Emotional intelligence and adult attachment: Effects on problematic smartphone usage

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Título: Inteligencia emocional y apego adulto: efectos del uso problemático del smartphone.
Resumen: El uso del smartphone puede tornarse problemático cuando se presentan dificultades de regulación emocional. En la investigación se plantearon tres objetivos: analizar el efecto de las dimensiones de inteligencia emocional y el apego sobre el uso del smartphone; evaluar las diferencias en el uso problemático del móvil atendiendo a tipos y estilos de apego; explorar el efecto del sexo y la edad. Se utilizaron la Escala de Dependencia y Adicción al Smartphone, la Escala de Inteligencia Emocional de Wong & Law y el Cuestionario de Apego adulto. El estudio incluyó a 552 jóvenes ($M = 21.79$, $SD = 2.66$; 74.1% mujeres) seleccionados por muestreo intencional y clasificados en Generación Z y Millennials. Una baja conciencia de las propias emociones (inteligencia emocional), una pobre autoestima y necesidad de aprobación, la resolución hostil de conflictos, rencor y posesividad (apego) predecían el uso problemático. Además, el tipo inseguro de apego y los estilos negativos como el temeroso se relacionan más con este uso problemático. El sexo aportaba cierta capacidad explicativa, siendo las mujeres las que mostraron más problemas. Los hallazgos apoyan la relevancia de construir un apego seguro y positivo y de ser capaces de evaluar las propias emociones para prevenir los usos problemáticos del smartphone.
Palabras clave: Uso problemático. Internet. Smartphone. Inteligencia emocional. Apego. Jóvenes adultos.

Abstract: Smartphone usage can become problematic when individuals have difficulties in emotional regulation. To clarify risk factors for problematic smartphone usage, the study had three objectives: To analyze the effect of emotional intelligence and attachment dimensions on smartphone usage; to evaluate differences by types and styles of attachment in problematic smartphone usage; to explore the roles of sex and age. For this purpose, the Smartphone Dependency and Addiction Scale, the Wong & Law Emotional Intelligence Scale, and the Adult Attachment Questionnaire were used. The study included 552 young adults ($M = 21.79$, $SD = 2.66$; 74.1% women) selected by purposive sampling, and classified in Generation Z and Millennials. The results showed that low awareness of one's emotions (emotional intelligence), poor self-esteem and need for approval, hostile conflict resolution, rancor, and possessiveness (attachment) predicted problematic smartphone usage. Furthermore, insecure type of attachment and negative styles such as fearfulness were closely related to smartphone addiction. Sex had some explanatory power with respect to device use, with women showing higher levels of problematic smartphone usage. In conclusion, the findings support the importance of the secure and positive attachment system, and being able to evaluate and regulate one's own emotions for preventing problematic smartphone use.
Keywords: Problematic usage. Internet. Smartphone. Emotional intelligence. Attachment. Young adults.

Introduction

The smartphone is highly popular because it provides immediate and easy access to vast amounts of information, and is versatile, accessible and readily available. It has become a highly useful tool for education and work, and is virtually indispensable for interpersonal interactions (Ditrendia, 2020). Smartphone usage generates pleasant states, which provide reinforcement rewards. However, its use can also be controlled by negative reinforces, potentially leading to problematic usage patterns (Chen at al., 2019). In fact, internet and other digital problematic usage are often the result of habitual behaviours used to relieve pain or loneliness, or to escape from reality (Van Deursen et al., 2015). Taken together, the data indicate associations of social skills and emotional regulation with the risk of developing dysfunctional smartphone use behaviours.

Given the relevance of the smartphone use in our daily life, in the last years there has been a notable increase in research on this subject (Billieux et al., 2015; García-Domingo et al., 2020; Shon et al., 2019). Although there is some debate in the literature about the consideration of the problematic smartphone usage as an addiction disorder, in this research the term "problematic usage" is used given that it has not

been recognized in the DSM-V (for more detail see Panova & Carbonell, 2018). For this reason, most investigations focus on describing behaviours and diagnostic criteria, whereas the factors underlying problematic smartphone usage, beyond self-esteem and introversion-extraversion, are largely unknown (Eichenberg et al., 2019; Haverlag, 2013). To clarify high risk factors for problematic smartphone usage, an in-depth investigation was performed in order to analyse the role of two relevant self-regulation mechanisms that have a major impact on how a person interacts with his/her environment: emotional intelligence and attachment system.

