

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/363173489>

# Problematic smartphone use and procrastination in the academic setting: a meta-analysis

Article in *Electronic Journal of Research in Educational Psychology* · September 2022

---

CITATIONS

0

READS

557

1 author:



[Sergio Hidalgo-Fuentes](#)

University of Valencia

31 PUBLICATIONS 86 CITATIONS

SEE PROFILE

# Problematic smartphone use and procrastination in the academic setting: a meta-analysis

**Sergio Hidalgo-Fuentes<sup>1</sup>**

---

<sup>1</sup> Departamento de Psicología Básica. Universidad de Valencia, Valencia

---

**Spain**

*Correspondence: Sergio Hidalgo-Fuentes.* School of Psychology. Dept. of Basic Psychology. Avda. Blasco Ibáñez, 21. C.P. 46010. Valencia. Spain. E-mail: [sergio.hidalgo@uv.es](mailto:sergio.hidalgo@uv.es)

---

© Universidad de Almería and Ilustre Colegio Oficial de la Psicología de Andalucía Oriental (Spain)

## Abstract

Problematic smartphone use has become a global problem with broad implications for education. The present meta-analysis studies the relationship between problematic smartphone use and procrastination in students. A literature search was conducted in Web of Science, PsycInfo and Scopus databases, obtaining a total of 18 articles that met the inclusion criteria, with a total sample of 8,679 participants. The results confirmed a positive relationship of moderate intensity between problematic smartphone use and procrastination in students ( $Zr = 0.40$ ). The possible moderating effects of participants' gender, age and educational level were analyzed. There is a need to implement programs to prevent problematic smartphone use in students and to continue investigating the relationship between the two variables, especially through longitudinal studies.

**Keywords:** Problematic smartphone use, Procrastination, Education, Meta-analysis.

## Resumen

El uso problemático del smartphone se ha convertido en un problema a nivel global con amplias repercusiones en el ámbito educativo. El presente meta-análisis estudia la relación entre el uso problemático del smartphone y la procrastinación en estudiantes. La búsqueda bibliográfica se realizó en las bases de datos Web of Science, PsycInfo y Scopus, obteniendo un total de 18 artículos que cumplieran los criterios de inclusión, con una muestra total de 8,679 participantes. Los resultados confirman una relación positiva de intensidad moderada entre el uso problemático del smartphone y la procrastinación en estudiantes ( $Zr = 0.40$ ). Los posibles efectos moderadores del sexo, la edad y el nivel educativo de los participantes fueron analizados. Se indica la necesidad de implantar programas para prevenir el uso problemático del smartphone en estudiantes y de continuar investigando la relación entre las dos variables, especialmente mediante estudios de tipo longitudinal.

**Palabras Clave:** Uso problemático del smartphone, Procrastinación, Educación, Meta-análisis

## Introduction

Procrastination, understood as the voluntary, irrational delay of behavior despite the anticipation of a potential negative outcome (Steel, 2011), is a common behavior in contemporary societies (Ferrari et al., 2007). Especially important is the study of procrastination in the educational setting, since postponement of study and of assignments has been negatively associated with factors like academic achievement (Gareau et al., 2019; Hidalgo-Fuentes et al., 2021), academic engagement (Aspée et al., 2021; Closson & Boutilier, 2017), intent to continue one's studies (Bäulke et al., 2018; Bäulke et al., 2021) and academic motivation (Cavusoglu & Karatas, 2015; Ljubin-Golub et al., 2019). Although procrastination occurs at every level of education, this type of behavior is more frequent among university students (Janssen, 2015), with prevalence rates between 30% and 60% (Rabin et al., 2011).

Since smartphones first appeared in 2007, the popularity of this digital device has been rising constantly, in 2020 reaching a total of 3.6 billion users worldwide (O'Dea, 2021). Despite all the advantages offered by smartphone use, such as increased possibilities for communication or easy access to information, problematic smartphone use in recent years has become a public health issue (World Health Organization, 2015). Although problematic smartphone use has often been conceptualized as smartphone addiction in the scientific literature, some authors advise against referring to it as an addiction (Panova & Carbonell, 2018), given that the DSM-5 (American Psychiatric Association, 2013) does not recognize this type of problem as a behavioral addiction, and it overlaps with other behaviors that are found in different studies, such as problematic Internet use or use of social networks (Montag et al., 2019; Sha et al., 2019). Problematic smartphone use has been associated with a large number of negative consequences, such as substance abuse (Grant et al., 2019), anxiety (Kim et al., 2018), depression (Boumosleh & Jaalouk, 2017), low quality sleep (Cabré-Riera et al., 2019), decrease in social support networks (Herrero et al., 2019) and in general, lower quality of life (Buctot et al., 2020). In addition, problematic smartphone use also has a negative impact in the educational sphere, being related to low academic achievement (Amez & Baert, 2020).

In recent years, different research studies have examined the association between problematic smartphone use and procrastination in the academic sphere (Rozgonjuk et al., 2018; Shi et al., 2021), but to date there has been no quantitative investigation of the effect size of the different studies that address this problem. Therefore, the aim of the present meta-

analysis was to examine whether problematic smartphone use is related to procrastination in the academic sphere, and if so, to evaluate the strength of this relationship. In addition, we will also examine whether the association between problematic smartphone use and procrastination is moderated by other variables observed in the study samples.

