher grades ($p < 0.001$). These results are particularly interesting for future prevention programs and parental online mediation strategies.

Keywords: adolescence; fear of missing out; Internet; risks; social networks

1. Introduction

Human beings possess a constant need to interact with their peers and to be socially integrated, both in the conventional offline context and in the online context [1]. When this need for socialization is not satisfied, the fear of missing out (FoMO) can develop. FoMO is defined by two primary components: (1) a feeling of distress triggered by the concern that surrounding people may be experiencing rewarding situations in which an individual is not participating and (2) the desire to remain continuously connected to what others are doing [2, 3]. FoMO is considered a type of problematic attachment that has been examined across a wide variety of areas [4]. While it seems to be more prevalent in girls than

in boys [5–7], there is no agreement on the age group in which it is most prevalent. Some authors have suggested that FoMO increases with age [8] and is more prevalent in youth [9], while others have claimed that FoMO is worse in adolescence [10, 11].

Several authors have framed the empirical understanding of FoMO within the self-determination theory of human motivation [3, 12]. From this theoretical perspective, and in relation to using social networking, Przybylski et al. [3] conceived FoMO as a negative emotional state that results in a self-regulatory mechanism in the face of dissatisfaction with social-relatedness needs. In this regard, the Interaction of Person-Affect-Cognition-Execution (I-PACE) suggests that any addictive behavior is a consequence of interactions

between predisposing variables, affective and cognitive responses to specific stimuli, and executive functions [13]. Bearing this in mind, different authors have conceived FoMO as a possible cognitive bias related to the Internet by building an expectation that online communication tools are the best way to regulate mood and satisfy the constant need for social connection [14, 15]. The dysfunctional risks refer to the problematic phenomena derived from the inappropriate use of relationship, information, and communication technologies (RICTs) that can generate negative consequences for the person [16]. From this perspective, FoMO but also problematic Internet use (PIU), Internet Gaming Disorder (IGD), and nomophobia can be conceptualized as dysfunctional Internet risks that can lead to inadequate psychological adjustment.

FoMO is closely related to other problems with which certain mechanisms are shared [3, 17, 18]. From this perspective, FoMO, as well as problematic use of social networks, nomophobia, and IGD have developed intensively with the expansion of smartphones and the greater accessibility and connection to the Internet in adolescence. All these problems are associated with each other due to the feeling of reward when using technology [19], the presence of impulsive-compulsive traits, excessive time spent connecting with others in the online context [20], and to the emotional and mental health problems associated with these phenomena [21, 22].

Concretely, widespread and continuous use of the Internet, smartphones, and social networks is related to FoMO [8, 14, 23]. The potential to access social experiences from anywhere and at any time via electronic devices is one reason that may explain PIU [8, 24]. Moreover, problematic social networking site (PSNS) use, characterized by a high preference for social interaction on social networks, poor self-regulation, compulsive use, and negative consequences in various areas of life, has been connected to FoMO [25]. Specifically, Varchetta et al. [26] and Franchina et al. [27] indicated that FoMO is the best predictor of PSNS use in college students and adolescents.

Several studies also evidence a relationship between FoMO and nomophobia, which is the fear of being disconnected from Internet-connected devices (usually smartphones) and being unable to communicate via the device due to no Internet connection, low or dead battery, billing problems, etc. [28–30]. Hamutoglu et al. [28] noted that FoMO mainly predicts two dimensions of nomophobia: not being able to communicate and losing connection. Several studies have also pointed out the significant relationship between FoMO and IGD [31, 32]. In relation to online video games, Freire and Santos [33] suggested that FoMO is related to the number of hours spent playing a game, the sense of belonging felt by the player, and the commitment a player has to collective goals in online multiplayer mode.

As a population, adolescents use the Internet the most, so it is paradoxical that most studies on FoMO and dysfunctional risks of technologies are conducted using adult or university populations [8, 25]. According to the Spanish National Institute of Statistics [34], 97.5% of children aged 10–15 years have used the Internet in the last 3 months,

and 68.7% own a cell phone. Furthermore, according to Andrade et al. [35], 83.5% of Spanish adolescents are registered on more than three social networking sites (SNSs).

Perhaps the lack of consistency in conceptualizing and assessing the phenomenon of FoMO has hindered its study in the adolescent population [36]. Typically, FoMO has been studied regardless of whether perceived missed experiences occur on- or offline [36–39]. Adolescence is currently characterized by the coconstruction of reality as a consequence of a continuous interaction between online and offline contexts, but with an increased prominence of online reality which has led to the label of the “always on” generation [1, 40]. Moreover, the idiosyncrasies of the online context overlap with users in particularly vulnerable stages, such as adolescence. In this stage, numerous biopsychosocial changes occur in which the reference peer group and its constant connection with them through technologies are crucial [40, 41].

Today, FoMO is of a marked online nature, and it is clearly relevant in adolescence. In the most widely used unifactorial scale [3], only one item refers to the importance of sharing rewarding experiences online, and the scale ON-FoMO Inventory focuses on the adult population [42]. Thus, a relevant gap is observed, and an assessment tool validated for adolescents to evaluate FoMO online would be of great value, especially in early and middle adolescence, between the ages of 11 and 14 years).

The main objective of this study was to establish an association between FoMO in early adolescence and the main risks of dysfunctional use of technology (problematic use of social networks, nomophobia, and IGD). The specific objectives were to (1) adapt the FoMO scale [3, 43] to adolescents and the online context, (2) obtain measurement properties of the scores of the adapted questionnaire, Fear of Missing Out in the Online Context in Adolescents (FoMO-OA), (3) analyse the differences in FoMO based on the ownership of mobile phones, SNS accounts, and video games, and (4) analyse FoMO in the online context based on sex and academic year of the participants.

We hypothesized that we would see a significant and positive relationship between FoMO and risks of dysfunctional use of technology, in line with previous studies [16, 22, 25, 33]. Additionally, like previous questionnaires that evaluated FoMO in the offline context and targeted adult or university populations [3, 43], we hypothesized that the FoMO-OA would be unifactorial in factor structure and would exhibit adequate standards of validity and reliability. Furthermore, we hypothesized that FoMO would be higher in girls, given that girls tend to be more concerned about relational aspects than boys [5–7]. Finally, we hypothesized that FoMO scores would be higher in the older group, given these adolescents spend more time using technology and have more online social experiences [8, 14, 44].

2. Method

2.1. Design and Participants. An instrumental, analytical, and cross-sectional study was carried out. The sample was obtained between March and May 2023. The sample of this

study is composed of 3569 Spanish students 11 to 14 years old (1794 males, 50.3%; 1694 females, 47.5%, and 74 students who did not indicate any of the aforementioned options, 2.2%). Participants were recruited from 34 high schools and vocational training centres in several autonomous communities of Spain (Aragón, Cantabria, Castilla la Mancha, Castilla-León, Community of Madrid, Foral Community of Navarre, Valencian Community, Galicia, La Rioja, Basque Country, and Principality of Asturias). The mean age of the participants was 12.56 (SD = 0.95), 26.9% ($n = 959$) of the participants were enrolled in the sixth grade of elementary education ($M_{age} = 11.49$, SD = 0.58), 38.8% ($n = 1386$) were enrolled in the first grade of Compulsory Secondary Education (CSE), ($M_{age} = 12.51$, SD = 0.61), and the remaining 34.3% ($n = 1224$) in second grade of CSE ($M_{age} = 13.45$, SD = 0.52). This study employed a nonprobabilistic incidental sampling procedure.