Emotional intelligence and problematic smartphone usage

Several investigations have linked emotional intelligence, understood as the ability to monitor and discriminate one's own and others' emotions, and subsequently use this information to guide one's thinking and actions (Salovey & Mayer, 1990), with behavioral addictions (e.g. Kun & Demetrovics, 2010; Parker et al., 2008). However, few researchers have directly linked this variable to internet addiction or problematic smartphone usage, and existing correlational studies show heterogeneous results. On the one hand, some studies show that, as seen in other addictions, people with lower levels of emotional intelligence have lower levels of physical and mental well-being, such that they are more at risk of developing internet (Beranuy et al., 2009; Parker et al., 2008), and smartphone problematic usage (Beranuy et al.,

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2009; Jeong et al., 2016) due to reinforcing effects of the behavior. In contrast, high levels of emotional intelligence provide moderate protection against addictive or problematic usage behaviors (García del Castillo et al., 2013). On the other hand, other studies did not report significant relationships between emotional intelligence and the dysfunctional use of the device (Kaiser, 2018). In some cases, regardless of the presence of problematic smartphone usage, participants showed high emotional intelligence levels (e.g. Flores et al., 2015; Van Deursen et al., 2015).

Some aspects of emotional intelligence have been also explored in relation to addictions or problematic usage. For example, the implications of emotional regulation in substance addictions have been widely explored (Gónzalez-Yubero et al., 2020). Regarding internet addiction or problematic smartphone usage, Hormes et al. (2015) found that low levels of emotional regulation were related to a greater tendency to develop cravings, mainly for the website Facebook. In addition, people with low emotional regulation capacity may resort to using a smartphone to self-regulate their emotions, by escaping unpleasant emotional states or generating pleasurable states (Fernández-Berrocal & Extremera, 2007).

In summary, emotional intelligence appears key to understand and prevent problematic digital usage (e.g. Beranuy et al., 2009; Jeong et al., 2016; Mascia et al., 2020). However, this topic is still in its infancy, especially with regard to the role of the various dimensions of emotional intelligence in problematic smartphone usage. Furthermore, a considerable number of the studies performed on this phenomenon involved participants from Asian countries (see the review by Olson et al., 2020) therefore, studies including other populations would increase the generalizability of the results. The current scarcity of results does not allow definitive conclusions to be drawn regarding the association between emotional intelligence and problematic smartphone usage.

Adult attachment and problematic smartphone usage

Attachment system is the result of the relation between the infant and the primary caregiver, which continues to affect relationships even in adulthood (Eichenberg et al., 2017). According to Bowlby (1969), attachment can be thought of as a measure of how secure or insecure a person feels in their relationships. When a person has not generated a secure attachment, his/her ability to form healthy interpersonal relationships is negatively affected. Thus, emotional stability and intimacy become difficult, leading to psychosocial problems (Bernheim et al., 2018). The effects of attachment style on problematic internet and smartphone usage have not been studied extensively. Nevertheless, associations of insecure attachment with conflicts in close relationships, social anxiety and Internet addiction have been demonstrated (e.g. Eichenberg et al., 2017; Zhang et al., 2020). The explanation for these relations is that the affected individual

uses his/her smartphone in order to satisfy the need for attachment and compensate for real-world attachment problems; thus, an attachment is formed with the device (Kim et al., 2017).

Other authors distinguish among four attachment styles: secure, preoccupied, fearful and dismissing (e.g. Bartholomew & Horowitz, 1991; Melero & Cantero, 2008). These styles provide information about the individual's views of the self and others; when the image is negative, anxiety/dependence (self) or avoidance (others) may occur. Combinations of the various facets associated with the above-mentioned styles can result in positive or negative attachments (Bartholomew & Horowitz, 1991). The secure attachment style is the most positive one (positive model of the self and others), while the fearful attachment style is considered the most negative one (negative model of the self and others). As posited by several studies, the secure style protects against the development of problematic technology usage, for which the fearful style is a risk factor (Balta et al., 2019).

However, there have been few studies on the dismissing and preoccupied attachment styles; moreover, given the heterogeneity of the results, the various hypotheses require further exploration. Existing research on these two attachment styles focuses on anxiety (experienced by preoccupied individuals) or avoidance (characteristic of dismissing individuals) (for details, see the review by D'Arienzo et al., 2019). Some authors consider avoidance to be key; for them, the negative model of others worsens real-life relationships and, when combined with maladaptive emotional regulation strategies, can lead to problematic technology usage (Balta et al., 2019; Kim & Koh, 2018). However, several researchers consider anxiety/dependence to be the best predictor of problematic digital behaviour, such as overuse of social networks (e.g. Facebook) and discomfort arising from others' perceptions (Kim et al., 2016; Yeo et al., 2014).

The previous studies point to the key role of attachment in the risk of developing problematic internet and smartphone usage. However, the data are still insufficient, especially in terms of the specific dimensions of attachment. Moreover, a large proportion of the studies analyzed attachment in childhood and adolescence; there has been less research on adult attachment.