## **Method**

### *Bibliographic search*

A bibliographic search was carried out to identify articles related to problematic smartphone use and procrastination in students. The search was carried out during the months of May and June 2021, using the Web of Science, PsycInfo and Scopus databases, and the terms “*procrastination*”, “*smartphone*”, “*cell phone*”, “*cellular phone*”, “*mobile phone*”, “*cellular*” and “*telephone*”, as well as the Boolean operators “*and*” and “*or*”. The search focused on peer-reviewed scientific articles, without placing any restriction on their publication date. Additionally, the article references were searched manually to avoid missing any pertinent studies.

### *Inclusion criteria*

The inclusion criteria were as follows: a) the constructs of problematic smartphone use and procrastination were measured, b) correlation coefficients between the two measures were presented, c) written in Spanish or English, and d) the participants were students. Of the 53 articles selected, 18 met these criteria (Akinci, 2021; Ayadi et al., 2021; Cebi et al., 2019; Elhai et al., 2021; Hong et al., 2021; Li et al., 2020; Márquez-Hernández et al., 2020; Przepiorka et al., 2021; Qaisar et al., 2017; Rozgonjuk et al., 2018; Saad, 2020; Saad & Khalifa, 2020; Wang & Lei, 2019; Wang et al., 2019a; Wang et al., 2019b; Yang et al., 2019; Yang et al., 2020; Zhen et al., 2020). The flow diagram shows the article search and selection process (see Figure 1).

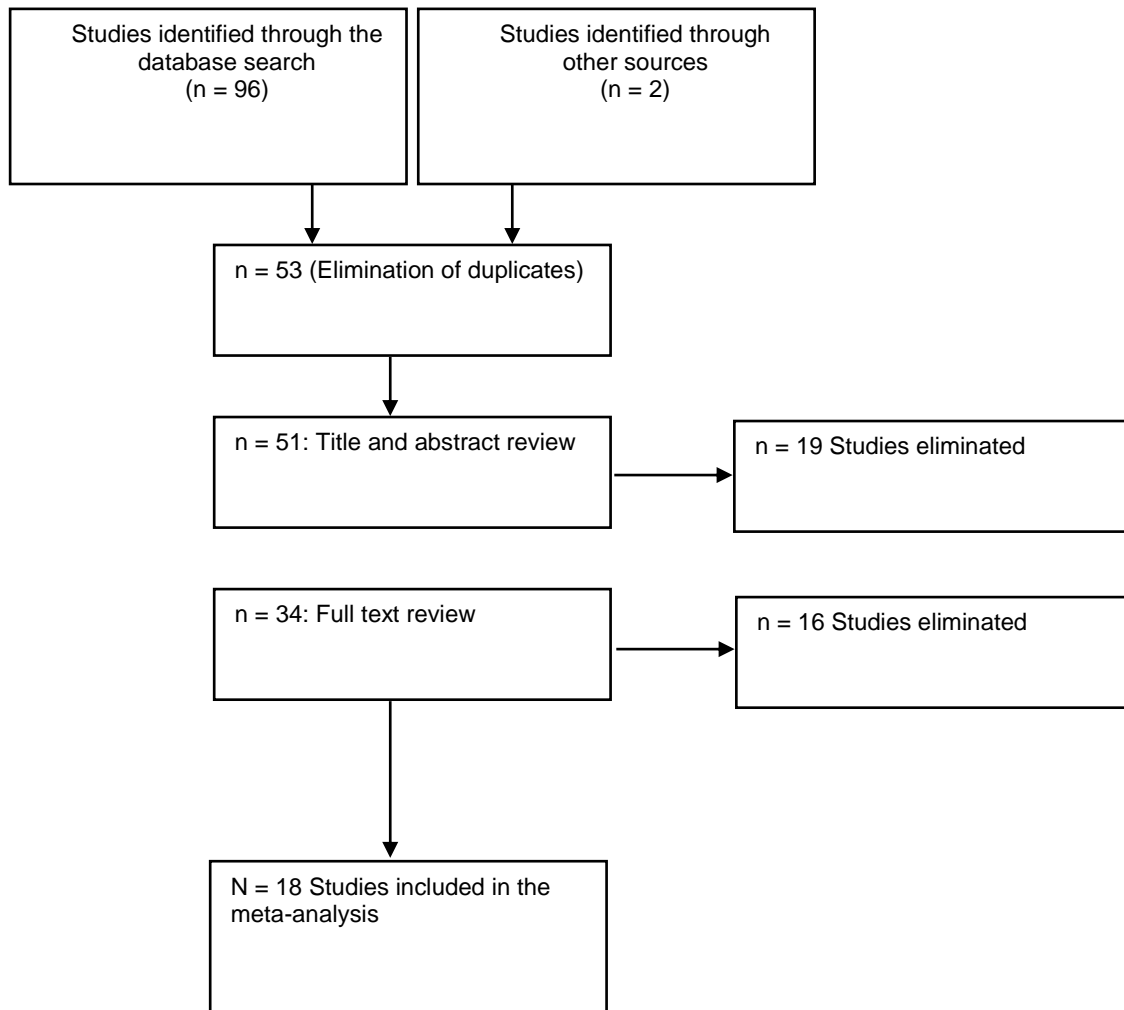


Figure 1 . *Modified PRISMA flow diagram of the search and selection process (Moher et al., 2009)*

### *Coding of studies*

The selected articles were introduced into a coding table that included the following information (See Table 1): study identification, sample size, educational level of participants, average age of the participants, percentage of women in the sample, instrument used to measure problematic smartphone use, instrument used to measure procrastination, and correlation between problematic smartphone use and procrastination (in the case of longitudinal studies, only the correlation of the Time 1 measurement was used). When a publication did not present some of the required data, we wrote to the correspondence author, requesting the information via e-mail; if no answer was obtained, the information appears as a missing value.