2.2. Instruments. Firstly, participants reported socio-demographic variables (sex, age, grade, and school). The assessment instruments used in Spanish are listed below. The Cronbach's alpha reliability of these scales in this study can be seen in Table 1.

FoMO-OA. This scale is an adaptation of the Spanish version of the questionnaire that is considered a benchmark in facilitating an operationalised understanding of FoMO, and that is widely used. It was developed by Przybylski et al. [3]. This process followed international standards for the design and adaptation of questionnaires [45]. Specifically, the new scale assesses the fears and concerns that an adolescent may feel when disconnected from the online experiences of their social environment (e.g., "I'm scared to see on social media that my friends are having a better time than I am"). Three experts in the field participated in the process of validating the content, achieving high interjudge reliability throughout the process (> 0.8) in the different elements shown in the table of specifications (Table 2) of the questionnaire. The main change was to focus all items on the person's online experience. Additionally, to analyse the adequacy and comprehension of the items for adolescents, four cognitive interviews were conducted with teenagers between 10 and 14 years old. The Likert-type response options on this scale range from 0 (*not at all*) to 4 (*very much*). The total score ranges between 0 and 40.

Nomophobia Questionnaire (NMP-SF) [46]. This 10-item scale assesses intense fear and excessive worry about (losing connection) or being unable to communicate via mobile (e.g., "I would be nervous about being disconnected from my virtual identity"). The Likert-type response options on this scale range from 0 (*strongly disagree*) to 6 (*strongly agree*). The total score ranges between 0 and 30.

The Problematic Social Networking Site Use Scale (PSNUS) [47]. This 15-item scale assesses adolescents' problematic use of social media. It has five dimensions: Preference for interaction via SNSs (e.g., "I'm more comfortable communicating with other people through social media than doing it face-to-face"); mood modification (e.g., "I've used social media to feel better when I was sad"); cognitive preoc-

cupation (e.g., "When I do not connect to my social media for some time, I start to worry about the idea of connecting"); compulsive use (e.g., "When I do not have access to social media, I find it hard to resist the urge to connect"); and negative consequences (e.g., "My use of social media has created problems in my life"). The Likert-type response options on this scale range from 1 (*strongly disagree*) to 6 (*strongly agree*). The total scores range between 15 and 90.

The Spanish version of the Internet Gaming Disorder Scale-Short Form (IGDS9-SF) [48] Spanish adaptation [49]. This scale includes nine items that assess IGD symptoms (e.g. "Do you consistently fail to control or terminate your gaming activity?"), rated on a Likert scale ranging from 0 (*never*) to 4 (*very often*). The total score can range from 0 to 45, with greater scores suggesting higher symptom severity of disordered gaming.

Finally, it should be noted that, with the exception of the FoMO scale, in the rest of the instruments, there was a prior control question in order to determine whether or not respondents could answer each of these questionnaires. Thus, before responding to the NMP-SF, we asked: "Do you have your own mobile phone?" (yes/no). Before answering the PSNUS, we asked the following question: "In the last 12 months, have you used any kind of social network? (e.g., Instagram, TikTok, Snapchat or any similar one?)" (yes/no). Finally, in relation to IGD, we asked the following preliminary question: "In the last 12 months, have you ever played a video game, regardless of the device (computer, console, mobile, etc.)?"

2.3. Procedure. The questionnaires were administered to students during school hours online on the Survey Monkey platform under the supervision of teachers in each classroom. The questionnaire took between 20 and 30 min to complete, depending on students' age and reading comprehension ability. This study was conducted with the approval of the participating schools and the University's Research Ethics Committee of International University of La Rioja (PI: 037/2022). Through official channels, the heads of each school gave the students' legal guardians a consent form, in which they were informed about the contact details of the research team, the purpose of the study, and the right not to participate in it. In this way, the parents/guardians who did not want the minor to participate returned the signed consent form and explicitly expressed their disagreement. Only 1% refused to participate in the study. There were no exclusion criteria other than refusal to participate by students or their legal guardians.

2.4. Statistical Analysis. The statistical analyses of the study were carried out with the SPSS (Statistical Package for the Social Sciences) v. 23.0 and MPLUS 8.0. First, the psychometric properties of each questionnaire were analysed using Cronbach's alpha. Then, we calculated the arithmetic mean, standard deviation, item-total correlation, skewness, kurtosis, and frequency range of each item of the FoMO-OA scale. These analyses revealed that some of the items were not normally distributed (see Table 2), so we used statistics that were robust to nonnormality in the following analyses.

TABLE 1: Correlation matrix for FoMO and other risks of dysfunctional use of technology.

Variable	1.	2.	3.	4.	5.	6.	7.	8.	Cronbach's α
1. FoMO	—	0.540*	0.389*	0.487*	0.628*	0.565*	0.470*	0.384*	0.89
2. Nomophobia	0.519*	—	0.323*	0.433*	0.592*	0.496*	0.374*	0.247*	0.90
3. PSNU-POSI	0.430*	0.339*	—	0.491*	0.526*	0.440*	0.503*	0.335*	0.85
4. PSNU-MR	0.471*	0.416*	0.515*	—	0.554*	0.512*	0.485*	0.400*	0.83
5. PSNU-Cog. Preoc.	0.599*	0.528*	0.597*	0.545*	—	0.706*	0.621*	0.387*	0.85
6. PSNU-Comp. Use	0.493*	0.428*	0.493*	0.531*	0.646*	—	0.654*	0.405*	0.82
7. PSNU-Negativ Con	0.475*	0.352*	0.550*	0.512*	0.637*	0.645*	—	0.430*	0.77
8. IGD	0.419*	0.345*	0.451*	0.474*	0.492*	0.508*	0.508*	—	0.87

Note: Boys are represented below the diagonal and girls above the diagonal.

Abbreviations: Cog. Preoc., cognitive preoccupation; Comp. use, compulsive use; FoMO, fear of missing out; IGD, Internet gaming disorder; MR, mood regulation; Negativ Con., negative consequences; POSI, preference for social interaction through SNS; PSNS, problematic social networking site use.

* $p < 0.001$.

TABLE 2: Means, standard deviation, total item correlation, percentage responses, and factorial loads of the FoMO-OA.