Sex and age differences in problematic smartphone usage from the perspective of emotional intelligence and attachment

In terms of prevalence, some studies found higher rates of smartphone dependence in females than males (De-Sola et al., 2016; Fischer-Grote, 2019); while others reported no sex differences (C. Chen et al., 2017). What does seem to be a consensus is that men and women use smartphones in different ways (van Deursen et al., 2015). Male participants are more likely to play games (De-Sola et al., 2016), watch mobile phone videos, and listen to music, whereas female par-

ticipants are more inclined to use social and communication applications (C. Chen et al., 2017). The underlying mechanisms for this could involve self-regulation processes, i.e. emotional intelligence and attachment. Women are more likely to display greater emotional awareness of the self and others (Fernández-Berrocal & Extremera, 2007), and social orientation to offline and online environments (Lee et al., 2014). However, women are more affected by negative interpersonal events and are more likely to show anxious/dependent attachment styles (Van Ijzendoorn & Bakermans-Kranenburg, 2010). Thus, social interactions through a smartphone can lead to unhealthy emotional states, including dependency on the device. Men are less prone to problematic smartphone usage (Balta et al., 2019) despite generally showing less emotional intelligence, a more hostile conflict resolution style, and a higher rate of avoidant attachment (Van Ijzendoorn & Bakermans-Kranenburg, 2010).

Age also determines the type of smartphone usage: younger people are the heaviest users of technologies and show more problematic usage patterns (Van Deursen et al., 2015). Adults are better able to regulate their emotions and show higher levels of emotional intelligence than adolescents (Mayer et al., 1999). Furthermore, social stress is particularly high among young people, and they tend to experience conflicts and difficulties in social relationships (Clarke, 2006). The above could partially explain the higher rate of problematic smartphone usage seen in adolescents. However, as technology use becomes more widespread among adults, and where age differences in usage patterns could become less apparent after adulthood begins, the findings should be updated.

Purpose and hypothesis

Emotional intelligence and attachment system play a role in the risk of developing substance and behavioral addictions (Bernheim et al., 2018; Gónzalez-Yubero et al., 2020), and studies have started to show their importance in emerging problematic technological usage (e.g. Eichenberg et al., 2017). Given the relevance of this topic, the present study first aimed to analyze the associations of various dimensions of emotional intelligence and attachment with problematic smartphone usage among young adults. According to previous studies reporting relationships of emotional intelligence and attachment with addiction, both factors are expected to have an effect on problematic smartphone usage. Second, the differential effects of secure and insecure attachment types, and of the various attachment styles (secure, preoccupied, fearful and dismissing), on problematic smartphone usage were explored. It was expected that individuals with more insecure and negative attachment styles (negative view of the self and others) would show higher levels of problematic smartphones usage (Balta et al., 2019; Zhang et al., 2018). Third, the associations of sex and age with the various measures were explored. Some previous findings point out

that women and younger adults were expected to show the highest levels of problematic smartphone usage (van Deursen et al., 2015).

Method

Participants

A total of 552 young adults aged 18-35 (*M* = 21.79, *SD* = 2.66) participated in this study (74.1% women, 25.9% men). Participants were classified according to their age in Generation Z (*n* = 308, aged 18–21 years) or Millennials (*n* = 244, aged 22–35 years). The majority of the participants were students (97.8%). Regarding the highest level of education attained, 0,2% of the sample had obtained the Elementary Level, 66.5% the General Certificate of Education, 21.4% the Certificate of Higher Education, 5.1% a University Degree, 4.2% a vocational education and training certificate, 1.4% the General Certificate of Secondary Education, and 1.3% a master's degree.

Furthermore, participants provided detailed information about the number and types of smartphone applications used. Most of the participants used only one communication app (77.2%), with WhatsApp the most frequently used (99.6%). Regarding social networks, more than half of the participants used two or three social networks (70%), of which the most popular were Instagram (89.9%), Facebook (72.8%) and Twitter (50.4%). Finally, about half of the sample did not play games on a smartphone (53.6%), while 35.4% played one or two games, such as 'Parchís' (12.9%), Candy Crush (6.3%) or Trivial (4%).

Instruments

Smartphone Dependency and Addiction Scale (Escala de Dependencia y Adicción al Smartphone [EDAS], Aranda et al., 2017). This scale is composed of 40 items, each rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree). Items are grouped into three subscales: 1. Use, abuse and addiction to smartphones and their applications; 2. Personality traits; and 3. Expenditure on smartphone applications and games. Only the first subscale, Use, Abuse and Addiction, was employed in this study because it best represents our research interest. It comprises 30 items that assess the degree of dependence on smartphones and their messaging applications and social networks. Time spent using smartphones, anxiety when not using them and interference with activities of daily life are also evaluated. After reverse-scoring the negatively worded items, higher scores indicate more problematic use of the smartphone. Cronbach's alpha was .91.