Table 1. *Characteristics of the studies included in the meta-analysis*

Study	N	Sample	Average age	% female	Problematic smartphone use <sup>a</sup>	Procrastination <sup>b</sup>	Correlation
Akinci, 2021	632	University	21.30	31.20	SAS-SV	APS	r=0.40
Ayadi et al., 2021	200	Secondary		50.00	SMPAQ	TPS	r=0.29
Çebi et al., 2019	571	University	19.03	70.20	PMPUS	APS	r=0.42
Elhai et al., 2021	103	University	19.28	66.99	SAS-SV	IPS	r=0.42
Hong et al., 2021	633	Secondary	13.61	56.40	MPPUS-10	GPS	r=0.45
Li et al., 2020	483	University	20.20	56.00	SAS-SV	TPS	r=0.56
Márquez-Hernández et al., 2020	124	University	20.92	79.00	MPPUS	MDMQ (procrastination subscale)	r=0.13
Przepiorka et al., 2021	478	University	19.93	64.00	AMPUS	GPS	r=0.27
Qaisar et al., 2017	200	University	20.98	50.00	PMPUQ	GPS	r=0.61
Rozgonjuk et al., 2018	366	University	25.75	78.69	E-SAPS18	API	r=0.15
Saad, 2020	68	Secondary	13.60		BSAS	TPS	r=0.41
Saad & Khalifa, 2020	228	Secondary	14.60		BSAS	TPS	r=0.41
Wang & Lei, 2019	762	Secondary	16.79	56.00	SAS-SV	GPS	r=0.31
Wang et al., 2019a	772	Secondary	16.81	55.96	SAS-SV	GPS	r=0.32
Wang et al., 2019b	794	Secondary	16.80	55.00	SAS-SV	GPS	r=0.34
Yang et al., 2019	475	University	19.77	44.00	SAS-SV	IPS	r=0.36
Yang et al., 2020	1004	University	19.40	76.69	MPAI	GP	r=0.40
Zhen et al., 2020	786	Secondary	13.96	47.80	MPDS	GPS	r=0.40

<sup>a</sup>MPPUS-10 = Mobile Phone Problem Use Scale – Short Version; SAS-SV Smartphone Addiction Scale – Short Version; MPDS = Mobile Phone Dependency Scale; SMPAQ = Savari Mobile Phone Addiction Questionnaire; BSAS = Brief Smartphone Addiction Scale; PMPUQ = Problematic-Mobile-Phone Use Questionnaire; MPPUS = Mobile Phone Problem Use Scale; AMPUS = Adapted Mobile Phone Use Habits; E-SAPS18= Estonian Smartphone Addiction Proneness Scale; PMPUS = Problematic Mobile Phone Use Scale; MPAI = Mobile Phone Addiction Index.

<sup>b</sup>GPS = General Procrastination Scale; IPS = Irrational Procrastination Scale; APS = Academic Procrastination Scale; TPS = Tuckman Procrastination Scale; MDMQ = Melbourne Decision Making Questionnaire; API = Aitken Procrastination Inventory.

### Data analyses

For all the analyses of studies included in the meta-analysis, due to their asymmetrical distribution, Pearson correlation coefficients were extracted between problematic smartphone use and procrastination and converted into Fisher  $z$  scores using the formula  $Z =$



$0.5 \cdot \ln[(1+r)/(1-r)]$ , while using the formula  $V_z = 1/n-3$  for calculating their variance. After the analyses, the Fisher  $z$  values were again converted into Pearson correlation coefficients to facilitate interpretation (Borenstein et al., 2021).

All the analyses were performed using the Major statistical package for Jamovi (Hamilton, 2018) and the program Meta-Essentials 1.5 (Suurmond et al., 2017). A random effects model with a restricted maximum likelihood estimator was used to estimate effect size and the 95% confidence interval (CI). Random effects models are considered preferable to fixed effects models as they present more precise estimates with more realistic CIs (Kisamore & Brannick, 2008). Following Cohen (1988), effect sizes between 0.1 and 0.3 were considered small, between 0.3 and 0.5 were considered moderate, and greater than 0.50 were considered large.

Cochran's  $Q$  and the  $I^2$  statistic were used to assess variability. Cochran's  $Q$  indicates whether there is statistically significant heterogeneity between the different effect sizes, while the  $I^2$  statistic reflects the degree of variability among the effect sizes of the studies. As a guideline,  $I^2$  values of 25%, 50% and 75% can be considered low, moderate and high, respectively (Higgins et al., 2003).

The risk of publication bias was assessed using two procedures: Egger's test and calculation of Rosenthal's fail-safe number. Egger's test assumes that if publication bias exists, studies with a smaller sample size will have significantly different effect sizes than studies with larger samples; while Rosenthal's method calculates the number of unpublished studies with non-significant results that would be necessary to cancel out the effect size found in the meta-analysis.

It was hypothesized that subjects' age, sex and educational level could act as moderating variables in the association between problematic smartphone use and procrastination. The moderating role of gender (coded as the percentage of females in the sample) and of age was assessed using meta-regression; while in the case of educational level (secondary vs. university), being a categorical variable, a subgroup analysis was used.

## Results

The search resulted in the retrieval of 18 studies with a total sample of 8,679 subjects. The 18 studies included in this meta-analysis were published between 2017 and 2021. Ten of the studies were conducted with university students, while in the remaining eight, the samples consisted of secondary students. The mean age of participants ranged from 13.6 to 25.75 years, but two studies did not report the age of the subjects. In relation to sex, eleven studies had a higher percentage of women in the sample, in two there was total parity, in three there was a higher percentage of men, and in the remaining two studies this data is not presented. The instrument used most often to measure problematic smartphone use was the Smartphone Addiction Scale-Short Version (Kwon et al., 2013), while in the case of procrastination, the most common test was the General Procrastination Scale (Lay, 1986).