Items	Fear of Missing Out in the Online Context in Adolescents (FoMO-OAs)	<i>M</i>	SD	IT	Skew.	Kurt.	Response frequencies %					Load.
							0	1	2	3	4	
1	Sometimes, I wonder if I spend too much time keeping up with what is going on on social media	1.32	1.14	0.39	0.63	-0.36	27.9	33.2	23.5	10.3	5.1	0.46
2	When I miss out on a planned online get-together it bothers me.	0.99	1.15	0.63	1.07	0.22	44.5	29.9	12.3	9.0	4.4	0.68
3	When I go on vacation, I continue to keep tabs on what my friends are doing on social media	1.12	1.16	0.61	0.89	-0.08	37.9	31.0	17.1	8.8	5.2	0.69
4	I get worried when I find out through social media that my friends are having fun without me	0.97	1.24	0.70	1.15	0.23	50.3	23.4	12.1	7.5	6.7	0.83
5	I get anxious when I do not know what my friends are up to on social media.	0.45	0.91	0.71	2.20	4.39	74.3	13.3	7.3	3.0	2.1	0.88
6	I fear my friends have more rewarding experiences on social media than me.	0.50	0.97	0.71	2.06	3.55	72.8	13.1	7.7	3.7	2.7	0.87
7	It is important that I understand my friends “in jokes” (through photos, publications or challenges, etc.)	0.67	1.03	0.60	1.58	1.81	61.4	20.3	10.8	4.5	2.9	0.72
8	It bothers me when I miss an opportunity to meet up with friends in WhatsApp groups, video-calls or chats in social media	1.13	1.20	0.65	0.91	-0.14	38.7	31.0	14.6	9.9	5.7	0.71
9	I fear my acquaintances have more rewarding experiences on social media than me.	0.45	0.91	0.70	2.22	4.49	74.4	13.2	7.3	2.9	2.2	0.85
10	When I have a good time it is important for me to share the details online (e.g. updating status).	0.70	1.03	0.60	1.51	1.59	59.6	21.4	11.4	4.7	2.9	0.72

Note: Response frequencies for 0 (*not at all*), 1 (*a little bit*), 2 (*moderately so*), 3 (*pretty much*), and 4 (*a lot*). *M* = arithmetical mean; IT = corrected item-total correlation; Load. = standardised item loading for the final model.

Abbreviations: Kurt, kurtosis; SD, standard deviation; Skew, skewness.

To analyse the factorial structure, a confirmatory factor analysis (CFA) was performed using the weighted least squares method adjusted for mean and variance (WLSMV) estimator, following the model proposed by Przybylski et al. [3] in its original version and the version adapted to Spanish [43]. This estimator, which has been previously used in other studies with Przybylski's [3] original scale, treats each item as ordinal, using polychoric covariance matrices and probit-based factor loadings. For this analysis, the criteria of Hu and Bentler [50] were considered to assess the

goodness of fit of the indices: Root mean square error of approximation (RMSEA) values less than 0.06 indicate an excellent fit, between 0.06 and 0.08 acceptable, and comparative fit index (CFI) and the Tucker–Lewis index (TLI) values of 0.95 or higher reflect a good fit. Moreover, measurement invariance was tested according to sex (male vs. female) and stage of school (primary vs. secondary education). For that purpose, models were calculated for each group. The configural invariance (the baseline model where the same factor structure is assumed across groups without

any equality constraints) was tested. This model was compared with a more restrictive model (metric model, factor loadings to be equal across groups) and, in the final step, a scalar factorial invariance (additionally constraining the item intercepts to be equal across groups) of the model was calculated to assess the invariance of the measurement model between sex and age. The fit of each model was compared to the fit of the previous model. If the model fit did not worsen, the subsequent model was selected. Although there are many different statistical methods to decide when model fit worsens, we followed Cheung and Rensvold's [51] guidelines and understand that if the Δ s in CFI are lower than 0.01 and 0.015 in RSMEA, it is assumed that invariance exists.

Then, to assess construct validity, the scores of FoMO-OA were compared through Spearman's correlations with several related constructs. Lastly, in order to analyse differences according to gender and grade, Welch's t -test (Cohen's d as effect size) and ANOVAs with Welch's F -test (eta squared as effect size) were calculated on each item and total scale score. Due to the many comparisons and to avoid Type I error, only values below 0.001 were considered significant.

3. Results

3.1. Descriptive Statistics. Table 2 displays the main descriptive statistics for the FoMO-OA. The response to the items in the questionnaire suggests a positive asymmetry, in which almost all items (except for Item 1) present an adequate item-total correlation and standardised load in the final model. It should be noted that the joint cumulative frequency of the value 3 (*quite a lot*) and 4 (*a lot*) in the 10 items varies between 15.6% for Item 8 and 5.1% for Items 5 and 9. Regarding the control questions, we note that 100% of the sample ($n=3569$) claimed to have a mobile phone, and 90.7% ($n=3239$) answered affirmatively about social networks. Broken down by age, social media ownership was 82.6% in 11-year-olds, 89.4% in 12-year-olds, 93% in 13-year-olds, and 95.3% in 14-year-olds. Regarding video games, 91.1% ($n=3223$) played video games, reaching 93.1% at age 11, 91.2% at age 12, 90.3% at age 13, and 91% at age 14.

3.2. Confirmatory Analysis and Model Invariance. Table 3 shows the results of the confirmatory analysis. The analysis of the one-dimensional model obtained acceptable indices. The analysis of the modification indices revealed that allowing the correlation of the error of the pairs of Items 2 and 8 and Items 6 and 9 would improve the model's fit. Although each item provides an indicator of interest for the validity of the construct's content, both pairs address a general and a specific behavior with a clear relationship between them. However, differential nuances are important to explore various indicators of the construct (the items are available in Table 2). This new model obtained better fit indices and was the final model on which the invariance analyses were performed. The standardised factor loadings of this model are shown in Table 2.

The invariance analyses presented in Table 3 show that the model is invariant for sex and educational stage, both

at the metric and scalar levels, because the changes in the CFI and TLI were not greater than -0.01 , nor were the changes in the RMSEA greater than 0.01.

3.3. Evidence of Validity. Regarding validity and other variables, Table 1 shows the correlations among variables for boys (under the diagonal) and girls (above it). Considering the total sample, the strongest correlation was between FoMO and the dimension of cognitive preoccupation ($r = 0.61, p < 0.001$) and compulsive use ($r = 0.53, p < 0.001$) of SNSs and nomophobia ($r = 0.53, p < 0.001$). Nonetheless, all correlations were significant below 0.001, with the correlation with IGD being the lowest ($r = 0.37, p < 0.001$). The correlations displayed in Table 1 show a similar pattern, revealing higher correlation coefficients in girls than in boys for most variables (nomophobia, PSNU-mood regulation, cognitive preoccupation, and compulsive use) and higher correlation coefficients for boys than for girls in IGD and preference for interaction through SNS and negative consequences for the use of SNS. Additionally, analyses were carried out comparing FoMO scores of those participants who had social networks and who claimed to play video games and those who did not (no analyses were carried out with mobile phone possession because the proportion of participants without a phone did not allow for comparisons). When comparing participants who used social networks, a significant Welch's t -test ($t_{(484.890)} = 14.05, p < 0.001, d = 0.61$) was obtained, with higher FoMO scores among those who used social networks ($M = 8.71, SD = 7.64$) compared to those who did not ($M = 4.14, SD = 5.43$). There were no significant differences ($t_{(417.738)} = -0.580, p = 0.562$, and $d = -0.03$) in FoMO between those who played video games ($M = 8.25, SD = 7.57$) and those who did not ($M = 8.50, SD = 7.79$).