Wong and Law Emotional Intelligence Scale (WLEIS, Wong & Law, 2002; Spanish version of the scale of Extremera-Pacheco et al., 2019). This instrument is composed of 16 items rated on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree) and includes four dimensions: 1. Evaluation of own emotions (α = .80); 2. Evaluation of the emo-

tions of others (α = .80); 3. Use of own emotions (α = .78); and 4. Regulation of emotions (α = .82). Cronbach's alpha for the total questionnaire was .89. Higher scores correspond to higher levels of emotional intelligence.

Adult Attachment Questionnaire (Cuestionario de Apego Adulto [CAA], Melero & Cantero, 2008). This instrument comprises 40 items rated on a 6-point Likert scale (1 = strongly disagree; 6 = strongly agree). Attachment is measured in four domains: 1. Low self-esteem: the need for approval, negative self-concept, relationship concerns, dependency, fear of rejection, and problems with behavioural and emotional inhibition (α = .86); 2. Hostile conflict resolution: anger toward others, resentment, quick to anger, possessiveness, and jealousy (α = .76); 3. Expression of feelings and comfort with relationships: sociability, ability to express emotions and confidence in others with respect to expressing and solving interpersonal problems (α = .70); and 4. Emotional self-sufficiency and discomfort with intimacy: contempt for intimate relationships, difficulty to commit and overvaluation of personal independence (α = .65). Cronbach's alpha was .80 for the total questionnaire. Regarding the interpretation of the scale, after reverse-scoring the negatively worded items, higher scores indicate less secure attachment.

Sociodemographic variables. Information about sex, age, and level of education and the number and type of instant messaging applications, social networks and mobile games used, were gathered.

Procedure

Regarding ethical considerations, the project research was previously approved by the Ethics Committee for Research with Humans at the University of Jaén. Participants were provided with the informed consent form for research involving humans, in compliance with the ethical standards. Prior to the data collection, they were informed regarding the basic aims and requirements of the study, and regarding their rights (e.g. voluntariness and anonymity). During this initial stage, self-report paper-and-pencil-questionnaires were distributed to the participants. Measures were presented in a counterbalanced sequence using D'Amato algorithm, to avoid order effects.

Data analysis

The data were analysed using SPSS Statistics for Windows (24.0; IBM Corp.). To enhance the statistical power, missing values were replaced using hot-deck multiple imputation. The percentage of missing data replaced was 0.8% for the EDAS (problematic smartphone use), 0.5% for the

WLEIS (emotional intelligence) and 0.4% for the CAA (adult attachment). In addition, data that were three standard deviations above or below the mean were winsorized; 1.3% of the data were winsorized for both the WLEIS and CAA and 2% for age. The data can be accessed from: https://osf.io/x8yvd/?view_only=1ab8bc56494f44e7a0baff 3bac1c5f16.

To identify the relative contributions of emotional intelligence and adult attachment dimensions to the use of and addiction to smartphones, a stepwise multiple linear regression analysis was performed. In this analysis, the subscales of the WLEIS and the CAA were entered as predictors, as well as sex and age to control the effect of both variables. The problematic smartphone usage was the dependent variable. Preliminary analyses were first conducted to ensure that the data did not violate the assumptions of normality, linearity, multicollinearity and homoscedasticity.

Additional analyses were run to examine how attachment types and styles impact on problematic smartphone usage. To classify participants by attachment type and style, the procedure of the authors of the questionnaire (Melero & Cantero, 2008) was followed. First, percentiles were calculated in order to classify the scores on the four subscales on a scale with seven levels ranging from very low to very high. Second, a k-means clustering approach was used to classify participants according to the two attachment types (secure and insecure) and four attachment styles (secure, preoccupied, dismissing and fearful).

Third, once participants had been classified as described above, two one-way ANOVAs were run with the problematic smartphone usage as the dependent variable: in the first analysis, attachment type (secure, insecure) was the independent factor, while in the second analysis, attachment style (preoccupied, dismissing, fearful, secure) was the independent factor. Significant main effects and interactions were analyzed using post-hoc pairwise comparisons with Bonferroni's correction to adjust for multiple comparisons. *P*-values < .05 were taken to indicate statistical significance.

Finally, the influence of sex and age on subscale scores was evaluated through univariate ANOVAs. The subscale scores of the instruments were the dependent variables, and sex and age group were the independent factors.

Results

Descriptive and correlational analysis

Table 1 shows the mean, standard deviation, skewness, kurtosis and Pearson correlation data. Nearly all variables showed significant relations.

Table 1
Mean, standard deviation, skewness, kurtosis and Pearson correlations for each variable.