To study the possible relationship between procrastination and problematic smartphone use in students, the effect size was estimated along with a 95% CI. As observed in Table 2, the results showed a global effect size of  $Z_r = 0.40$  (CI 95% = 0.33 - 0.46), a moderate effect size considering Cohen's criteria (1988). The confidence interval did not contain the zero value, thereby excluding the null hypothesis of zero correlation between problematic smartphone use and procrastination in students. Based on these results, therefore, we conclude that the more students engage in problematic smartphone use, the greater their tendency to procrastinate.

Table 2. *Effect size and 95% Confidence Interval*

TE <sub>Z<sub>r</sub></sub>	TE <sub>r</sub>	Z	p	CI 95% (Z <sub>r</sub> )		CI 95% (r)	
				LI	LS	LI	LS
0.40	.38	12.5	< .001	0.33	0.46	.32	.43

Figure 2 presents the forest plot with  $Z_r$  effect sizes, and the 95% CI for each study included in the present meta-analysis; as seen here, the different effect sizes range between  $Z_r = 0.13$  and  $Z_r = 0.71$ .

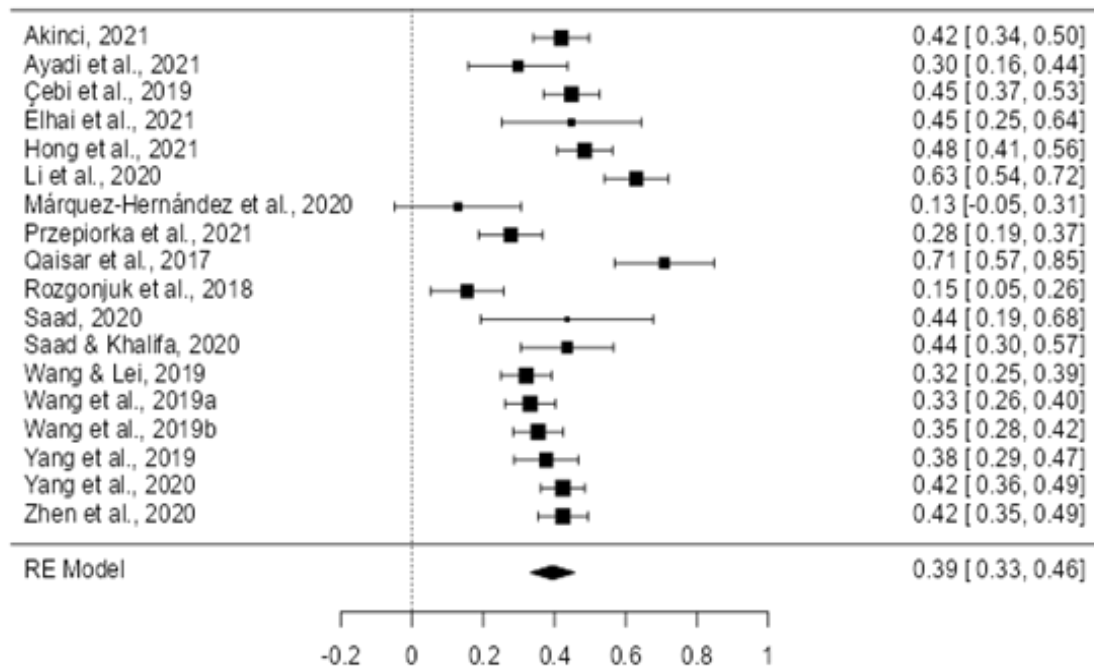


Figure 2 . Forest Plot

Regarding the possible presence of publication bias, the Egger test showed no evidence of significant bias ( $p = .927$ ). However, following Botella and Sánchez-Meca's (2015) recommendation to use a second procedure to check for possible publication bias, we carried out an analysis of Rosenthal's fail-safe number. The result of  $n = 8.091$  ( $p < .001$ ) indicated the robustness of the effect size found, since it would take 8,091 unpublished studies with an effect size of zero to make the  $p$  value non-significant, hence, approximately 80 times more than the general criterion of  $(5*k)+10$ , where  $k$  represents the number of studies included in the meta-analysis (Botella & Sánchez-Meca, 2015).

Effect size heterogeneity of the studies included in the meta-analysis was assessed through Cochran's  $Q$  and the  $I^2$  statistic (Higgins et al., 2019). The results indicated that the studies were heterogeneous, thus ruling out the homogeneity hypothesis ( $Q = 102.180$ ;  $p < .001$ ). The  $I^2$  statistic showed high heterogeneity with a value of 87.49%, indicating that the effect size found may be moderated by other variables.

In the meta-regression analyses, there were no indications that the effect size varied between studies as a function of the average age of the participants (intercept = .591;

$\beta = -.010$ ;  $p = .323$ ) or of the percentage of women in the sample (intercept =  $.631$ ;  $\beta = -.004$ ;  $p = .116$ ), suggesting stability across age and sex. As for the variable of educational level, the subgroup analysis showed no significant differences ( $Q = .17$ ;  $p = .681$ ); effect size in the studies with secondary students was  $Zr = 0.38$  (CI 95% [0.37, 0.40]), and  $Zr = 0.40$  (IC 95% [0.28, 0.53]) in studies with a sample of university students.

## Discussion and Conclusions

The aim of this study was to provide a reliable estimation of the relationship between problematic smartphone use and procrastination in the academic setting. A systematic review of the literature was carried out in order to identify studies dealing with this problem and to conduct a meta-analysis whereby we could obtain the effect size between the two variables studied.

