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La competencia digital docente y el diseño de situaciones innovadoras
con TIC para la mejora del aprendizaje

*Digital competence in teaching and the design of innovative situations
with ICT to improve learning*

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PREDICTORS OF THE RISK OF ADDICTION TO SOCIAL NETWORKS AND THE INTERNET

Predictores del riesgo de adicción a las redes sociales e Internet

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INTRODUCTION. This study was based on the general objective of identifying factors that predict the risk of becoming addicted to the Internet or social networks. **METHOD.** A descriptive design has been used for the research, using mean, skewness and kurtosis, with a binomial logistic regression. A sample of 217 university students, all of them first year students of the Faculty of Education Sciences of the University of Granada, was used for the research. In this study the demographic variables of age and gender were considered within the investigated students, it is observed that the students had a mean age of 19.37 years and a median of 18 years. In which we can highlight that the majority gender of the sample is female (66.8%) and the remaining 33.2% is male. On the other hand, the Adolescent Risk of Addiction to Social Networks and the Internet (ERA-RSI) scale was used for data collection. **RESULTS.** The factors that most accurately predict risk of social networking and Internet addiction in first-year college students are normalization, personal difficulties, and ego. Loneliness proved to be predictive, but to a lesser degree, and, finally, disinhibition proved to have no predictive influence. **DISCUSSION.** It was found that the telephone applications that are constantly launched on the Internet have a great influence on the predictors of addiction.

Keywords: *Risk predictors, Addiction, Internet, Social networks, University students.*

Introduction

Contemporary society lives immersed in a process of continuous change, in which changes occur at an increasingly greater speed and affect a greater part of the population from different sectors and social stratum. These changes are particularly conditioned by technological advancement and progress, which also impact upon the creation of new digital entertainment settings where individuals, mainly young people, share their time and experiences on a virtual platform. Mobile phone applications (apps), which are constantly being released, social networks and internet, lay the foundations for a generation that lives permanently connected through academic, occupational, social and family activities or through engagement in new leisure practices. However, beyond individual factors, it is important to consider how the sociocultural context shapes the way people access, use and interpret digital technology. Culture provides lenses through which we perceive the world, including technological innovations (Hofstede, 2003). For example, collective norms and values determine whether intensive use of mobile devices is seen as problematic or acceptable. In collectively oriented cultures, such as Asian ones, such use is more likely to be perceived as detrimental to interpersonal relationships (Soto Vega, 2010). Likewise, socioeconomic position impacts differential opportunities for access to technology. Studies reveal that young people from disadvantaged contexts face more risks in digital environments (Rodríguez-Sabiote *et al.* 2020). With all this, to fully understand the challenges posed by ICTs it is essential to attend to the underlying situated meanings and power dynamics shaped by culture and social structure.

Despite the advantages and benefits that new technologies can offer us, it is true that the digital world is not free of risk (Ruiz & Ruiz Domínguez, 2023). A vast array of recent research indicates the large number of internet users who could end up becoming addicts, in the same way that other users have already become addicts to alcohol, drugs or betting. Addiction to social networks and the Internet can cause negative influences among its users and society (Cao *et al.*, 2020). Such addiction has repercussions on the academic and occupational performance, and family life of sufferers (Habib, 2019; Tao *et al.*, 2010; Pérez Cabrejos *et al.*, 2021; Castelló & Ponce, 2020; Cala & Martínez-Gil, 2022).

Over recent years, research works have emerged which have analysed the risk factors and consequences associated with excessive use (Andreassen, 2015; Gunay *et al.*, 2018; Gundogmus *et al.*, 2020; Jeong, 2016; Krishnamurthy & Chetlapalli 2015; Ozturk *et al.*, 2015; Vaghefi *et al.*, 2020). As will be demonstrated later on in the present work, a tight relationship also exists between mobile devices or smartphones and the term nomophobia as a clearly emerging risk factor. In the present day, mobile phones have become essential elements that we carry with us at all times due to the fact that they offer quick and easy access to the Internet, social networks, mobile applications, etc. Due to this, nomophobia is thought of as a 21st Century phobia which mostly affects younger populational groups (Bivin *et al.*, 2013; Rodríguez-Sabiote *et al.*, 2020). In the sphere of clinical psychology, it is described as the irrational and overwhelming fear of not being able to communicate or be contacted through a mobile device (Yildirim & Correia, 2015; Brand *et al.*, 2023; Braña Sánchez *et al.*, 2023). It serves to highlight some research studies which have been conducted on this topic, for instance those carried out by Gezgin *et al.*, (2016) and Gezgin *et al.*, (2017). It may also be useful to draw on studies that uncovered the risks and dangers of digital leisure during childhood and adolescence (Sánchez-Teruel & Robles-Bello, 2016). It is pertinent, after what has been said, to clarify a bit the term nomophobia, which is described in the field of

clinical psychology as the irrational and overwhelming fear of not being able to communicate or be contacted through a mobile device (Yildirim & Correia, 2015). It is considered a 21st century phobia that mainly affects younger population groups (Bivin *et al.*, 2013; Rodríguez-Sabiote *et al.*, 2020), and is closely related to the problematic use of smartphones and mobile applications. Some relevant studies are those conducted by Gezgin *et al.*, (2016) and Gezgin *et al.*, (2017) exploring the prevalence levels and influence of nomophobia. This could be considered an important risk factor for developing addiction to social networks and the internet, the main topic addressed by this article.