3.4. Sex and Course Differences. Table 4 shows the differences by sex. Significant sex-based differences were observed in Items 3, 4, 8, and 10, as well as the total score of the questionnaire (with the score for girls being higher in all cases). Likewise, there were also differences depending on the school course in two of the items (Items 1 and 3) as well as the total score as a function of the course. In all cases, the score was higher in the upper grades, especially between the second year of CSE and the sixth year of primary education.

Additionally, Table 5 shows the scores for the percentiles of the FOMO-OA according to sex and age. In general, the tendency is that girls have higher scores, and, in general, the older they are, the higher the scores. It is important to note that scores above 21 points, regardless of the sex and age variable, imply being in the 95th percentile.

4. Discussion

The widespread use of smartphones with Internet connection at increasingly younger ages enables the emergence of Internet risks that mainly affect adolescents due to the psychosocial vulnerability of this life stage [41]. In this sense, the present study offers interesting findings, showing that in early adolescence and the beginning of middle

TABLE 3: Fit and measurement invariance for the FoMO-OA.

Model	χ^2 (df)	p	Comp. Models	$\Delta \chi^2$	Δ df	$\Delta(\chi^2/\text{df})$	p value	CFI	Δ CFI	TLI	Δ TLI	RMSEA	(CI 95%)	Δ RMSEA
<i>FoMO Scale (CFA)</i>														
Unidimensional model	1216.872 (35)	< 0.001	—	—	—	—	—	0.970	—	0.961	—	0.097	(0.093, 0.102)	—
Final unidimensional model	635.105 (32)	< 0.001	—	—	—	—	—	0.984	—	0.979	—	0.071	(0.067, 0.076)	—
Sex-based measurement invariance														
1. Boys	303.885 (33)	< 0.001	—	—	—	—	—	0.987	—	0.982	—	0.068	(0.061, 0.075)	—
2. Girls	395.179 (33)	< 0.001	—	—	—	—	—	0.979	—	0.972	—	0.080	(0.073, 0.088)	—
3. Configural	690.326 (66)	< 0.001	—	—	—	—	—	0.983	—	0.977	—	0.075	(0.070, 0.080)	—
4. Metric	707.550 (75)	< 0.001	3-4	49.656	9	0.000	0.983	0.000	0.980	0.003	0.071	(0.066, 0.075)	-0.004	
5. Scalar	664.561 (104)	< 0.001	4-5	150.174	38	0.000	0.985	0.002	0.987	0.007	0.056	(0.052, 0.061)	-0.015	
Age-based measurement invariance														
6. Primary education	163.273 (33)	< 0.001	—	—	—	0.000	0.985	—	0.979	—	0.064	(0.055, 0.074)	—	
7. Secondary education	511.024 (33)	< 0.001	—	—	—	0.000	0.984	—	0.979	—	0.074	(0.069, 0.080)	—	
8. Configural	660.376 (66)	< 0.001	—	—	—	0.000	0.985	—	0.980	—	0.071	(0.066, 0.076)	—	
9. Metric	676.460 (75)	< 0.001	8-9	46.920	9	0.000	0.985	0.000	0.982	0.002	0.067	(0.062, 0.072)	-0.004	
10. Scalar	530.182 (104)	< 0.001	9-10	78.604	38	0.000	0.990	0.005	0.991	0.009	0.048	(0.044, 0.052)	-0.019	

Note: χ^2 = chi-squared test; p = significance value; CI 95% = 95% confidence interval for RMSEA; final unidimensional model = error terms between Items 2-8 and 6-9 were allowed to correlate. Abbreviations: CFI, comparative fit index; df, degrees of freedom; RMSEA, root mean square error of approximation; TLI, Tucker-Lewis Index.

TABLE 4: Differences in FOMO-OA items and total score based on sex and grade.

Items	Gender-related differences				Grade-related differences								
	Boys (n = 1794)	Girls (n = 1694)	Welch's <i>t</i>	(<i>p</i>)	Cohen's <i>d</i>	Primary ^a (n = 959)	6 th grade (n = 1386)	1 st grade (n = 1386)	2 nd grade (n = 1224)	CSE ^c M (SD)	Welch's <i>F</i> (<i>p</i>)	Eta squared	Post hoc differences (G-H)
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)			<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)			
Item 1	1.26 (1.15)	1.39 (1.13)	-3.136	(0.002)	-0.105	1.22 (1.15)	1.30 (1.13)	1.41 (1.13)	6.128	(0.001)	0.004	<i>a</i> < <i>c</i>	
Item 2	0.95 (1.13)	1.03 (1.17)	-2.072	(0.038)	-0.069	0.95 (1.11)	1.01 (1.16)	0.98 (1.16)	0.668	(0.513)	0.000	—	
Item 3	1.05 (1.16)	1.22 (1.17)	-4.443	(< 0.001)	-0.148	0.91 (1.09)	1.11 (1.17)	1.29 (1.18)	27.843	(< 0.001)	0.016	<i>a</i> < <i>b</i> , <i>c</i> <i>b</i> < <i>c</i>	
Item 4	0.85 (1.17)	1.09 (1.29)	-6.025	(< 0.001)	-0.202	0.89 (1.19)	0.97 (1.23)	1.02 (1.27)	3.850	(0.021)	0.002	—	
Item 5	0.47 (0.92)	0.45 (0.91)	0.828	(0.408)	0.028	0.40 (0.85)	0.40 (0.85)	0.46 (0.92)	2.206	(0.110)	0.001	—	
Item 6	0.49 (0.96)	0.52 (0.99)	-0.840	(0.401)	-0.028	0.42 (0.92)	0.52 (0.97)	0.54 (1.01)	2.848	(0.058)	0.002	—	
Item 7	0.72 (1.07)	0.64 (1.10)	2.377	(0.018)	0.079	0.60 (1.01)	0.67 (1.01)	0.72 (1.06)	2.900	(0.055)	0.002	—	
Item 8	1.06 (1.17)	1.20 (1.22)	-3.498	(< 0.001)	-0.117	1.11 (1.18)	1.12 (1.18)	1.15 (1.22)	0.282	(0.754)	0.000	—	
Item 9	0.45 (0.91)	0.45 (0.90)	0.119	(0.905)	0.004	0.39 (0.84)	0.47 (0.93)	0.46 (0.92)	2.129	(0.119)	0.001	—	
Item 10	0.63 (1.01)	0.79 (1.07)	-4.608	(< 0.001)	-0.154	0.64 (1.03)	0.71 (1.04)	0.73 (1.03)	2.432	(0.088)	0.001	—	
Total score	7.89 (7.54)	8.73 (7.64)	-3.321	(< 0.001)	-0.111	7.53 (7.10)	8.35 (7.73)	8.74 (7.79)	6.538	(< 0.001)	0.004	<i>a</i> < <i>c</i>	

Note: *p* = significance; the letters ^a, ^b, and ^c in superscript indicate the letter for the post hoc comparisons.