The systematic review identified 18 studies that met the inclusion criteria and were included in the meta-analysis, having a total combined sample of 8679 participants. The results of the analyses indicate that, in general, problematic smartphone use and procrastination among students of different educational levels show a relationship of moderate intensity ( $Zr = 0.40$ ), such that students with high levels of problematic smartphone use also score higher in procrastination. This positive association between the two variables is consistent, as all the studies included in the meta-analysis showed positive correlations between problematic smartphone use and procrastination. The relationship between problematic smartphone use and academic procrastination is an expected result, given that excessive use of this device has been associated with numerous negative consequences in the educational setting (Aspée et al., 2021; Hidalgo-Fuentes et al., 2021; Ljubin-Golub et al., 2019; Samaha & Hawi, 2016). Generally speaking, smartphone use or Internet access have been considered activities that encourage procrastination behaviors (Reinecke et al., 2018). According to Rozgonjuk et al. (2018), for example, the fact that both problematic smartphone use and procrastination are maladaptive coping strategies leads to frequent correlations between the two. Additionally, following the theoretical model proposed by Billieux et al. (2015), problematic smartphone use is related to risk factors such as low self-esteem and lack of self-control, variables that have also been associated with academic procrastination (Uzun et al., 2020). In addition to its association with problematic smartphone use, procrastination in students has also been related

to other technology addictions such as problematic use of Internet (Aznar-Díaz et al., 2020; Geng et al., 2018) or social networks (Przepiorka et al., 2021; Şahin, 2014).

Regarding possible moderating variables in this relationship, even though we found gender differences both in problematic smartphone use (Amador-Licona et al., 2019; Nayak, 2018) and in procrastination (Balkis & Duru, 2017), participants' sex did not turn out to be a significant moderator in the effect size found. Neither did participants' mean age modify the intensity of the association found, even though age is negatively related to problematic smartphone use (Elhai et al., 2019). Finally, although procrastination in the educational setting is more frequent in university students than in secondary students (Janssen, 2015), participants' level of education also failed to produce a moderating effect on the the effect size found.

While the results of this meta-analysis are a valuable contribution concerning the relationship between problematic smartphone use and procrastination in the academic setting, they are not free of limitations. On one hand, all but one of the studies included in the meta-analysis are cross-sectional, making it impossible to establish causal inferences between the study variables. It is also important to note that the number of studies included in this meta-analysis is not very high, showing a need for continued research on the relationship between problematic smartphone use and academic procrastination. Finally, the association between problematic smartphone use and procrastination in the different studies might be affected by the variety of tests used to measure the two variables.

Despite these limitations, the present study makes a positive impact by synthesizing research that has examined the relationship between problematic smartphone use and procrastination in students. Although the results found cannot ensure that the relationship between the study variables has a causal nature, the fact that problematic smartphone use is a predictor of academic procrastination indicates that it would be positive to develop preventive programs against problematic smartphone use and apply them with students, in order to reduce procrastination in the educational setting. Thus, and given that smartphone use seems to be related to low self-control, resilience-related intervention programs to control smartphone use and improve time management could have positive effects. Although further research is needed due to the low number of available studies, two recent meta-analyses have shown that inter-

ventions to reduce the severity of problematic smartphone use have shown good effectiveness (Augner et al., 2021; Malinauskas & Malinauskiene, 2019).

## References

- Akinci, T. (2021). Determination of Predictive Relationships between Problematic Smartphone Use, Self-Regulation, Academic Procrastination and Academic Stress through Modelling. *International Journal of Progressive Education*, 17(1), 35-53.
- Amador-Licon, N., Carpio-Mendoza, J. J., Guízar-Mendoza, J. M., & Rodríguez-Sánchez, P. (2019). Auto-percepción del Uso Problemático del Teléfono Móvil en Estudiantes Universitarios de Acuerdo a su Sexo [Self-perception of problematic cell phone use in university students, according to sex]. *Cuadernos Hispanoamericanos de Psicología*, 19(2), 1-16. <https://doi.org/10.18270/chps.v19i2.3134>
- American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders: DSM-5*. American Psychiatric Publishing
- Amez, S., & Baert, S. (2020). Smartphone use and academic performance: A literature review. *International Journal of Educational Research*, 103, 101618. <https://doi.org/10.1016/j.ijer.2020.101618>
- Aspée, J., González, J., & Herrera, Y. (2021). Relación funcional entre procrastinación académica y compromiso en estudiantes de educación superior: una propuesta de análisis [Functional relationship between academic procrastination and engagement in higher education students: an analysis proposal]. *Perspectiva Educativa*, 60(1), 4-22. <https://doi.org/10.4151/07189729-Vol.60-Iss.1-Art.1116>
- Augner, C., Vlasak, T., Aichhorn, W., & Barth, A. (2021). Tackling the ‘digital pandemic’: The effectiveness of psychological intervention strategies in problematic Internet and smartphone use—A meta-analysis. *Australian & New Zealand Journal of Psychiatry*, 00048674211042793. <https://doi.org/10.1177/00048674211042793>
- Ayadi, N., Pireinaladin, S., Shokri, M., Dargahi, S., & Zarein, F. (2021). Investigating the Mediating Role of Procrastination in the Relationship between Positive and Negative Perfectionism and Mobile Phone Addiction in Gifted Students. *Iranian Journal of Psychiatry*, 16(1), 30-55. <https://doi.org/10.18502/ijps.v16i1.5375>
- Aznar-Díaz, I., Romero-Rodríguez, J. M., García-González, A., & Ramírez-Montoya, M. S. (2020). Mexican and Spanish university students’ Internet addiction and academic