On the other hand, research that has recently explored the relationship between the use of social devices/networks and mental health, especially among young people and adolescents, is scarce; however, we highlight Moreno, López, Romero & Rodríguez (2020) who conducted a study with 734 Spanish university students on nomophobia and anxiety. They found that students who showed higher levels of nomophobia also presented more anxiety. Women scored higher on both variables. Ophir, Lipschits-Brazilier & Rosenberg, H. (2022) who reviewed studies on the excessive use of social networks and their impact on mental health in adolescents. They conclude that excessive use is related to anxiety, depression, body image problems, among others. They suggest preventive education on the subject. Błachnio, *et al.* (2021) studied risk and protective factors for well-being in adolescents (14-18 years) during COVID pandemic. Social isolation and low self-esteem increased the risk of problematic social network use. Lee *et al.* (2020) and Lázaro *et al.* (2021) conducted a recent systematic review of epidemiological studies on smartphone use and mental health problems. Meta-analysis showed correlation between smartphones and anxiety/depression, but not causal. They suggest longitudinal studies. It is clear, then, that the complexity of the phenomenon of addiction to social networks and the Internet demands a multidisciplinary approach (Kuss & Griffiths, 2017). This allows nurturing the analysis from different theoretical and methodological approaches. For example, the field of psychology contributes to the study of psychological and behavioral correlates; psychiatry provides explanatory models of behavioral addiction; education contributes to the design of digital literacy interventions; and sociology examines the sociocultural aspects that mediate the use of technology. This multidisciplinary confluence enriches the comprehensive understanding of a multidimensional object of study. It allows to better capture its complexity, overcoming partial unidisciplinary visions (Montesó-Curto & Aguilar, 2017).

In general, social networks have different addictive components that increase their use, mainly among the younger population. One strategy is the creation of needs such as the Need for Popularity (NFP), which is that everyone wants to be perceived as popular (Utz *et al.*, 2012). Thus, introverted people with low self-esteem who are not popular outside social networks such as Facebook, manage to perceive themselves as popular within the social network (Utz *et al.*, 2012). Social media addiction can be referred to as social media addiction, and young people are the most addicted sector of the population, accessing social media numerous times a day and for very long periods of time, putting their health at risk (Rodgers *et al.*, 2009; Van den Eijnden *et al.*, 2016). Studies highlight the significant relationship between the use of social networks and internet addiction (Barat & Sayadi, 2013) and how the false attractions of the internet come to cause this addiction and satisfying the psychological and emotional needs of users. Young university students find themselves in an increasingly digital learning and communication environment, which in many cases turn out to be very useful means and tools for their learning in higher education (Gómez-Galán *et al.*, 2020),

but also has negative aspects, mainly in social, leisure and free time contexts (Gómez-Galán *et al.*, 2020).

In this way, the present work seeks to go beyond simple analysis of the different risks for addiction to the Internet and social networks by identifying the main predictive variables of the behaviours that increase addiction risk in first-year university students. In this way, it strives to contribute a different yet complimentary and practical viewpoint of the scientific literature, coming mainly from the ambits of education, psychology and psychiatry. Considerations are given of a topic that is in a constant state of growth and development, affecting populations which are younger and, often, more vulnerable. Thus, with Andreassen (2015) and Griffiths *et al.* (2014), we have chosen the following factors operationalised in five items: normalisation loneliness, ego, disinhibition and personal difficulties. However, we are aware that there are many more factors that may be related to addiction to SNI, especially those related to the personality and lifestyles of the users surveyed. In conclusion, it would be valuable to contrast our findings with studies that address personality and lifestyle factors to identify possible interactions and combined effects on addiction risk.

Study objectives

The following study objectives guided the present research:

1. Determine the descriptive characteristics of a set of predictive and dependent variables which help to estimate the extent of risk of addiction to social networks and the Internet in first-year university students.
2. Examine whether statistical differences exist in the recorded incidence of these aforementioned (predictive and dependent) variables as estimated through a dichotomous/binomial response procedure.
3. Identify the factors that most accurately predict risk behaviours for addiction to social networks and the Internet within the young people described above.

Method

Participants

The present study focuses on first-year university students, a population of special interest given that they are in a stage of transition and identity formation, where peer influence and the need for social belonging play a crucial role (Gallardo-López *et al.* 2020). Previous research reveals that this age group presents worrying levels of addiction and problematic use of social networks that negatively impact their well-being and academic performance (Selvi *et al.* 2020; Samaha & Hawi 2016).

Hence, the relevance of studying predictors of social network and internet addiction risk specifically among early college students. This population faces the challenge of adapting to college life, coping with new demands, and forging support networks, factors associated with digital technology abuse (Gomes *et al.* 2016).

For the present study, a sample of 217 students undertaking the first year of studies in the Faculty of Educational Sciences at the University of Granada was employed. Participants came from a possible total of 425 students who were enrolled on the first year of this course. This sample size represents more than 50% of the reference population and, in all cases, a subject-to-variable ratio (STV) of >5 was obtained or, to be more exact $STV=7.75$ ($217/28$). This ratio reflects the coefficient produced after dividing the sample size by the number of items included on the administered scale. Thus, we can confirm that the minimum acceptable sample size to meet our research purposes was achieved (Arrindell & van der Ende, 1985; MacCallum *et al.*, 1999), this being $STV>5$.

Further, when considering the demographic variables of age and gender within the students under investigation, it is seen that students had an average age of 19.37 years and a median age of 18 years. We prefer the latter of these measures given the presence of a very small number of older students who bias the numerical mean, pushing it upwards. With regards to gender, the majority of the sample is female (66.8%) and the remaining 33.2% is male. This imbalance was corrected during data analysis by stratifying according to gender. Finally, when considering the degree course to which participants belonged, we find that 32.7% were studying a Social Education Degree or Infant Education Degree, 18.9% were undertaking a Primary Education Degree and the remaining 15.7% were enrolled on a Pedagogy Degree. No type of sampling strategy was employed for participant selection. All students undertaking the first year of the aforementioned degrees were informed about the research and invited to fill out the scale online. This online protocol respected the anonymity of students at all times and completion of the scale was entirely voluntary.

Variables

Predictor variables: normalisation, loneliness, ego, disinhibition and personal issues.

Criterion/dependent variables: symptoms of addiction, social use, geek behaviour, nomophobia and overall scale.