Variable	M	SD	Skew.	Kurt.	1	2	3	4	5	6	7	8	9
1.EDAS_UAA	2.78	0.61	-0.13	-0.22	-								
2.WLEIS_EOE	4.90	1.14	-0.36	-0.20	-.23**	-							
3.WLEIS_EEO	5.44	1.00	-0.76	0.89	-.04	.44**	-						
4.WLEIS_UE	4.93	1.15	-0.36	-0.17	-.13**	.49**	.35**	-					
5.WLEIS_RE	4.35	1.24	-0.29	-0.44	-.24**	.59**	.28**	.47**	-				
6.CAA_LS	40.05	11.59	0.20	-0.30	.38**	-.37**	.00	-.36**	-.34**	-			
7.CAA_HC	31.07	8.22	0.29	0.01	.43**	-.17**	-.11*	-.07	-.26**	.40**	-		
8.CAA_EF	39.93	6.27	-0.34	-0.26	-.04	.36**	.42**	.39**	.13**	-.20**	-.10*	-	
9.CAA_SD	18.32	5.36	0.51	0.19	.15**	-.08	-.10*	-.02	.01	.23**	.27**	-.18**	-

$**p < .01$, $*p < .05$

Note. EDAS_UAA: Use, abuse, and addiction to the smartphone and its applications; WLEIS_EOE: Evaluation of own emotions; WLEIS_EEO: Evaluation of emotions of others; WLEIS_Use of emotions; WLEIS_RE: Regulation of emotions; CAA_LS: Low self-esteem, need for approval and fear of failure; CAA_HC: Hostile conflict resolution, rancour and possessiveness, CAA_EF: Expression of feelings and comfort with relationships; CAA_SD: Emotional self-sufficiency and discomfort with intimacy.

Effect of WLEIS and CAA on EDAS

Aiming to respond the first goal, the stepwise multiple linear regression analysis showed that the amount of explained variance for the problematic smartphone usage increased significantly in four proposed models (Table 2). The first model, including the hostile conflict resolution dimension of adult attachment explained the variability of the participants' problematic smartphone usage by 18%. The second model, adding low self-esteem (other dimension of adult attachment), accounted for an additional 5.2 %. The third model, adding sex, improved prediction by 1% and finally, the fourth model, including evaluation of own emotions (emotional intelligence), accounted for an additional 0.8%. Thus, this analysis showed that hostile conflict resolution, low self-esteem, sex and evaluation of own emotions have a significant effect on the problematic smartphone usage.

Table 2
Stepwise multiple regression analysis showing the factors most closely associated with problematic smartphone usage.

	Beta	t	p	Adj.R²	SE	⊿R²	F	df	p
Independent variables									
Model 1				.183	0.55	.185	124.49	1, 549	< .001
CAA_HC	.430	11.16	< .001						
Model 2				.234	0.53	.052	85.13	2, 548	< .001
CAA_HC	.330	8.09	< .001						
CAA_LS	.250	6.12	< .001						
Model 3				.243	0.53	.008	59.20	3, 547	< .001
CAA_HC	.343	8.40	< .001						
CAA_LS	.236	5.80	< .001						
Sex	.103	2.75	.006						
Model 4				.250	0.52	.010	46.85	4, 546	< .001
CAA_HC	.341	8.39	< .001						
CAA_LS	.202	4.68	< .001						
Sex	.103	2.76	.006						
WLEIS_EOE	-.097	-2.43	.015						

Note. CAA_HC: Hostile conflict resolution, rancour and possessiveness; CAA_LS: Low self-esteem, need for approval and fear of failure; WLEIS_EOE: Evaluation of own emotions; Adj.: Adjusted. Standardized beta values were considered.

Adult attachment types and styles: associations with use, abuse and addiction to smartphones and their applications

In this analysis, the effects of different attachment types and styles were explored on the problematic smartphone usage. Regarding the types of adult attachment, the two participant clusters corresponding to secure attachment and insecure attachment are described in Table 3. The analysis based on attachment styles yielded four participant clusters.

Table 3
Types and styles of adult attachment based on the clusters analysis.

	Types		Styles			
	Secure attachment	Insecure attachment	Preoccupied	Dismissing	Fearful	Secure
CAA_LS	Low	High	Low	High	High	Low
	31.43	49.24	31.86	47.39	52.72	30.65
CAA_HC	Low	Mod/High	Mod/High	Low/Mod	Very high	High
	26.56	35.86	34.81	29.95	41.45	22.67
CAA_EF	Moderate	Low/Mod	Moderate	Low/Mod	Moderate	Mod/High
	41.73	38.03	40.63	36.56	40.07	42.63
CAA_SD	Low/Mod	Moderate	Low/Mod	Moderate	Mod/High	Low/Mod
	16.76	19.97	17.40	18.52	21.81	16.50
N	285 (51.6%)	267 (48.3%)	120 (21.7%)	160 (28.9%)	107 (19.3%)	165 (29.8%)

Note. Mod: Moderate; CAA_LS: Low self-esteem, need for approval and fear of failure; CAA_HC: Hostile conflict resolution, rancor and possessiveness, CAA_EF: Expression of feelings and comfort with relationships; CAA_SD: Emotional self-sufficiency and discomfort with intimacy.