Abbreviations: CSE, compulsory secondary education; G-H, Games-Howell; M, mean; SD, standard deviation.

TABLE 5: Scores for the percentiles of the FOMO-OA as a function of sex and age ($n = 3488$).

Percentiles	Scores (0-40)							
	Boys ($n = 1794$)				Girls ($n = 1694$)			
	11 years $n = 258$	12 years $n = 570$	13 years $n = 628$	14 years $n = 338$	11 years $n = 264$	12 years $n = 550$	13 years $n = 589$	14 years $n = 291$
1	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	1	1
10	0	1	1	1	1	1	1	2
15	1	1	1	1	2	2	2	3
20	2	2	2	2	2	2	3	3
25	2	2	3	3	3	3	3	4
30	3	3	3	3	3	4	4	4
35	3	3	4	4	4	4	5	5
40	4	4	4	4	4	5	5	6
45	4	5	5	5	5	5	6	6
50	5	5	6	6	6	6	7	7
55	6	6	7	7	6	7	8	8
60	6	7	8	8	7	8	9	9
65	7	8	9	9	8	9	10	11
70	9	9	10	11	9	10	11	11
75	10	10	12	13	11	12	12	14
80	11	12	15	15	12	14	14	16
85	14	14	18	17	15	17	16	19
90	18	18	20	20	19	20	19	23
95	23	21	25	28	23	25	24	29
99	32	32	36	29	28	33	31	38

adolescence, there is a positive and significant relationship between FoMO and the main problems of dysfunctional use of technologies (PSNS, nomophobia, and IGD). In addition, this study has filled a gap by adapting and obtaining the measurement properties of an instrument that assesses online FoMO in adolescents: the FoMO-OA.

In relation to the main objective, the initial hypothesis is confirmed, given the significant and positive relationship between FoMO and the risks of dysfunctional Internet use analysed. Specifically, we observed that the strongest correlation of FoMO is with PSNS, in line with previous FoMO studies [26, 27]. In fact, almost all participants of this study use social media (90.7%), and their use is associated with higher FoMO scores. Within PSNS, we underline the relationship between cognitive preoccupation and the FoMO of continually being aware of and not missing out on the rewarding experiences of others online. This is largely due to the fact that in these “*always on*” generations, it is easy to be updated because they usually publish all/almost all their social experiences to get immediate feedback [52]. Another relevant dimension of PSNS with FoMO is compulsive use. In this sense, Fioravanti et al. [25] also show that FoMO is a variable that triggers a compulsive use of social networks driven by that constant need to get in touch with others. According to these results, different authors envisage on the basis of the I-PACE theoretical model that FoMO possibly acts as a cognitive bias related to the Internet [14, 15]; thus, adolescents would develop the expectation that

social networks are the best way to immediately regulate the constant need to be aware of and be part of the social experiences of others [15, 53]. These findings seem to indicate that FoMO is not only a risk of dysfunctional use of technology, as González-Cabrera and Machimbarrena [47] suggest, but also that it has a relational component (due to social connectivity) that makes it a more complex and multifaceted risk.

This study also evidences the relationship between nomophobia and FoMO in adolescents, in line with previous research focused mainly on the adult and university populations [22, 28, 30, 54]. Along these lines, and taking into account that all adolescents have a smartphone, the two problems are not only related, but both feed off each other because the fear of being without a mobile phone leads to the fear of not being able to consult and access social networks [54]. According to Li et al. [17], the excessive use of social networks and a higher level of FoMO appear to contribute to smartphone addiction. In this sense, the joint assessment of FoMO and nomophobia, mainly through the NMP-Q [55], may show some overlap with the dimensions of not being able to communicate and losing connection. This suggests that in the future, the two constructs can be analysed together to integrate both problems into a new conceptual reality because the fear of being disconnected from the mobile phone occurs when the adolescent disconnects from social experiences with their reference group (especially online) at a vital stage where the peer group is crucial.

Concerning IGD, it is also related to FoMO, in line with previous studies [32, 33, 56]. In this regard, Zhang et al. [57] show that the relationship between the two problems is mediated by anxiety and certain metacognitive beliefs such as worry, low cognitive confidence, and beliefs about the need for control. Along these lines, Freire and Santos [33] also point out that in current multiplayer online games, the sense of belonging and commitment to the game are very important variables that affect the relationship between IGD and FoMO because there is a very remarkable social, relational, and joint interaction dimension (especially in cooperative games or games where teams or clans are formed to face challenges). However, in this study, there are no significant differences in the FoMO variable between those who play and those who do not play. This requires additional analysis to select users of certain types of video games and specifically analyse the role of FoMO in IGD, because the topic is currently under discussion for the possible mediating [58] or predictive role of IGD [57].

Regarding the first specific objective, the CFA of FoMO-OA reveals a one-dimensional scale with acceptable fit indices, which explains a high percentage of variance, with item-total correlations and satisfactory factor loads in all the items (except for Item 1). In this way, the hypothesis that the adapted version of the instrument [3, 43] is one-dimensional is also confirmed. In addition, the reliability analyses indicated a high internal consistency of the scale, and the invariance analyses for sex and school course are an additional contribution to the assessment tools on FoMO. It also highlights the convergent validity of the FoMO-OA scale with the rest of the constructs evaluated. Along these lines, the instrument by Przybylski et al. [3] adapted to the online context (FoMO-OA) represents an advance in research, given that most of the existing scales target the adult or university population [8, 25, 36, 42] and do not adequately show the needs of the new generations in which the need for social connection is easily satisfied by technologies [35].

In addition to the above and concerning the second specific objective, we note that the study sample presents significantly more FoMO in social network users (compared to those who were not users of social networks), which is convergent with previous studies [2, 8, 25]. Not being a user of social networks could be considered a protective factor for FoMO, which is of particular interest given that this is potentially avoidable in 11- and 12-year-olds, nearly 9 out of 10 of whom use social networks. One potential line of action is parental mediation of technology and the use of restrictive technology mediation in early adolescence [59].

Concerning the last objective, the initial hypothesis is confirmed, given that girls have higher levels of FoMO than boys, in line with multiple previous studies [6, 7]. Although this explanation is complex and can have multiple approaches, girls may present more FoMO because they tend to make greater use of social networks [35], and, in general, they grant more importance to the need for acceptance by the peer group to obtain constant positive reinforcement [60]. With regard to age, the results are in line with the study of Akbari et al. [8], which also indicates that FoMO seems to increase with age

in adolescents. This result is in line with the hypothesis and is in line with the idea that young people, unlike adults, largely access news and information through a range of friend groups and social platforms [61]. Although other authors suggest that FoMO is more frequent in young people than in adolescents between 12 and 18 years of age [9] or who find no differences in FoMO between cohorts [10], these differences may be due to methodological variations or the age ranges used. Studies containing samples with broad age ranges, going from early adolescence (11 years) to emerging adulthood (25 years), may be necessary [41].