Data collection techniques

For data collection, the scale of risk of addiction to social networks and internet for adolescents (SRA-SNI) was used. This scale was designed and validated by Peris *et al.* (2018, p. 34). It is composed of a total of 29 items, which were reduced to 28 for the present study as item 1 from the personal nature category was eliminated. Items are grouped into 4 factors which were inferred following exploratory factor analysis of outcomes obtained in the original validation study. The first of these factors pertains to symptoms of addiction (items 2 to 8), whose interest lies in determining the place in which and the extent to which students use social networks and the Internet. The second factor is social use (items 9 to 17) which is focused on estimating the way in which students most commonly use social networks and the Internet. The third factor pertains to geek behaviour (items 18 to 23), whose interest lies in outlining the way in which young people invest their time when on social networks and online. Finally, nomophobia (items 24 to 29) is focused on determining the extent of irrational fear experienced when not having a mobile device to hand for a period of time. Responses for questions pertaining to all of these items followed a Likert response format, with scales running from 1 (never/none) to 4 (always/a lot).

In addition, in order to satisfy our research interests, we considered the demographic variables of students' gender, age and degree course. These variables were not considered as predictors for various reasons. Gender was discarded for the imbalanced sample distribution of males and females. Similarly, degree title was not considered due to the imbalanced sample size available for the various categories. Age was discarded for being excessively homogenous. For this reason, we focused our study on different questions, 5 to be specific, which provided information about 5 considered predictors and produced binomial (no vs yes) data. The choice of these 5 factors occurs because they are the antithesis of the protective factors to avoid addiction to SNI. With Robertson *et al.* (2018) and Lei *et al.* (2018) we could highlight resilience, self-control, social support and peer relationships as protective factors.

In congruence with what was explained in the introductory section, we therefore consider the following five predictors:

- a) I regularly have a need to share photographs, write comments, etc. I see it as something normal → normalisation.
- b) Loneliness often pushes me to use social networks and the Internet on electronic devices → loneliness.
- c) I often use social networks and the Internet on electronic devices out of a need to receive recognition from others, for example, by getting a “like” → ego.
- d) I do not think that the regular use of social networks and the Internet on electronic devices carries with it as many risks as people suggest that it does → disinhibition.
- e) I use social networks and the Internet very often on electronic devices because I find it difficult to communicate with others and, generally, I struggle with my social skills → personal difficulties.

Reliability and validity

In order to examine internal consistency of the scale in the present research, we calculated Cronbach's α y McDonald's ω reliability indices. Outcomes are presented below for individual factors and the overall scale. Internal consistency calculated via Cronbach's α and McDonald's ω indices were .854 and .857, respectively. In both cases, obtained outcomes reveal strong internal consistency of the scale (McDonald, 1999; Katz, 2006). With regards to outcomes for Cronbach's α and McDonald's ω coefficients according to factors, somewhat lower values were obtained than for the overall scale. The social use factor (.775 and .776 for each of the reliability indices, respectively) most stood out as showing the highest reliability, whilst geek behaviour (.701 and .710, respectively) had the lowest reliability. Despite producing somewhat lower values than those found for the overall scale, these values can also be considered to be moderately acceptable and demonstrate acceptable internal consistency of scale factors (Zumbo *et al.*, 2007).

With regards to validity, concurrent criterion validity of the items making up the scale was considered. Item-total test correlations were produced which were higher than $r > .30$, with only some exceptions. However, we ruled out this possibility given that the present sample does not provide a sample size that is 10 times greater than the number of considered variables ($10 \times 28 = 280$). Further, neither univariate nor multivariate data met assumptions of normality and kurtosis (Hu & Bentler 1995; Kline 2011; Ryu, 2011; Simsek & Noyan, 2012). As a result, such calculations

were not viable given the sensitivity of fit indices such as the RMSEA index to the failure to meet these requisites Morata-Ramírez *et al.* (2015).

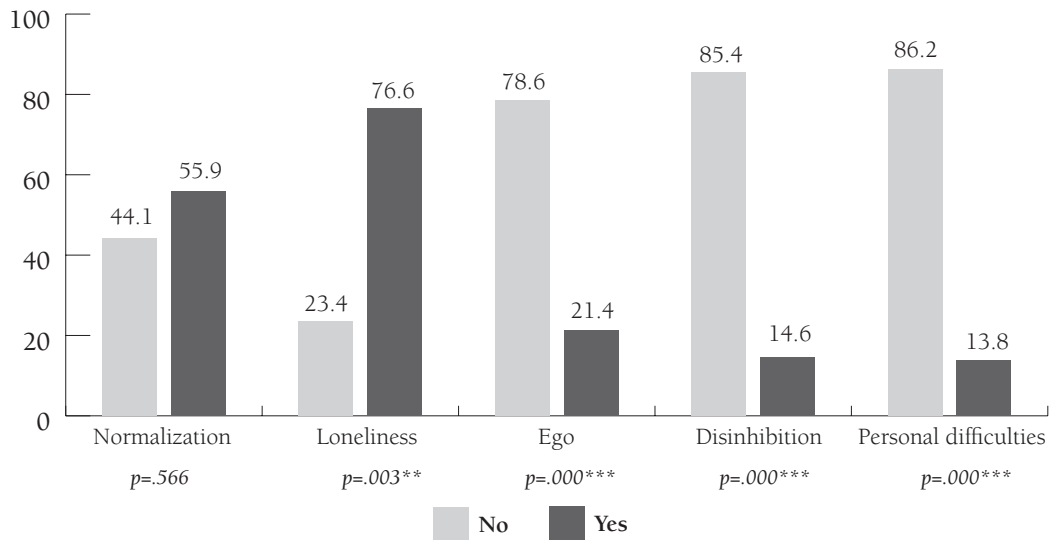
Data analysis

In order to meet the stated research objectives, we used the data analysis programs SPSS v.26 (IBM, 2020) and Jamovi v.1.2 (The jamovi project, 2020). Diverse statistical techniques were applied which were descriptive, inferential and multivariate in nature. All outcomes were provided stratified according to gender in order to control for imbalances in sample distribution. With regards to descriptive techniques, frequencies and percentages are presented in relation to the response categories of considered variables. Further, binomial tests were employed for inferential statistics and to compare proportions between groups. Finally, for the multivariate analysis we developed various logistic regression models using forward stepwise (Wald) variable entry. These models contemplated five aspects of risk (normalisation, loneliness, ego, disinhibition and personal difficulties) which acted as potential predictors of all of the considered risk factors (symptoms of addiction, social use, geek behaviour, nomophobia and total scale of risk of social network and internet addiction).