The effect of attachment type was significant, $F(1, 550) = 96.24$, $p < .001$, $\eta^2_p = .149$. Specifically, the secure attachment type was associated with a lower problematic smartphone usage ($M = 2.55$) than the insecure attachment type ($M = 3.02$).

The effect of attachment style was also significant, $F(3, 548) = 37.20$, $p < .001$, $\eta^2_p = .169$. Post-hoc Bonferroni comparisons showed differences between all styles in problematic smartphone usage ($p < .001$), except between the preoccupied and the dismissing style ($p = .394$) (Table 4). The mean scores for each attachment style were as follows: preoccupied, 2.76; dismissing, 2.88; fearful, 3.15; and secure, 2.45.

Table 4
Post-hoc comparisons between attachment styles.

(I) Attachment types	(J) Attachment types	Means difference (I-J)	SE	p	Lower 95% CI	Upper 95% CI
Preoccupied	Dismissing	-0.123	0.07	.394	-0.30	0.05
	Fearful	-0.390	0.07	< .001	-0.58	-0.20
	Secure	-0.308	0.07	< .001	0.13	0.48
Dismissing	Preoccupied	0.123	0.07	.394	-0.05	0.30
	Fearful	-0.267	0.07	.001	-0.45	-0.08
	Secure	0.431	0.06	< .001	0.27	0.59
Fearful	Preoccupied	0.390	0.07	< .001	0.20	0.58
	Dismissing	0.297	0.07	.001	0.08	0.45
	Secure	0.698	0.07	< .001	0.52	0.88
Secure	Preoccupied	-0.308	0.07	< .001	-0.48	-0.13
	Dismissing	-0.431	0.06	< .001	-0.59	-0.27
	Fearful	-0.698	0.07	< .001	-0.88	-0.52

Effects of sex and age on EDAS, WLEIS and CAA

The effects of sex and age were also explored on the problematic smartphone usage, emotional intelligence, and adult attachment by one-way ANOVA. With respect to sex, women showed higher problematic smartphone use, evaluation of the emotion of others (emotional intelligence dimension), and expression of feelings and comfort with relationships (adult attachment dimensions) than men. Furthermore, women showed lower regulation of emotions (construct of the emotional intelligence), and emotional self-sufficiency and discomfort with intimacy scores (construct of adult attachment), than men. Regarding age, Generation Z showed higher problematic smartphone use and hostile conflict resolution scores than Millennials (Table 5).

Table 5
One-way ANOVAs with sex and age group as independent factors.

	Sex			Age			Sex * Age
	Men	Women	Test	Gen. Z	Millennials	Test	Test
EDAS_UAA	2.68	2.80	$F(1, 547) = 4.17, p = .042, \eta^2_p = .008$	2.80	2.68	$F(1, 547) = 4.03, p = .045, \eta^2_p = .007$	$F(1, 547) = 0.06, p = .813, \eta^2_p < .001$
WLEIS_EOE	4.94	4.90	$F(1, 547) = 0.18, p = .673, \eta^2_p < .001$	4.83	5.01	$F(1, 547) = 2.66, p = .104, \eta^2_p = .005$	$F(1, 547) = 0.03, p = .856, \eta^2_p < .001$
WLEIS_EEO	5.02	5.59	$F(1, 547) = 37.97, p < .001, \eta^2_p = .065$	5.32	5.28	$F(1, 547) = 0.19, p = .659, \eta^2_p < .001$	$F(1, 547) = 0.07, p = .789, \eta^2_p < .001$
WLEIS_UE	4.87	4.96	$F(1, 547) = 0.66, p = .415, \eta^2_p = .001$	4.88	4.95	$F(1, 547) = 0.42, p = .515, \eta^2_p = .001$	$F(1, 547) = 0.00, p = .989, \eta^2_p < .001$
WLEIS_RE	4.59	4.28	$F(1, 547) = 6.48, p = .011, \eta^2_p = .012$	4.38	4.50	$F(1, 547) = 1.06, p = .304, \eta^2_p = .002$	$F(1, 547) = 0.70, p = .403, \eta^2_p = .001$
CAA_LS	38.61	40.51	$F(1, 547) = 2.84, p = .093, \eta^2_p = .005$	40.49	38.63	$F(1, 547) = 2.72, p = .100, \eta^2_p = .005$	$F(1, 547) = 1.20, p = .273, \eta^2_p = .002$
CAA_HC	32.17	30.55	$F(1, 547) = 4.16, p = .042, \eta^2_p = .008$	32.34	30.38	$F(1, 547) = 6.14, p = .014, \eta^2_p = .011$	$F(1, 547) = 0.04, p = .847, \eta^2_p < .001$
CAA_EF	37.68	40.77	$F(1, 547) = 26.56, p < .001, \eta^2_p = .046$	38.97	39.48	$F(1, 547) = 0.73, p = .393, \eta^2_p = .001$	$F(1, 547) = 0.03, p = .873, \eta^2_p < .001$
CAA_SD	19.79	17.77	$F(1, 547) = 15.58, p < .001, \eta^2_p = .028$	18.66	18.89	$F(1, 547) = 0.21, p = .644, \eta^2_p < .001$	$F(1, 547) = 0.12, p = .731, \eta^2_p < .001$