This study also has some limitations. First, the FoMO-OA questionnaire is self-reported; therefore, it is liable to possible biases and social desirability. In future research, it would be advisable to use additional measures or heteroreports to better understand variables that may be related to this phenomenon. Second, this is a cross-sectional study, and therefore, no predictive associations over time can be established. Third, although the tests of the psychometric properties of the instrument are adequate (reliability, construct validity, factorial and convergent validity), other analyses such as predictive validity and test-retest reliability could be performed in future research. However, although the scale is shown as one-dimensional to make it more practical, in future applications of the FoMO-OA scale, it would be advisable to unify Items 2 and 8 and Items 6 and 9 to improve the fit of the model further. In the case of Items 2 and 8, both share two elements: the fact of missing out on collective events and the uneasiness (noted as "it bothers me") this arouses, which makes them similar. The nuance that separates them is the planning and the specific events they refer to (to miss out on a planned online get-together vs. miss an opportunity to meet up with friends in WhatsApp groups, video calls, or chats in social media). Regarding Items 6 and 9, they specifically share the fear of friends and acquaintances having rewarding experiences, the only nuance being the difference between friends and acquaintances, which makes them very similar and perhaps difficult to differentiate for an adolescent. Lastly, it would be convenient to carry out our cognitive interviews to assess the suitability of Item 1 and explain the somewhat lower factor loading of this item. Fourth, the sampling was neither random nor representative of the Spanish reality (although the sample was large and was collected in multiple regions of the Spanish state). Therefore, the results must be interpreted with caution. Fifth, in this manuscript it is not possible to establish a cut-off point that would allow us to provide a prevalence of who has online FOMO problems. This would require a gold standard and more complex analyses such as an ROC curve. Nevertheless, we have advanced our knowledge by providing a table with scores for the most important percentiles of FOMO-OA according to sex and age.

Despite the limitations, the study has significant practical implications. Having a FoMO tool adapted to the online context in adolescents (FoMO-OA) allows not only to investigate this phenomenon with other dysfunctional uses of technology but also to open research lines that analyse its relationship with other relational risks such as cyberbullying,

sexortion, or online grooming. In this sense, studies suggest that FoMO plays a relevant role in problems such as cyber-stalking or peer exclusion [62, 63]. In general, the possession of smartphones at increasingly younger ages, even below the legal age allowed, indicates the need to delve into online parental mediation, maximizing opportunities and minimizing risks [59]. Likewise, it is necessary to consider FoMO as an Internet risk that must be prevented in psychoeducational programs [64], along with other Internet risks, by providing an integrated and multifaceted view of reality. This suggests the need for studies to assess the overlap or accumulation of risks of dysfunctional use of technology and their impact on minors' psychological well-being. In this sense, scientific literature has focused on the negative consequences (stress, depressive symptoms, or anxiety) generated by FoMO. This study could also follow the line opened by Eitan and Gazit [65], where it is analysed how FoMO in relation to each dysfunctional risk of technology can also cause JoMO (positive feelings and even experiencing a version of the joy of missing out on something). Finally, it is also important that future studies can provide cut-off points with which to establish risk and problem scores for FoMO (especially in adolescents). Knowing and analyzing these problems should lead to the creation of better programs of universal primary prevention or indicated prevention.

In conclusion, in the current hyperconnected social context, FoMO is positively and significantly related to nomophobia, problematic use of social networks, and problems with online video games in adolescents aged 11–14 years. In addition, the adaptation of an instrument that allows the evaluation of online FoMO in adolescents (FoMO-OA) in an online context has been validated, showing this reality as more problematic for girls and students in the second grade of CSE.

Data Availability Statement

The data that supports the findings of this study are available from the corresponding author, upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

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References

- [1] K. Subrahmanyam and D. Smahel, *Digital Youth*, Springer, New York, 2011.
- [2] J. D. Elhai, J. C. Levine, R. D. Dvorak, and B. J. Hall, "Fear of missing out, need for touch, anxiety and depression are related to problematic smartphone use," *Computers in Human Behavior*, vol. 63, pp. 509–516, 2016.
- [3] A. K. Przybylski, K. Murayama, C. R. DeHaan, and V. Gladwell, "Motivational, emotional, and behavioral correlates of fear of missing out," *Computers in Human Behavior*, vol. 29, no. 4, pp. 1841–1848, 2013.
- [4] C. J. Budnick, A. P. Rogers, and L. K. Barber, "The fear of missing out at work: examining costs and benefits to employee health and motivation," *Computers in Human Behavior*, vol. 104, Article ID 106161, 2020.
- [5] S. A. S. Ibrahim, N. W. M. Pauzi, A. Dahlan, and J. Vetryan, "Fear of missing out (FoMO) and its relation with depression and anxiety among university students," *Environment-Behaviour Proceedings Journal*, vol. 7, no. 20, pp. 233–238, 2022.
- [6] E. Mari, S. Biondi, M. Varchetta et al., "Gender differences in Internet addiction: a study on variables related to its possible development," *Computers in Human Behavior Reports*, vol. 9, Article ID 100247, 2023.
- [7] U. Oberst, E. Wegmann, B. Stodt, M. Brand, and A. Chamarro, "Negative consequences from heavy social networking in adolescents: the mediating role of fear of missing out," *Journal of Adolescence*, vol. 55, no. 1, pp. 51–60, 2017.
- [8] M. Akbari, M. Seydavi, S. Palmieri, G. Mansueto, G. Caselli, and M. M. Spada, "Fear of missing out (FoMO) and Internet use: a comprehensive systematic review and meta-analysis," *Journal of Behavioral Addictions*, vol. 10, no. 4, pp. 879–900, 2021.
- [9] H. Gul, S. Firat, M. Sertcelik, A. Gul, Y. Gurel, and B. G. Kilic, "Effects of psychiatric symptoms, age, and gender on fear of missing out (FoMO) and problematic smartphone use: a path analysis with clinical-based adolescent sample," *Indian Journal of Psychiatry*, vol. 64, no. 3, pp. 289–294, 2022.
- [10] C. T. Barry and M. Y. Wong, "Fear of missing out (FoMO): a generational phenomenon or an individual difference?," *Journal of Social and Personal Relationships*, vol. 37, no. 12, pp. 2952–2966, 2020.
- [11] I. Beyens, E. Frison, and S. Eggermont, "'I don't want to miss a thing': adolescents' fear of missing out and its relationship to adolescents' social needs, Facebook use, and Facebook related stress," *Computers in Human Behavior*, vol. 64, pp. 1–8, 2016.
- [12] D. Alt, "College students' academic motivation, media engagement and fear of missing out," *Computers in Human Behavior*, vol. 49, pp. 111–119, 2015.
- [13] M. Brand, K. S. Young, C. Laier, K. Wölfling, and M. N. Potenza, "Integrating psychological and neurobiological considerations regarding the development and maintenance of specific Internet-use disorders: an interaction of person-affect-cognition-execution (I-PACE) model," *Neuroscience & Biobehavioral Reviews*, vol. 71, pp. 252–266, 2016.
- [14] J. D. Elhai, D. McKay, H. Yang, C. Minaya, C. Montag, and G. J. G. Asmundson, "Health anxiety related to problematic smartphone use and gaming disorder severity during COVID-19: fear of missing out as a mediator," *Human Behavior and Emerging Technologies*, vol. 3, no. 1, pp. 137–146, 2021.
- [15] E. Wegmann, U. Oberst, B. Stodt, and M. Brand, "Online-specific fear of missing out and Internet-use expectancies contribute to symptoms of Internet-communication disorder," *Addictive Behaviors Reports*, vol. 5, pp. 33–42, 2017.
- [16] J. González-Cabrera and J. M. Machimbarrena, "Quality of life and its relationship with bullying and cyberbullying: face-to-face and online victimization and aggression among peers,"