Results

Firstly, we show percentages pertaining to each risk predictor stratified according to gender, as well as comparisons between no vs yes levels within each risk predictor.

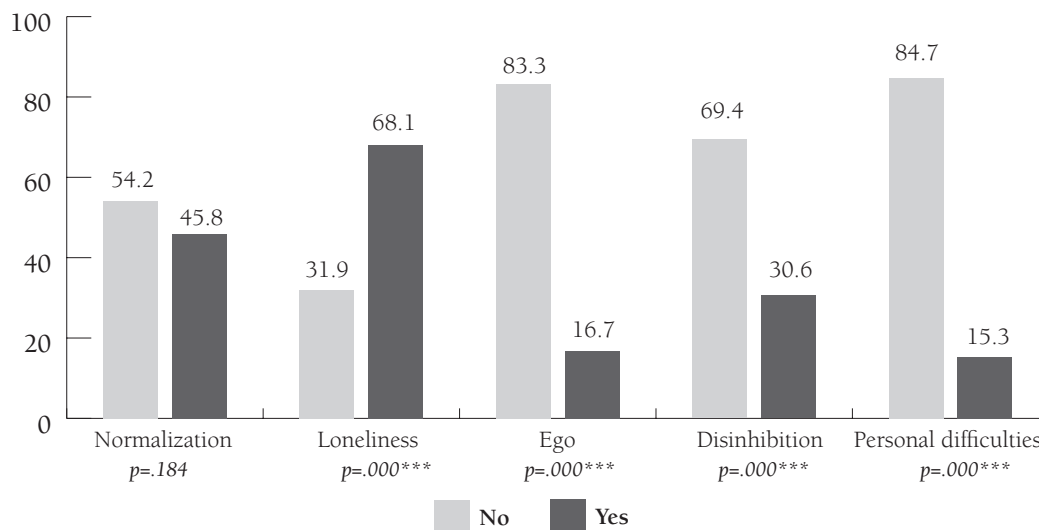
FIGURE 1. Percentages corresponding to each of the risk predictors according to female sex and comparison of the yes or no response



Note: H_1 is percent $\neq 0.5$ (binomial test used).

* $p < .05$ ** $p < .01$ *** $p < .001$

FIGURE 2. Percentages pertaining to each risk predictor according to male gender and comparison of the yes or no response



Note: H_1 is percent $\neq 0.5$ (binomial test used).

* $p < .05$ ** $p < .01$ *** $p < .001$

As can be seen, within males all predictors show an incredibly strong leaning towards 'yes', in the specific case of loneliness, and towards no in the case of all other predictors, namely, ego, disinhibition and personal difficulties. The only exception is seen for the predictor of normalisation, where the distribution of yes and no responses is more balanced, although with responses favouring the yes option by almost 9 percentage points (54.2%–45.8%=8.4%) according with the male gender. With regards to females, highly similar outcomes are produced. It serves to highlight those female students reported feeling more lonely than male students and responded 'yes' less frequently with regards to disinhibition.

In fact, in order to confirm this apparent imbalance, we implemented a test to examine whether statistically significant differences existed between the percentage of yes and no responses. This test was conducted in both males and females. The outcomes obtained do not leave any room for doubt. Within both males and females, statistically significant differences were only not produced between the response percentages attributed to yes and no for the predictor of normalisation ($p=.556$ for males and $p=.184$ for females), although highly different outcomes were found according to gender. For males, being connected for a long time to social networks or the Internet does not appear to be considered as something normal. In contrast, the proportion reporting this as normal amongst females is higher than the proportion of those stating it not to be normal.

The remaining predictors displayed statistically significant differences between the percentages of respondents in agreement and in disagreement. An identical profile is seen amongst males and females. For the predictors pertaining to ego, disinhibition and personal difficulties, proportions overwhelmingly favour the no response option. On the other hand, the yes response option was reported by a much higher proportion of respondents for the predictor pertaining to loneliness.

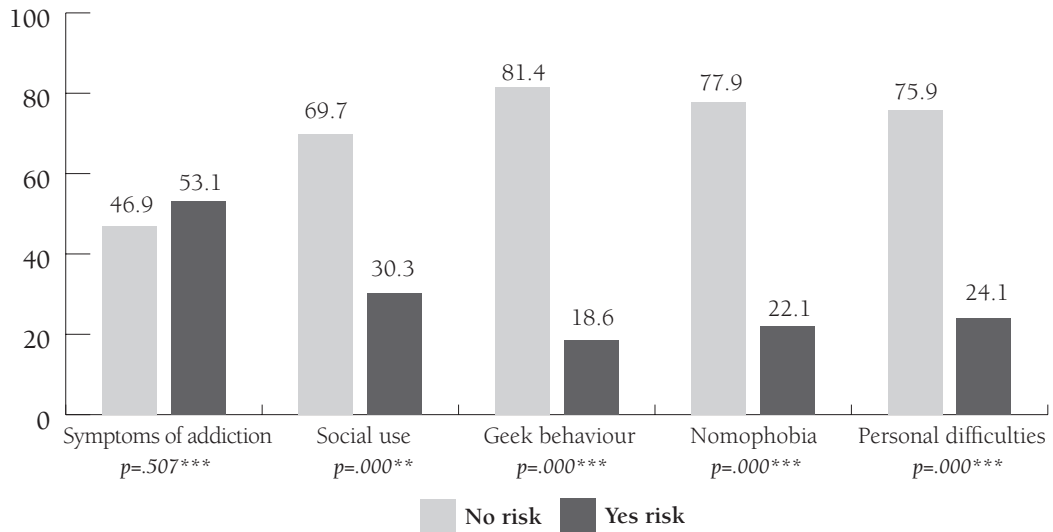
Further, in order to assign students to the 'at risk' or 'not at risk' categories of social network and internet addiction¹, we used the scale conceived by Peris *et al.* (2018, p. 34). According to this scale, a student, as a function of their gender, can suffer an increased risk of addiction to social networks and the Internet when their scores for the four dimensions and their overall ERA-RIS scale score are greater than or equal to the 3rd quartile ($\geq Q_3$). These cut-points are presented in Table 1.