Note. EDAS_UAA: Use, abuse, and addiction to the smartphone and its applications; WLEIS_EOE: Evaluation of own emotions; WLEIS_EEO: Evaluation of emotions of others; WLEIS_UE: Use of emotions; WLEIS_RE: Regulation of emotions; CAA_LS: Low self-esteem, need for approval and fear of failure; CAA_HC: Hostile conflict resolution, rancour and possessiveness, CAA_EF: Expression of feelings and comfort with relationships; CAA_SD: Emotional self-sufficiency and discomfort with intimacy; Gen.: Generation.

Discussion and conclusions

To clarify the high-risk factors for problematic smartphone usage, the roles of emotional intelligence and attachment system were explored in depth. The roles of sex and age, in terms of digital generations, were also explored.

The results showed that, for young adults, smartphone use was related to emotional intelligence and attachment. Regarding emotional intelligence, were the processes on own emotions' manage and not with the evaluation of the others' emotions those relevant to understand smartphone usage. Specifically, the recognition, use and regulation of one's own emotions were related to the use and abuse of, and addiction to, smartphones and their apps: with increased emotional intelligence in the aforementioned dimensions, abusive use of smartphones decreased, as did the associated anxiety and interference with activities of daily life. Of these three dimensions, the one that best predicted and explained the smartphone usage was the evaluation of one's own emotions. Previous studies reported similar results. In the field of behavioral addictions, authors concluded that perception and regulation of one's own emotions had a crucial role in addictions (e.g. Kun & Demetrovics, 2010). Research exclusively focusing on problematic internet or smartphone usage, although still in its infancy, reported similar findings. On the one hand, emotional intelligence protects against internet addiction and problematic internet use (Casale et al., 2013). On the other hand, a lack of emotional intelligence is a risk factor for the development of Internet addiction (Casale et al., 2013; Khosravani et al., 2017).

Regarding the dimensions of adult attachment, low self-esteem, the need for approval, hostile conflict resolution and possessiveness, together with the evaluation of own emotions, well explained smartphone use, abuse and addiction in this study. However, this was not the case for the dimension of expression of feelings and comfort with relationships. Moreover, although emotional self-sufficiency and discomfort with relationships did show a relationship, it did not predict the problematic smartphone usage. Therefore, contrary to other studies (Kim et al., 2017), it seems that problematic smartphone usage (in terms of frequency, interference with daily activities and discomfort) is not strongly associated with avoidance of relationships (use of the device as an escape or refuge), or the pursuit of them. According to our results, a negative self-concept and the need to restore self-esteem through approval from others were more important factors. Social networks could meet these needs, functioning as a search space for positive reinforcement from others to overcome any deficit in positive self-reinforcement (Chen at al., 2019). The "low self-esteem" dimension of the adult attachment also includes items pertaining to the need to check one's importance to others, which could correspond to the constant checking of others' reactions to public posts on social networks. This result confirms the relevance of self-esteem to dysfunctional relationships with smartphones (Li et al., 2019). Furthermore, the hostile conflict resolution and possessiveness also explained some of the variance in scores pertaining to the use of smartphones and their apps: participants with higher scores with respect to anger towards others, resentment, quick to

anger and jealousy were more likely to show problematic smartphone usage.