in *Handbook of Anger, Aggression and Violence: Causes, Pathology and Treatments*, pp. 1–18, Springer International Publishing, 2023.

[17] L. Li, Z. Niu, S. Mei, and M. D. Griffiths, “A network analysis approach to the relationship between fear of missing out (FoMO), smartphone addiction, and social networking site use among a sample of Chinese university students,” *Computers in Human Behavior*, vol. 128, Article ID 107086, 2022.

[18] Ł. Tomczyk and E. S. Lizde, “Nomophobia and phubbing: wellbeing and new media education in the family among adolescents in Bosnia and Herzegovina,” *Children and Youth Services Review*, vol. 137, Article ID 106489, 2022.

[19] M. A. Olivencia-Carrión, R. Ferri-García, M. D. M. Rueda, M. G. Jiménez-Torres, and F. López-Torrecillas, “Temperament and characteristics related to nomophobia,” *Psychiatry Research*, vol. 266, pp. 5–10, 2018.

[20] S. Gonçalves, P. Dias, and A. P. Correia, “Nomophobia and lifestyle: smartphone use and its relationship to psychopathologies,” *Computers in Human Behavior Reports*, vol. 2, Article ID 100025, 2020.

[21] N. I. Charini and S. Supriyadi, “Relationship FoMO and nomophobia with social anxiety symptoms in the use of social media at UMP,” *Proceedings Series on Health & Medical Sciences*, vol. 5, pp. 87–92, 2024.

[22] S. Okur, Ö. Acar Bulut, and S. Erden Çinar, “The mediating role of social media usage habits in the relationship between FoMO and nomophobia,” *Kuramsal Eğitimbilim*, vol. 15, no. 1, pp. 126–145, 2022.

[23] S. Turkle, *Always-on/Always-on-You: The Tethered Self*, Routledge, 3rd edition, 2023.

[24] J. D. Elhai, J. C. Levine, A. M. Alghraibeh, A. A. Alafnan, A. A. Aldraiweesh, and B. J. Hall, “Fear of missing out: testing relationships with negative affectivity, online social engagement, and problematic smartphone use,” *Computers in Human Behavior*, vol. 89, pp. 289–298, 2018.

[25] G. Fioravanti, S. Casale, S. B. Benucci et al., “Fear of missing out and social networking sites use and abuse: a meta-analysis,” *Computers in Human Behavior*, vol. 122, Article ID 106839, 2021.

[26] M. Varchetta, A. Fraschetti, E. Mari, and A. M. Giannini, “Adicción a redes sociales, miedo a perderse experiencias (FoMO) y vulnerabilidad en línea en estudiantes universitarios,” *Revista Digital de Investigación en Docencia Universitaria*, vol. 14, no. 1, Article ID e1187, 2020.

[27] V. Franchina, M. Vanden Abeele, A. Van Rooij, G. Lo Coco, and L. De Marez, “Fear of missing out as a predictor of problematic social media use and phubbing behavior among Flemish adolescents,” *International Journal of Environmental Research and Public Health*, vol. 15, no. 10, p. 2319, 2018.

[28] N. B. Hamutoglu, D. M. Gezgin, G. Sezen-Gultekin, and O. Gemikonakli, “Relationship between nomophobia and fear of missing out among Turkish university students,” *Cypriot Journal of Educational Sciences*, vol. 13, no. 4, pp. 549–561, 2018.

[29] A. León-Mejía, M. Gutiérrez-Ortega, I. Serrano-Pintado, and J. González-Cabrera, “A systematic review on nomophobia prevalence: surfacing results and standard guidelines for future research,” *PLoS One*, vol. 16, no. 5, Article ID e0250509, 2021.

[30] J. Wen, Y. Huang, G. Liu, and M. Miao, “The nature of nomophobia and its associations with contents of smartphone use and fear of missing out: a network perspective,” *Telematics and Informatics*, vol. 82, Article ID 102011, 2023.

[31] L. Li, Z. Niu, M. D. Griffiths, and S. Mei, “Relationship between gaming disorder, self-compensation motivation, game flow, time spent gaming, and fear of missing out among a sample of Chinese university students: a network analysis,” *Frontiers in Psychiatry*, vol. 12, Article ID 761519, 2021.

[32] G. Yuan, J. D. Elhai, and B. J. Hall, “The influence of depressive symptoms and fear of missing out on severity of problematic smartphone use and Internet gaming disorder among Chinese young adults: a three-wave mediation model,” *Addictive Behaviors*, vol. 112, Article ID 106648, 2021.

[33] R. C. Freire and V. A. Santos, “Features shared between fear of missing out on rewarding experiences (FOMO) and Internet gaming disorder,” *Brazilian Journal of Psychiatry*, vol. 43, no. 2, pp. 129–130, 2021.

[34] Spanish National Institute of Statistics, *Encuesta sobre Equipamiento y Uso de Tecnologías de Información y Comunicación en los Hogares*, 2022, https://www.ine.es/prensa/tich_2022.pdf.

[35] B. Andrade, I. Guadix, A. Rial, and F. Suárez, “Impacto de la tecnología en la adolescencia,” in *Relaciones, Riesgos Y Oportunidades*, UNICEF España, 2021, <https://www.unicef.es/publicacion/impacto-de-la-tecnologia-en-la-adolescencia>.

[36] M. M. Mazlum and A. Atalay, “Developing the fear of missing out (FoMO) scale for university students: the validity and reliability study,” *Journal of Pedagogical Research*, vol. 6, no. 4, pp. 20–34, 2022.

[37] J. Ma, C. X. Wang, and Y. Ye, “Development and validation of fear of missing out scale among Chinese college students,” *Current Psychology*, vol. 41, no. 12, pp. 8625–8634, 2022.

[38] B. C. Riordan, L. Cody, J. A. M. Flett, T. S. Conner, J. Hunter, and D. Scarf, “The development of a single item FoMO (fear of missing out) scale,” *Current Psychology*, vol. 39, no. 4, pp. 1215–1220, 2020.

[39] Z. Zhang, F. R. Jiménez, and J. E. Cicala, “Fear of missing out scale: a self-concept perspective,” *Psychology & Marketing*, vol. 37, no. 11, pp. 1619–1634, 2020.