TABLE 1. Cut-points for each factor and overall scale scores according to gender

Factor & Overall scale	Symptoms addiction		Social use		Geek behaviour		Nomophobia		Overall scale	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
$\geq Q_3$	20	23	22	26	11	10	15	16	67	74

Source: Peris et al., 2018, p. 34.

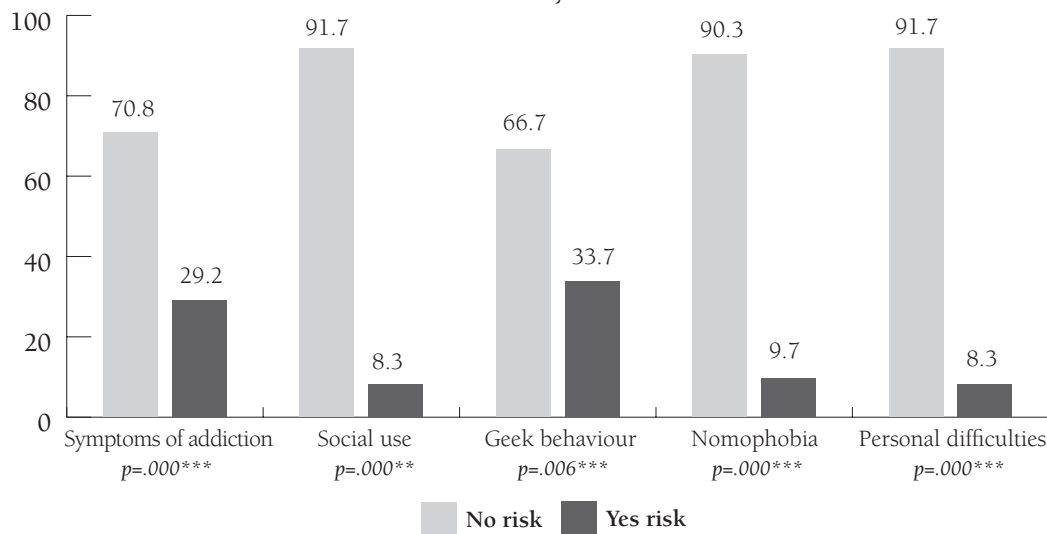
FIGURE 3. Percentages obtained for each risk type according to female gender and comparison of no risk vs yes risk



Note: H_1 is percent $\neq 0.5$ (binomial test used).

* $p < .05$ ** $p < .01$ *** $p < .001$

FIGURE 4. Percentages obtained for each risk type according to male gender and comparison of no risk vs yes risk



Note: H_1 is percent $\neq 0.5$ (binomial test used).

* $p<.05$ ** $p<.01$ *** $p<.001$

In light of the outcomes obtained, we can appreciate that, both globally and according to gender, ‘not at risk’ percentages predominate for each of the contemplated risk factors. Statistically significant differences ($p<.000$) were produced for all cases, with the only exception being the risk factor of symptoms of addiction amongst women. In this particular case, although the frequency and proportion to which risk was reported was slightly greater than no risk, statistically significant differences were not produced ($p>.05$).

Given all of the aforementioned and in response to the main research aim, we developed, as explained above, various binomial logistic regression models using forward stepwise (Wald) entry. The five contemplated aspects of risk acted as potential predictors of the considered risk factors. Before moving on to discuss the obtained outcomes, we checked assumptions of collinearity. For this, the tolerance index was calculated, alongside the variance inflation factor (VIF). Tolerance values close to .9 were obtained for all examined models, whilst VIF values were slightly above 1. If we consider suggestions made by Kleinbaum *et al.* (1988) and Belsley (1991), VIF values <10 and tolerance index values close to one can be interpreted as indicating the absence of collinearity. We can, therefore, conclude that these conditions were met for all of the estimated models.

On the other hand, it is also convenient to clarify the concept Odds ratio ($p / 1-p$) where:

p = probability of an event occurring

$1-p$ = probability of an event not occurring

From this odds ratio the probability of an event can be derived:

$$\text{pro}\{ \text{yes} \} = e^{B_0+B_1X} / 1 + e^{B_0+B_1X} \text{ or } \text{pro}\{ \text{yes} \} = 1 / 1 + e^{B_0+B_1X}.$$

where:

- B_0 and B_1 are the coefficients estimated from the data.
- “X” would be the independent variable
- “e” is the natural logarithm base (2.718).

In our case, as we have several independent variables, the model would be as follows:

$$\text{pro}\{ \text{yes} \} = 1 / 1 + e^{-z}$$

where: Z is the linear combination:

$$Z = B_0 + B_1X_1 + B_2X_2 + B_nX_n$$

And where:

B_0 is the constant or intercept and expresses the value of the probability of Z when the independent variables are zero.