Adult attachment was also analyzed in terms of type (secure and insecure) and style (preoccupied, dismissing, fearful and secure). Secure attachment protected against disruptive smartphone use. From the perspective of attachment styles and types, the participants classified as secure had the lowest problematic smartphone usage. In contrast, the fearful style participants showed the highest scores (i.e. more time using the smartphone, more anxiety when not using it, and greater interference with activities of daily life), followed by the dismissing and preoccupied style participants (with no differences between the latter two). A recent study on the mediating role of fearful attachment on problematic smartphone use presented some relevant results (Balta et al., 2019): fearful and dismissing attachment styles partially explained the relationship between certain personality traits (e.g. narcissism and spitefulness) and problematic device use. The underlying mechanism could be based on the combination of self-image and perceptions of others. Individuals with a negative model of others, as seen with the fearful and dismissing styles, engage in fewer real-life social interactions and thus experience less belongingness (Hart et al., 2015); this leads to more use of technology to compensate for deficits in their offline life, ultimately causing problematic use (Beyderman & Young, 2016; Kim & Koh, 2018). However, while individuals with these attachment styles are avoidant and distrustful of others, they show differences in self-image; while dismissing individuals have a negative self-image, fearful individuals have a positive one (Balta et al., 2019). In this regard the self-image could play a different role on the addiction. While the effect of poor self-esteem has been widely reported (e.g. Chen et al, 2019; Li et al., 2019), the effect of high self-esteem is poorly understood.

Finally, the analysis of sex and age helped to better understand the results. Sex helped explain and predict problematic smartphone usage. Women showed greater use and abuse of smartphones, as reported in previous works (e.g. Koh & Kim, 2017; Van Deursen et al., 2015). This could be due to the higher levels of social orientation of women compared to men (Lee et al., 2014), such that social media is more appealing to women (Duggan & Brenner, 2013). In this regard, our results regarding the effects of sex on emotional intelligence and attachment could improve understanding of the underlying mechanisms. Female participants showed a greater capacity to evaluate others' emotions, and higher scores with respect to expression of feelings and comfort with relationships; meanwhile, male participants showed higher scores for emotional regulation, hostile conflict resolution style, and emotional self-sufficiency and discomfort with intimacy.

Regarding the effect of age on problematic smartphone usage, the higher rate of abuse among the younger participants (Generation Z) could be due to greater immersion in technologies, especially those that provide pleasurable experiences and opportunities for communication (Lenhart et al.,

2010). The hostile conflict resolution style may be related to dysfunctional outcomes in both offline and online relationships.

Nevertheless, some limitations suggest that study findings need to be interpreted carefully. First, a cross-sectional design was used, so any inferences regarding causality must be made with caution. Future studies could benefit from longitudinal designs, and should aim to provide experimental research of causal contingencies. Moreover, to include a wider range of variables would lead to creating a more complete model of risk factors. Exploring whether spending one's childhood in a virtual world negatively affects interpersonal relationship skills as an adult could be interesting. Second, this study used self-report methods, which can lead to social desirability and recall bias, among other types of bias. Third, the reliability value of the fourth subscale of adult attachment questionnaire (α = .65, Emotional self-sufficiency and discomfort with intimacy: contempt for intimate relationships, difficulty to commit and overvaluation of personal independence) is below the acceptable values of alpha, ranging from 0.70 to 0.9 (Bland & Altman, 1997; DeVellis, 2003). However, this "moderate" value needs to be used with caution because the value of α depends on the number of items on the scale (Cortina, 1993), being especially reduced on this subscale compared to the others (7 items versus 13, 11, and 9 items for subscales 1, 2, and 3, respectively). Fourth, the purposive sampling along with the homogeneity of the sample (it mainly comprised college students) reduce the generalizability and the representativeness of the present findings. This is especially salient when compared to probability sampling techniques designed to reduce biases. However, the purposive sampling disadvantages are less depending on the theoretical and empirical framework, the objectives or the nature of the universe i.e. homogeneity or heterogeneity in the constituent units (Sharma, 2017). In this regard, as several studies on the field recruited similar participants (e.g. Cocoradă et al., 2018; B. Chen et al. 2017; C. Chen et al., 2017), comparison among findings is possible. In addition, the sample variance in relevant features allowed us to inference useful results that lead to answering the research question. In the same vein, the greater proportion of women and the reduced age range especially in Generation Z make it difficult to generalize these findings and recommend considering this data more descriptively.

Despite the above mentioned limitations, the findings of this study provide some keys for possible problematic smartphone usage interventions. The relevance of building a positive and secure attachment in childhood appears crucial for a positive image of the self and others in adulthood, in turn influencing the way in which we perceive both the offline and the online world. This research could improve the resolution of conflicts derived from misuse of social networks and internet in educational institutions. It seems relevant for young people to understand that the knowledge of their own emotions and self-regulation, and the strengthening of the positive attachment, as a protection against addic-

tion or harassment through the smartphone. The psychoeducational programs including activities to improve emotional intelligence and promote secure and positive affective

relations would positively influence on the interaction with the smartphones, preventing major problems.

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