[40] M. McCrindle, A. Fell, and S. Buckerfield, *Generation Alpha: Understanding Our Children and Helping Them Thrive*, Headline, 2021.

[41] K. Salmela-Aro, “Stages of adolescence,” in *En Encyclopedia of Adolescence*, pp. 360–368, Elsevier, 2011.

[42] C. P. Sette, N. R. S. Lima, F. N. F. R. Queluz, B. L. Ferrari, and N. Hauck, “The online fear of missing out inventory (ON-FoMO): development and validation of a new tool,” *Journal of Technology in Behavioral Science*, vol. 5, no. 1, pp. 20–29, 2020.

[43] F. Gil, U. Oberst, G. del Valle, and A. Chamarro, “Nuevas tecnologías - ¿Nuevas patologías? El smartphone y el fear of missing out,” *Aloma: Revista de Psicología, Ciències de l'Educació i de l'Esport*, vol. 33, no. 2, pp. 77–83, 2015.

[44] A. Díaz-López, J. J. Maquilón-Sánchez, and A. B. Mirete-Ruiz, “Maladaptive use of ICT in adolescence: profiles, supervision and technological stress,” *Comunicar*, vol. 28, no. 64, pp. 29–38, 2020.

[45] American Psychological Association, *Standards for Educational and Psychological Testing*, American Educational Research Association, 2014.

[46] V. Caba-Machado, J. M. Machimbarrena, A. Díaz-López, D. Sevilla-Fernández, C. Pérez-Sancho, and J. González-Cabrera, “Nomophobia questionnaire short-form: psychometric

properties and longitudinal association with anxiety, stress, and depression in adolescents," *International Journal of Human-Computer Interaction*, vol. 40, no. 17, pp. 4585–4595, 2023.

[47] J. M. Machimbarrena, M. Varona, A. Muela, and J. M. González-Cabrera, "Profiles of problematic social networking site use: a cross-cultural validation of a scale with Spanish and Mexican adolescents," *Cyberpsychology: Journal of Psychosocial Research on Cyberspace*, vol. 17, no. 3, p. 5, 2023.

[48] H. M. Pontes and M. D. Griffiths, "Measuring DSM-5 Internet gaming disorder: development and validation of a short psychometric scale," *Computers in Human Behavior*, vol. 45, pp. 137–143, 2015.

[49] M. Beranuy, J. M. Machimbarrena, M. A. Vega-Osés et al., "Spanish Validation of the Internet Gaming Disorder Scale-Short Form (IGDS9-SF): prevalence and relationship with online gambling and quality of life," *International Journal of Environmental Research and Public Health*, vol. 17, no. 5, p. 1562, 2020.

[50] L. Hu and P. M. Bentler, "Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives," *Structural Equation Modeling: A Multidisciplinary Journal*, vol. 6, no. 1, pp. 1–55, 1999.

[51] G. W. Cheung and R. B. Rensvold, "Evaluating goodness-of-fit indexes for testing measurement invariance," *Structural Equation Modeling: A Multidisciplinary Journal*, vol. 9, no. 2, pp. 233–255, 2002.

[52] J. Brailovskaia and J. Margraf, "From fear of missing out (FoMO) to addictive social media use: the role of social media flow and mindfulness," *Computers in Human Behavior*, vol. 150, Article ID 107984, 2023.

[53] J. D. Elhai, H. Yang, J. Fang, X. Bai, and B. J. Hall, "Depression and anxiety symptoms are related to problematic smartphone use severity in Chinese young adults: fear of missing out as a mediator," *Addictive Behaviors*, vol. 101, Article ID 105962, 2020.

[54] W. M. Czerski, "Piękno technologii – nomofobia i FoMO jako przykłady lęków współczesnej młodzieży," *Kultura-Społeczeństwo-Edukacja*, vol. 22, no. 2, pp. 133–144, 2022.

[55] A. León-Mejía, E. Calvete, C. Patino-Alonso, J. M. Machimbarrena, and J. González-Cabrera, "Nomophobia questionnaire (NMP-Q): factorial structure and cut-off points for the Spanish version," *Adicciones*, vol. 33, no. 2, pp. 137–148, 2020.

[56] Y. Wang, B. Liu, L. Zhang, and P. Zhang, "Anxiety, depression, and stress are associated with Internet gaming disorder during COVID-19: fear of missing out as a mediator," *Frontiers in Psychiatry*, vol. 13, Article ID 827519, 2022.

[57] M. X. Zhang, S. M. Yu, Z. Demetrovics, and A. M. S. Wu, "Metacognitive beliefs and anxiety symptoms could serve as mediators between fear of missing out and gaming disorder in adolescents," *Addictive Behaviors*, vol. 145, Article ID 107775, 2023.

[58] H. Duman and B. Y. Ozkara, "The impact of social identity on online game addiction: the mediating role of the fear of missing out (FoMO) and the moderating role of the need to belong," *Current Psychology*, vol. 40, no. 9, pp. 4571–4580, 2021.

[59] S. Livingstone, K. Ólafsson, E. J. Helsper, F. Lupiáñez-Villanueva, G. A. Veltri, and F. Folkvord, "Maximizing opportunities and minimizing risks for children online: the role of digital skills in emerging strategies of parental media-
tion," *Journal of Communication*, vol. 67, no. 1, pp. 82–105, 2017.

[60] Y.-J. Wu, C. Outley, D. Matarrita-Cascante, and T. P. Murphrey, "A systematic review of recent research on adolescent social connectedness and mental health with Internet technology use," *Adolescent Research Review*, vol. 1, no. 2, pp. 153–162, 2016.

[61] C. Gong and Y. Ren, "PTSD, FOMO and fake news beliefs: a cross-sectional study of Wenchuan earthquake survivors," *BMC Public Health*, vol. 23, no. 1, p. 2213, 2023.

[62] D. Marengo, M. Settanni, M. A. Fabris, and C. Longobardi, "Alone, together: fear of missing out mediates the link between peer exclusion in WhatsApp classmate groups and psychological adjustment in early-adolescent teens," *Journal of Social and Personal Relationships*, vol. 38, no. 4, pp. 1371–1379, 2021.

[63] I. L. Silva Santos, C. E. Pimentel, and T. E. Mariano, "Cyberstalking scale: development and relations with gender, FOMO and social media engagement," *Current Psychology*, vol. 42, no. 6, pp. 4802–4810, 2023.

[64] J. Ortega-Barón, J. M. Machimbarrena, A. Díaz-López, V. Caba-Machado, B. Tejero, and J. González-Cabrera, "Efficacy of a multi-risk internet prevention program: Safety.net," *Revista de Psicodidáctica*, vol. 29, no. 2, pp. 97–106, 2024.

[65] T. Eitan and T. Gazit, "No social media for six hours? The emotional experience of Meta's global outage according to FoMO, JoMO and Internet intensity," *Computers in Human Behavior*, vol. 138, Article ID 107474, 2023.