B_1, B_2, B_n are slope coefficients and report how much the probability of occurrence of Z varies with a unit change of the corresponding independent variable, keeping the other explanatory variables constant X_1 and X_2 values that the independent variables can adopt e represents the disturbance term or the estimation error. Here is the explanatory table with the provided information (Table 2):

TABLE 2. Explanatory of concept Odds ratio

Concept	Formula	Description
Odds ratio	$p / (1-p)$	p = probability of an event occurring $1-p$ = probability of an event not occurring
Probability of an event (single independent variable)	$\text{pro}\{ \text{yes} \} = e^{(B_0+B_1X)} / (1 + e^{(B_0+B_1X)})$ or $\text{pro}\{ \text{yes} \} = 1 / (1 + e^{(B_0+B_1X)})$	B_0 and B_1 are the coefficients estimated from the data “X” is the independent variable “e” is the natural logarithm base (2.718)
Probability of an event (multiple independent variables)	$\text{pro}\{ \text{yes} \} = 1 / (1 + e^{-z})$	Z is the linear combination: $Z = B_0 + B_1X_1 + B_2X_2 + \dots + B_nX_n$ B_0 is the constant or intercept and expresses the value of the probability of Z when the independent variables are zero B_1, B_2, \dots, B_n are slope coefficients and report how much the probability of occurrence of Z varies with a unit change of the corresponding independent variable, keeping the other explanatory variables constant X_1 and X_2 are values that the independent variables can adopt ϵ represents the disturbance term or the estimation error

This table summarizes the key concepts and formulas related to odds ratios and the probability of an event occurring in the context of logistic regression with single and multiple independent variables.

Since we considered differentiated scales for males and females with regards to the obtained outcomes, different elaborated models are presented which break down outcomes according to gender (Table 3).

TABLE 3. Binomial logistic regression models for males

MODEL 1: Symptoms addiction		B	S.E.	Wald	df	Sig.	SSHLT	PPPC
Predictors	Normalisation	1.34	.60	5.03	1	.025*	.0507	76.4%
	Loneliness	2.56	1.07	5.65	1	.017*		
	Constant	-3.69	1.09	11.41	1	.000**		
MODEL 2: Social use		B	S.E.	Wald	df	Sig.	SSHLT	PPPC
Predictors	No predictor has been statistically significant							
MODEL 3: Geek behaviour		B	S.E.	Wald	df	Sig.	SSHLT	PPPC
Predictors	No predictor has been statistically significant							
MODEL 4: Nomophobia		B	S.E.	Wald	df	Sig.	SSHLT	PPPC
Predictors	Ego	1.645	.899	3.348	1	.047*	.875	90.7%
	Personal_Difficulties	1.775	.903	3.869	1	.049*		
	Constant	-3.125	.652	22.964	1	.000***		
MODEL 5: Overall scale		B	S.E.	Wald	df	Sig.	SSHLT	PPPC
Predictors	Personal_Difficulties	1.981	.899	4.851	1	.028*	.988	91.7%
	Constant	-2.962	.592	25.023	1	.000***		

* $p < .05$ ** $p < .01$ *** $p < .001$

SSHLT → Statistical significance of Hosmer-Lemeshow test.

PPPC → Percentage of properly predicted cases

As appears to emerge from observation of the table presented immediately before discussion of the five criterion or dependent variables considered in the present study, effective predictors of risk associated with social network and internet addiction could only be inferred from three of these variables.

Firstly, with regards to model 1 pertaining to symptoms of addiction, we found an intercept, or constant, of $\beta_0 = -3.69$ ($p < .001$), in addition to two predictors with slopes of $\beta_1 = 2.56$ (loneliness) and $\beta_2 = 1.34$ (normalisation). Both of these were associated with statistically significant Wald statistics ($p = .017$ and $p = .025$, respectively) and, for this reason, they were included in the model as effective predictors. Secondly, with regards to models 2 and 3 pertaining to social use and geek behaviour, not a single effective predictor was found. Statistically significant predictors were again produced in model 4 pertaining to the risk factor relating to nomophobia, with this model

obtaining an intercept of $\beta_0 = -3.12$ ($p < .001$) and two predictors with slopes of $\beta_1 = 1.77$ (personal difficulties) and $\beta_2 = 1.64$ (ego). In both of these cases, statistically significant Wald statistics ($p = .049$ and $p = .047$, respectively) were also seen to emerge. Finally, in model 5 pertaining to the overall scale, an intercept of $\beta_0 = -2.96$ ($p < .001$) and a single predictor with a slope of $\beta_1 = 1.98$ (personal difficulties) were observed. This slope was associated with a statistically significant Wald statistic ($p = .028$). In all cases, it can be seen that the estimated coefficients relating to the slopes were positive. This means that the logistic function established between the predictor and its criterion reveals a direct relationship in that, when students report the response option 0 (no), they also have a greater chance of obtaining a value of 0 (no risk of the criterion factor) for the predictor and vice versa.

With regards to model fit of the resultant models, we conducted the Hosmer-Lemeshow test. Statistical significance ($p > .05$) was obtained for three of the inferred models of effective predictors. This indicates good fit given that there are no statistically significant differences between the predicted models and the actual data. Finally, with regards to the predictive strength of these three models, we can see that the percentage of correctly predicted cases was 76.4% in model 1, 90.7% in model 4 and 91.7% in model 5. This gives an average 86.26% correct prediction rate.

Finally, in order to give an overall view of obtained outcomes in relation to the examined predictors, we present the following summary Table 4.

TABLE 4. Summary table of predictors and criteria variables (factors)

Gender	Factors	Predictors					Number of predictors
		Normalisation	Loneliness	Ego	Disinhibition	Personal difficulties	
Male	Symptoms of addiction	Yes predictor	Yes predictor				2
	Social use						0
	Geek behaviour						0
	Nomophobia			Yes predictor		Yes predictor	2
	Overall scale					Yes predictor	1
Female	Symptoms of addiction	Yes predictor		Yes predictor			2
	Social use	Yes predictor	Yes predictor	Yes predictor		Yes predictor	4
	Geek behaviour					Yes predictor	1
	Nomophobia	Yes predictor				Yes predictor	2
	Overall scale	Yes predictor		Yes predictor			2
Number of times the predictor appears in various equations for males		1	1	1	0	2	16
Number of times the predictor appears in various equations for females		4	1	3	0	3	

In consideration of the table presented above, two types of analysis can be approached. Vertical analysis (for predictors) is one type of analysis, whilst horizontal analysis (for criterion variables) is another. Vertical analysis (of predictors such as normalisation) pertains to one model for males and four models for females. Further, personal difficulties (member of 2 models for males and 3 for females) and ego (forming part of 1 model for males and 3 models for females) emerged as the most important predictors of the risk of social network and internet addiction in the sample of first-year university students under study. Far lower importance was attributed to the predictor of loneliness (member of 1 model for males and 1 model for females). Further mention should also be given to the outcomes obtained for the predictor describing disinhibition given that its contribution to predicting the risk of addiction to social networks and the Internet was totally null.