- procrastination: Correlation and potential factors. *PloS one*, 15(5), e0233655. <https://doi.org/10.1371/journal.pone.0233655>
- Balkis, M., & Duru, E. (2017). Gender differences in the relationship between academic procrastination, satisfaction with academic life and academic performance. *Electronic Journal of Research in Educational Psychology*, 15(1), 105-125. <https://doi.org/10.14204/ejrep.41.16042>
- Bäulke, L., Eckerlein, N., & Dresel, M. (2018). Interrelations between motivational regulation, procrastination and college dropout intentions. *Unterrichtswissenschaft*, 46(4), 461-479. <https://doi.org/10.1007/s42010-018-0029-5>
- Bäulke, L., Grunschel, C., & Dresel, M. (2021). Student dropout at university: a phase-orientated view on quitting studies and changing majors. *European Journal of Psychology of Education*, 1-24. <https://doi.org/10.1007/s10212-021-00557-x>
- Billieux, J., Maurage, P., Lopez-Fernandez, O., Kuss, D. J., & Griffiths, M. D. (2015). Can disordered mobile phone use be considered a behavioral addiction? An update on current evidence and a comprehensive model for future research. *Current Addiction Reports*, 2(2), 156-162. <https://doi.org/10.1007/s40429-015-0054-y>
- Borenstein, M., Hedges, L. V., Higgins, J. P., & Rothstein, H. R. (2021). *Introduction to meta-analysis*. John Wiley & Sons
- Botella, J. & Sánchez-Meca, J. (2015). *Meta-Análisis en Ciencias Sociales y de la Salud* [Meta-analysis in Social and Health Sciences]. Editorial Síntesis
- Botella, J., Suero, M., & Ximenez, C. (2012). *Análisis de datos en psicología I* [Data análisis in psychology]. Pirámide.
- Boumosleh, J.M. , & Jaalouk, D. (2017). Depression, anxiety, and smartphone addiction in university students - A cross sectional study. *PLoS One*, 12(8), e0182239. <https://doi.org/10.1371/journal.pone.0182239>
- Buctot, D. B., Kim, N., & Kim, J. J. (2020). Factors associated with smartphone addiction prevalence and its predictive capacity for health-related quality of life among Filipino adolescents. *Children and Youth Services Review*, 110, 104758. <https://doi.org/10.1016/j.childyouth.2020.104758>
- Cabré-Riera, A., Torrent, M., Donaire-Gonzalez, D., Vrijheid, M., Cardis, E., & Guxens, M. (2019). Telecommunication devices use, screen time and sleep in adolescents. *Environmental research*, 171, 341-347. <https://doi.org/10.1016/j.envres.2018.10.036>

- Cavusoglu, C., & Karatas, H. (2015). Academic procrastination of undergraduates: Self-determination theory and academic motivation. *The Anthropologist*, 20(3), 735-743. <https://doi.org/10.1080/09720073.2015.11891780>
- Cebi, A., Reisoğlu, İ., & Bahçekapılı, T. (2019). The relationships among academic procrastination, self-control, and problematic mobile use: considering the differences over personalities. *Addicta: The Turkish Journal on Addictions*, 6(3), 447-468. <https://doi.org/10.15805/addicta.2019.6.3.0082>
- Closson, L. M., & Boutilier, R. R. (2017). Perfectionism, academic engagement, and procrastination among undergraduates: The moderating role of honors student status. *Learning and Individual Differences*, 57, 157-162. <https://doi.org/10.1016/j.lindif.2017.04.010>
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences*. Lawrence Erlbaum Associates.
- Elhai, J. D., Rozgonjuk, D., Yildirim, C., Alghraibeh, A. M., & Alafnan, A. A. (2019). Worry and anger are associated with latent classes of problematic smartphone use severity among college students. *Journal of affective disorders*, 246, 209-216. <https://doi.org/10.1016/j.jad.2018.12.047>
- Elhai, J. D., Sapci, O., Yang, H., Amialchuk, A., Rozgonjuk, D., & Montag, C. (2021). Objectively-measured and self-reported smartphone use in relation to surface learning, procrastination, academic productivity, and psychopathology symptoms in college students. *Human Behavior and Emerging Technologies*, 1-10. <https://doi.org/10.1002/hbe2.254>
- Ferrari, J. R., Diaz-Morales, J. F., O'Callaghan, J., Diaz, K., & Argumedo, D. (2007). Frequent behavioral delay tendencies by adults: International prevalence rates of chronic procrastination. *Journal of Cross-Cultural Psychology*, 38(4), 458-464. <https://doi.org/10.1177/0022022107302314>
- Gareau, A., Chamandy, M., Kljajic, K., & Gaudreau, P. (2019). The detrimental effect of academic procrastination on subsequent grades: the mediating role of coping over and above past achievement and working memory capacity. *Anxiety, Stress, & Coping*, 32(2), 141-154. <https://doi.org/10.1080/10615806.2018.1543763>
- Geng, J., Han, L., Gao, F., Jou, M., & Huang, C. C. (2018). Internet addiction and procrastination among Chinese young adults: A moderated mediation model. *Computers in Human Behavior*, 84, 320-333. <https://doi.org/10.1016/j.chb.2018.03.013>