With regards to factors or dimensions of the scale as a whole (horizontal analysis), we can observe that, in the case of males, both symptoms of addiction and nomophobia can be predicted from indices of normalisation and loneliness. This was clearly revealed through binary logistic regression outcomes. Further, overall risk can be predicted from only one predictor, this being that of personal difficulties.

With regards to females, a greater number of predictors emerged. In this way, we can see that two predictors (normalisation and ego) were produced in relation to the factor describing symptoms of addiction and the overall scale which can help inform predictions of lower or higher incidence. For nomophobia, the predictors of normalisation and personal difficulties emerged, whilst, only personal difficulties emerged as a predictor of geek behaviours. Nonetheless, the factor to reveal the most complexity is undoubtedly that of social use. Higher and lower levels of incidence of this factor is predicted by 4 predictors, namely, normalisation, loneliness, ego and personal difficulties.

Discussion and conclusions

A series of conclusions can be reached given the results presented here. Firstly, with regards to the merely descriptive and inferential outcomes, we can differentiate between predictors and the factors which serve to predict these aforementioned predictors.

With regards to incidence of the 5 predictors when considered according to gender, we observe that this incidence was generally similar across predictors. In this way, we can see that, for both males and females, the predominant category for the predictor describing normalisation was not considering constant social network and internet use as normal. Nevertheless, the 'yes' category garnered enough responses for statistically significant differences to not be produced. With regards to the predictor describing loneliness, both males and females stated feeling lonely enough to have to focus their interests on social networks and the Internet in such a way that the 'yes' category was opted for significantly more than the 'no' category.

Finally, for the predictors describing ego, disinhibition and personal difficulties, the 'no' category predominated significantly relative to the 'yes' category. Thus, we can conclude that both males and females mostly state that they do not feel the need for recognition from others when they use social networks and the Internet as a substitute for more tangible recognition. Further, they

appear to be aware of the limits and dangers involved in social network and internet use, whilst also not suffering from personal difficulties related with a lack of empathy, personal communication issues or social skills, making them focus themselves on social networks and the Internet.

With regards to incidence of the 5 factors considered as criterion variables, we can conclude that, for both males and females, risk of addiction to social networks and the Internet does not appear to be particularly high. In this sense, the likelihood of not being at risk ('no') was greater than the likelihood of being at risk ('yes'), with statistically significant differences emerging in all cases. The only exception to this is seen for symptoms of addiction within females, although the 'not at risk' category still had more responses.

Nonetheless, as previously explained and in order to definitively establish another essential aspect of the present study, we strove to identify the predictors that were most accurately able to predict the risk of first-year university students suffering social network and internet addiction. In relation to this proposal, we can observe that the predictors that most help in predicting the risk of suffering an addiction to social networks and the Internet are the consideration of this type of addiction as something normal, suffering personal difficulties and having a high consideration of oneself (ego). Loneliness emerged to a lesser extent within the studied sample. However, other research studies did find loneliness to be an important component when considering social network and internet addiction (Moser, 2000), whilst also acting as a determinant of the way in which individuals interact with the digital world (Nowland *et al.*, 2018). Disinhibition or the tendency to minimise the dangers of social network and internet use had a null influence. With regards to considering internet and social network addiction as something normal, it feels like a risky practice and one that is at odds to that which is commonly established as safe, responsible and controlled use of new technology. This social conception of the normalisation of internet and social network addiction could truly be related with what the literature upholds as future normalisation of addiction to specific substances (Keane, 2020). Along the same lines, it has been more than demonstrated by a number of studies that this belief is not correct given that such addiction can translate to psychological issues (depression, anxiety, dependence, etc.), school failure, and family, personal and occupational issues (Akin & Iskender, 2011; Lozano *et al.*, 2020). Such evidence serves to highlight the importance of the dangers of excessive social network or internet use as, in young people, such issues can lead to the breaking of affective ties and, as a result, social problems (Hernández Contreras *et al.*, 2019).

Finally, a relationship was established between some of the warning signs proposed by Young (1998) and Griffiths (2000). In this way, addiction to the Internet, social networks or new technological devices could be revealed by some of the predictor variables proposed in the present study. These include: denying oneself sleep time in order to stay online; losing the notion of time when connected (disinhibition); complaints and family conflict due to excessive internet use; uncontrolled excitement and euphoria when using the Internet, social networks or technological devices; lying about the time one is connected to the Internet or using social networks, and; social isolation (loneliness).

After discussing the findings of this study and trying to establish a general conclusion with implications for education, we can focus on the most important predictors such as normalisation, personal difficulties and ego. Although we could also include loneliness in view of the results of other studies that address the issue of addiction to social networks and which have been

mentioned earlier in this section. Moreover, in light of the latest news and information about the great escalation in the use of artificial intelligence with specific applications such as ChatGPT, this may pose a new challenge for research and the specific impact this may have on the academic world. The results of this research can provide us with information about certain behaviours, attitudes and expressions that our university students may engage in and alert us to potential symptoms of excessive use and/or addiction to social networks. In order to prevent certain addictions before they become a real problem, interventions and programmes can be designed based on the results of this and other similar studies to address the dangers of addiction to social networks and the Internet from a multitude of mobile and digital devices. Awareness of this from the early years of university in an increasingly technological environment can be of great benefit to the optimal social, psychological and academic development of university students.

Study limitations and future perspectives

The present study has some limitations which are mainly methodological in nature. In this regard, the first limitation is that the study was carried out within a single university context (a single faculty). Another limitation was the inclusion of more females than males, although this limitation was minimised by developing separate analyses according to gender with the aim of ensuring invariance in the groups. Another notable limitation is the absence of a larger sample that represents in a more balanced way the rest of the courses, grades and degrees of the higher education institution under study.

With regards to future perspectives of the present work, we should highlight the contribution of identifying the aspects that may influence addiction to a greater or lesser extent, alongside the urge to impact these factors through training, education, psychology, etc. (Sanz Benito *et al.*, 2023). It is recommended that such actions take place at the earliest age possible given that the youngest of our society have early access to the digital world. Given this, research such as that conducted by Prats *et al.* (2018) is hugely important. This research presents educational workshops as a form of pedagogical guidance for adolescents. These workshops address good social network and internet use, and could undoubtedly be of great use when it comes to raising awareness amongst young people about engaging in a more ethical, critical and responsible use of technology. Further, the huge opportunities offered by new virtual settings, accessed through different digital devices, cannot be ignored with regards to the generation of knowledge and awareness (Salmerón *et al.*, 2010). They are also of great pedagogical value and opportunities to take advantage of technological resources and social networks should not be missed in order to be able to work from different ambits of higher education (Fernández-Ferrer & Cano, 2016; Lu *et al.*, 2021; Peña Hita *et al.*, 2018).

In conclusion, perhaps the most practical and useful aspect of the present work, in consideration of its nature and the viability of translating it into educational practice, is that it provides the opportunity to work with young people and impact upon predictive variables of internet and social network addiction. The work is timely as it permits these variables to be influenced before they become an issue demanding a more complex solution. In other words, working with such variables could prevent specific addictions. In the present case, the most important predictors to be identified in the prediction of risk of internet and social network addiction were normalisation,

personal difficulties and ego. But we should not forget that future consideration of new work should also include factors related to the personality and lifestyles of the users surveyed.

Compliance with Ethical Standard

In this research and its corresponding work, the ethical guidelines that cover all studies of this nature have been taken into account. The corresponding ethical authorization, issued by the University of Granada, has been obtained.

Competing interest

The authors declare that they have no competing interests.

Ethical Treatment of Research

The development of this research follows the ethical criteria endorsed by the *Code Of Good Practice in Research* of the University of Granada (<https://www.ugr.es/node/13648>). In this regard, the University of Granada firmly adheres to UNESCO's Declaration on Science (http://www.unesco.org/science/wcs/eng/declaration_e.htm) and the Use of Scientific Knowledge, and the Singapore Statement on Research Integrity (<https://wcrif.org/guidance/singapore-statement>). Therefore, all procedures performed in studies involving human participants were in accordance with the ethical standards of honesty, rigour, conflicts of interest and research misconduct and unacceptable practices. All the participants of this research have completed an Informed Consent Form.

Notes

1. From now on referred to as SNI.

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Resumen

Predictores del riesgo de adicción a las redes sociales e Internet

INTRODUCCIÓN. Este estudio se ha basado en el objetivo general de identificar los factores que predicen el riesgo de convertirse en adicto a Internet o a las redes sociales. **MÉTODO.** Para la investigación se ha utilizado un diseño descriptivo, utilizando la media, asimetría y curtosis, con una regresión binomial logística. Para la investigación se utilizó una muestra de 217 estudiantes universitarios, todos ellos de primer curso de la Facultad de Ciencias de la Educación de la Universidad de Granada. En este estudio se consideraron las variables demográficas de edad y género dentro de los estudiantes investigados, se observa que los estudiantes tenían una edad media de 19.37 años y una mediana de 18 años. En el cual, podemos destacar que el género mayoritario de la muestra es el femenino con un (66.8%) y el 33.2% restante es masculino. Por otro lado, para la recogida de datos se utilizó la escala de riesgo de adicción a las redes sociales e internet para adolescentes (ERA-RSI). **RESULTADOS.** Los

factores que predicen con mayor precisión el riesgo de adicción a las redes sociales y a Internet en los estudiantes universitarios de primer año son la normalización, las dificultades personales y el ego. La soledad resultó ser predictiva, pero en menor grado, y, por último, la desinhibición resultó no tener influencia predictiva. **DISCUSIÓN.** Se ha comprobado que las aplicaciones telefónicas que se lanzan constantemente en Internet tienen una gran influencia en los predictores de la adicción.

Palabras clave: *Predictores de riesgo, Adicción, Internet, Redes sociales, Estudiantes universitarios.*

Résumé

Prédicteurs du risque d'addiction aux réseaux sociaux et à Internet

INTRODUCTION. Cette étude a pour objectif général d'identifier les facteurs prédictifs du risque de dépendance à Internet ou aux réseaux sociaux. **MÉTHODE.** Un modèle descriptif a été utilisé pour la recherche en utilisant la moyenne, l'asymétrie et l'aplatissement, avec une régression logistique binomiale. Un échantillon de 217 étudiants universitaires, tous en première année de Sciences de l'Éducation à l'Université de Grenade, a été utilisé pour la recherche. Dans cette étude, les variables démographiques de l'âge et du sexe ont été prises en compte chez les étudiants étudiés. Il a été observé que les étudiants avaient un âge moyen de 19,37 ans avec une médiane de 18 ans. En outre, nous pouvons souligner que la majorité de l'échantillon est composée d'un 66,8 % de femmes et que les 33,2% restants sont des hommes. Pour la collecte des données, l'échelle ERA-RSI (Adolescent Risk of Addiction to Social Networks and the Internet) a été utilisée. **RÉSULTATS.** Les facteurs qui prédisent le risque d'addiction aux réseaux sociaux et à Internet chez les étudiants universitaires de première année sont la normalisation, les difficultés personnelles et l'ego. La solitude s'est avérée prédictive, mais à un degré moins important et, enfin, la désinhibition n'a pas eu d'influence prédictive. **DISCUSSION.** Il a été constaté que les applications téléphoniques constamment lancées sur internet ont une forte influence sur les prédicteurs de la dépendance.

Mots-clés : *Prédicteurs de risque, Dépendance, Internet, Réseaux sociaux, Étudiants universitaires.*

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