- Grant, J. E., Lust, K., & Chamberlain, S. R. (2019). Problematic smartphone use associated with greater alcohol consumption, mental health issues, poorer academic performance, and impulsivity. *Journal of behavioral addictions*, 8(2), 335-342. <https://doi.org/10.1556/2006.8.2019.32>
- Hamilton, W.K. (2018). *MAJOR: Meta Analysis JamOvi R*. For the jamovi project
- Herrero, J., Urueña, A., Torres, A., & Hidalgo, A. (2019). Socially connected but still isolated: Smartphone addiction decreases social support over time. *Social Science Computer Review*, 37(1), 73-88. <https://doi.org/10.1177/0894439317742611>
- Hidalgo-Fuentes, S., Martínez-Álvarez, I., & Sospedra-Baeza, M. J. (2021). Rendimiento académico en universitarios españoles: el papel de la personalidad y la procrastinación académica [Academic achievement in Spanish university students: the role of personality and academic procrastination]. *European Journal of Education and Psychology*, 14(1), 1-13. <https://doi.org/10.32457/ejep.v14i1.1533>
- Higgins, J. P., Thomas, J., Chandler, J., Cumpston, M., Li, T., Page, M. J., & Welch, V. A. (Eds.). (2019). *Cochrane handbook for systematic reviews of interventions*. John Wiley & Sons.
- Higgins, J. P., Thompson, S. G., Deeks, J. J., & Altman, D. G. (2003). *Measuring inconsistency in meta-analyses*. *BMJ*, 327(7414), 557-560. <https://doi.org/10.1136/bmj.327.7414.557>
- Hong, W., Liua, R. D., Ding, Y., Jiang, S., Yang, X., & Sheng, X. (2021). Academic procrastination precedes problematic mobile phone use in Chinese adolescents: A longitudinal mediation model of distraction cognitions. *Addictive Behaviors*, 106993. <https://doi.org/10.1016/j.addbeh.2021.106993>
- Janssen, J. (2015). *Academic procrastination: Prevalence among high school and undergraduate student and relationship to academic achievement*. [Doctoral dissertation, Georgia State University]. [https://scholarworks.gsu.edu/cgi/viewcontent.cgi?article=1115&context=epse\\_diss](https://scholarworks.gsu.edu/cgi/viewcontent.cgi?article=1115&context=epse_diss)
- Kim, Y. J., Jang, H. M., Lee, Y., Lee, D., & Kim, D. J. (2018). Effects of internet and smartphone addictions on depression and anxiety based on propensity score matching analysis. *International journal of environmental research and public health*, 15(5), 859. <https://doi.org/10.3390/ijerph15050859>
- Kisamore, J. L., & Brannick, M. T. (2008). An illustration of the consequences of meta-analysis model choice. *Organizational Research Methods*, 11(1), 35-53. <https://doi.org/10.1177/1094428106287393>

- Kwon, M., Kim, D. J., Cho, H., & Yang, S. (2013a). The smartphone addiction scale: development and validation of a short version for adolescents. *PloS one*, 8(12), e83558. <https://doi.org/10.1371/journal.pone.0083558>
- Lay, C. H. (1986). At last, my research article on procrastination. *Journal of Research in Personality*, 20(4), 474–495. [https://doi.org/10.1016/0092-6566\(86\)90127-3](https://doi.org/10.1016/0092-6566(86)90127-3)
- Li, L., Gao, H., & Xu, Y. (2020). The mediating and buffering effect of academic self-efficacy on the relationship between smartphone addiction and academic procrastination. *Computers & Education*, 159, 104001. <https://doi.org/10.1016/j.compedu.2020.104001>
- Ljubin-Golub, T., Petričević, E., & Rovani, D. (2019). The role of personality in motivational regulation and academic procrastination. *Educational Psychology*, 39(4), 550-568. <https://doi.org/10.1080/01443410.2018.1537479>
- Malinauskas, R., & Malinauskiene, V. (2019). A meta-analysis of psychological interventions for Internet/smartphone addiction among adolescents. *Journal of Behavioral Addictions*, 8(4), 613-624. <https://doi.org/10.1556/2006.8.2019.72>
- Márquez-Hernández, V. V., Gutiérrez-Puertas, L., Granados-Gámez, G., Gutiérrez-Puertas, V., & Aguilera-Manrique, G. (2020). Problematic mobile phone use, nomophobia and decision-making in nursing students mobile and decision-making in nursing students. *Nurse Education in Practice*, 49, 102910. <https://doi.org/10.1016/j.nepr.2020.102910>
- Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & Prisma Group. (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *PLoS medicine*, 6(7), e1000097. <https://doi.org/10.1371/journal.pmed.1000097>
- Montag, C., Wegmann, E., Sariyska, R., Demetrovics, Z., & Brand, M. (2019). How to overcome taxonomical problems in the study of Internet use disorders and what to do with “smartphone addiction”? *Journal of behavioral addictions*, 1-7. <https://doi.org/10.1556/2006.8.2019.59>
- Nayak, J. K. (2018). Relationship among smartphone usage, addiction, academic performance and the moderating role of gender: A study of higher education students in India. *Computers & Education*, 123, 164-173. <https://doi.org/10.1016/j.compedu.2018.05.007>
- O’Dea, S. (2021). *Number of smartphone users worldwide from 2016 to 2023*. Statista.
- Panova, T., & Carbonell, X. (2018). Is smartphone addiction really an addiction? *Journal of behavioral addictions*, 7(2), 252-259. <https://doi.org/10.1556/2006.7.2018.49>

- Przepiorka, A., Blachnio, A., & Cudo, A. (2021). Procrastination and problematic new media use: the mediating role of future anxiety. *Current Psychology*, 1-9. <https://doi.org/10.1007/s12144-021-01773-w>
- Qaisar, S., Akhter, N., Masood, A., & Rashid, S. (2017). Problematic mobile phone use, academic procrastination and academic performance of college students. *Journal of Educational Research*, 20(2), 201-214.
- Rabin, L. A., Fogel, J., & Nutter-Upham, K. E. (2011). Academic procrastination in college students: The role of self-reported executive function. *Journal of Clinical and Experimental Neuropsychology*, 33(3), 344-357. <https://doi.org/10.1080/13803395.2010.518597>
- Reinecke, L., Meier, A., Aufenanger, S., Beutel, M. E., Dreier, M., Quiring, O., Stark, B., Wölfling, K., & Müller, K. W. (2018). Permanently online and permanently procrastinating? The mediating role of Internet use for the effects of trait procrastination on psychological health and well-being. *New Media & Society*, 20(3), 862-880. <https://doi.org/10.1177/1461444816675437>
- Rozgonjuk, D., Kattago, M., & Täht, K. (2018). Social media use in lectures mediates the relationship between procrastination and problematic smartphone use. *Computers in Human Behavior*, 89, 191-198. <https://doi.org/10.1016/j.chb.2018.08.003>
- Rosenthal, R. (1984). *Meta-analytic procedures for social research*. Sage
- Saad, M. A. E. (2020). Self-Regulated Learning and Academic Procrastination as Predictors of Smartphone Addiction among Second Year-Middle School Learning Disabled Students. *Amazonia Investiga*, 9(26), 236-243. <https://doi.org/10.34069/ai/2020.26.02.27>
- Saad, M. A. E., & Khalifa, A. G. (2020). Modeling Self-Regulated Learning: The mediating role in the relationship between academic procrastination and problematic smartphone use among third year-middle school learning disabled students. *Electronic Journal of Research in Education Psychology*, 18(52), 507-522. <https://doi.org/10.25115/ejrep.v18i52.2987>
- Şahin, Y. L. (2014). Comparison of users' adoption and use cases of Facebook and their academic procrastination. *Digital Education Review*, 25, 127-138. <https://doi.org/10.1344/der.2014.25.127-138>
- Samaha, M., & Hawi, N. S. (2016). Relationships among smartphone addiction, stress, academic performance, and satisfaction with life. *Computers in human behavior*, 57, 321-325. <https://doi.org/10.1016/j.chb.2015.12.045>

- Sha, P., Sariyska, R., Riedl, R., Lachmann, B., & Montag, C. (2019). Linking internet communication and smartphone use disorder by taking a closer look at the Facebook and WhatsApp applications. *Addictive behaviors reports*, 9, 100148. <https://doi.org/10.1016/j.abrep.2018.100148>
- Shi, M., Zhai, X., Li, S., Shi, Y., & Fan, X. (2021). The Relationship between Physical Activity, Mobile Phone Addiction, and Irrational Procrastination in Chinese College Students. *International Journal of Environmental Research and Public Health*, 18(10), 5325. <https://doi.org/10.3390/ijerph18105325>
- Steel, P. (2011). *The procrastination equation: How to stop putting things off and start getting stuff done*. Pearson Education Limited.
- Suurmond, R., van Rhee, H., & Hak, T. (2017). Introduction, comparison, and validation of Meta-Essentials: a free and simple tool for meta-analysis. *Research synthesis methods*, 8(4), 537-553. <https://doi.org/10.1002/jrsm.1260>
- Uzun, B., LeBlanc, S., & Ferrari, J. R. (2020). Relationship between Academic Procrastination and Self-Control: The Mediation Role of Self-Esteem. *College Student Journal*, 54(3), 309-316.
- Wang, P., & Lei, L. (2019). How does problematic smartphone use impair adolescent self-esteem? A moderated mediation analysis. *Current Psychology*, 1-7. <https://doi.org/10.1007/s12144-019-00232-x>
- Wang, P., Liu, S., Zhao, M., Yang, X., Zhang, G., Chu, X., Wang, X., Zen, P., & Lei, L. (2019a). How is problematic smartphone use related to adolescent depression? A moderated mediation analysis. *Children and Youth Services Review*, 104, 104384. <https://doi.org/10.1016/j.childyouth.2019.104384>
- Wang, J., Wang, P., Yang, X., Zhang, G., Wang, X., Zhao, F., Zhao, M., & Lei, L. (2019b). Fear of missing out and procrastination as mediators between sensation seeking and adolescent smartphone addiction. *International Journal of Mental Health and Addiction*, 17(4), 1049-1062. <https://doi.org/10.1007/s11469-019-00106-0>
- World Health Organization. (2015). *Public health implications of excessive use of the Internet, computers, smartphones and similar electronic devices*. <https://apps.who.int/iris/handle/10665/184264>
- Yang, Z., Asbury, K., & Griffiths, M. D. (2019). An exploration of problematic smartphone use among Chinese university students: Associations with academic anxiety, academic procrastination, self-regulation and subjective wellbeing. *International Journal of*

*Mental Health and Addiction*, 17(3), 596-614. <https://doi.org/10.1007/s11469-018-9961-1>

Yang, X., Wang, P., & Hu, P. (2020). Trait Procrastination and Mobile Phone Addiction Among Chinese College Students: A Moderated Mediation Model of Stress and Gender. *Frontiers in Psychology*, 11, 3318. <https://doi.org/10.3389/fpsyg.2020.614660>

Zhen, R., Li, L., Ding, Y., Hong, W., & Liu, R. D. (2020). How does mobile phone dependency impair academic engagement among Chinese left-behind children? *Children and Youth Services Review*, 116, 105169. <https://doi.org/10.1016/j.chilyouth.2020.105169>

---

**Received:** 23-06-2021

**Accepted:** 29-12-2021