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# A Seven-Year Follow-Up of Smartphone Addiction and Psychological and Social Adjustment in the Adult Spanish Population

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A B S T R A C T

*Objective:* Our goal is to understand the association between problematic or addictive smartphone use and the psychological (i.e., depressive symptoms) and social adjustment (i.e., social support) of Spanish adults. *Method:* We used the full dataset from 2016 until the end of the follow-up period in 2023 from a series of surveys conducted by the Cybersecurity and Confidence in Spanish Households National Survey (CCSHNS), which was carried out by the National Observatory of Telecommunications and Information Society (ONTSI) of the Spanish Ministry for Digital Transformation and Public Service. *Results:* Inferential analyses performed using latent growth curve models demonstrated that the increase in smartphone addiction symptoms was significantly correlated with an increase in depressive symptoms and a decrease in social support over time. Furthermore, survival curve analysis demonstrated that the probability of being classified as a smartphone addict was higher among participants with higher levels of depression and lower social support at the start of the study. The study's findings revealed statistical relationships between the development of smartphone addiction symptoms and poorer psychological (i.e., increasing depressive symptoms) and social (i.e., decreasing social support) adjustment across all gender and age groups, except for the oldest group in the sample (over 54 years old). *Conclusions:* The findings provide insights into how the psychological and social adjustment of citizens in highly digitized societies is negatively related to excessive use of smartphones.

In this study, we present an empirical follow-up of the evolution of smartphone addiction symptoms (SAS), as well as psychological and social adjustment, in the Spanish adult population. This follow-up was conducted by the National Observatory of Telecommunications and Information Society (ONTSI) of the Spanish Ministry for Digital Transformation and Public Service between 2016 and 2023. Although data from this follow-up have been partly published for specific years (Erdem et al., 2025; Herrero, Torres, et al., 2019; Herrero, Urueña, et al., 2019; Herrero et al., 2022; Herrero et al., 2023), a comprehensive analysis of the complete time series has yet to be presented. In this study, we combine a detailed analysis of each wave with inferential statistical analyses based on latent growth curve and survival curve models. These analyses delve into the empirical relationships between different trajectories of SAS and other components of psychological and social adjustment (i.e., depressive symptoms and social support). These inferential statistical analyses are further stratified by gender and age group.

The introduction of the first iPhone model in 2007 ushered in a new era of mobile connectivity. This was followed by the adaptation of desktop applications for smartphones, as well as the creation of new applications that now dominate the digital landscape of highly digitized societies (Haidt, 2024). In light of this profound transformation, researchers and public policymakers have raised legitimate concerns about the potential negative outcomes of these technologies on users (Fineberg et al., 2025). This interest has given rise to new conceptual tools to account for this complex phenomenon, such as problematic smartphone use and smartphone addiction (Harris et al., 2020; Nawaz et al., 2024; Rochat et al.,2025). The plethora of studies that have attempted to unravel the complex empirical relationships between smartphone addiction and users' psychological and social adjustment (Augner et al., 2023; Elhai et al., 2017; Fisher-Grote et al., 2021; Lazarotto et al., 2023) is currently almost unmanageable.

A significant number of studies have been devoted to empirically accounting for the mechanisms by which problematic

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smartphone use and addiction negatively affect users' mental health. This trend is exemplified by mediation and moderated mediation analyses. However, these studies are often conducted with small convenience samples, which raises doubts about their generalizability to the population. Other studies have used nationally representative samples (Lu et al., 2024; Meng et al., 2022 for systematic reviews and meta-analyses), but they have often been limited to correlational designs, obscuring relationships over time. Consequently, a significant proportion of the results obtained thus far are characterized by limited generalizability to the population, as well as a lack of practical knowledge regarding the long-term relationships between these variables in the general population (Erdem et al., 2025; Hamaker, 2023). This limitation constrains our understanding of the relationships between variables over time.

Combining the study of representative national samples with the analysis of empirical relationships over time presents a significant research challenge. However, it is a worthwhile endeavor due to the valuable insights its results can offer into the evolution of psychological and social adjustment within the population and its relationship to the abuse and/or dependence on new communication technologies, as exemplified by problematic smartphone use or addiction. In this study, we combine two key aspects: the use of representative national samples and the analysis of changes over time. Our goal is to examine the longitudinal relationship between problematic or addictive smartphone use and the psychological and social adjustment of Spanish adults from 2016 to 2023, when the follow-up study concluded.

Two specific objectives further delineated this overarching objective. First, the study aimed to illustrate in detail how smartphone addiction relates to psychological and social adjustment across different gender and age groups. Second, the study endeavored to extrapolate the findings to the broader Spanish adult population. Achieving both specific objectives might provide a detailed understanding of how citizens in highly digitized societies experience the increasing digitization of their lives and the extent to which this may affect different segments of the population.

## Method

### Participants and Procedure

In this study, we used the series of surveys conducted by the Cybersecurity and Confidence in Spanish Households National Survey (CCSHNS), carried out by the National Observatory of Telecommunications and Information Society (ONTSI) of the Spanish Ministry for Digital Transformation and Public Service. The CCSHNS is a nationally representative survey on cybersecurity conducted every six months in Spain. Each panel includes a representative sample of Spanish internet users aged 18 to 75. Representativeness of the sample ensures a sufficient number of participants in all age segments, especially in more vulnerable populations such as young people. The primary sampling units are households, and the secondary sampling units are individuals within those households. First, a representative Spanish sample of households is selected in terms of autonomous communities, size of locality, social class, and number of persons in the household. Second, Internet users over 17 years of age within these households are identified and selected. In each wave, around 3,500 participants are sampled and complete the online questionnaire. Since 2016, the survey has broadened its focus to include smartphone abuse and users' psychological and social adjustment. For this study, we used the full set of data from 2016 until the end of the follow-up period in 2023.

### Variables and Scales

#### *Smartphone Addiction Symptoms*

The CCSHNS used Bian and Leung's (2015) Smartphone Addiction Symptoms Scale (SAPS). The original SAPS is a 19-item scale that assesses various aspects of mobile phone addiction, such as withdrawal and craving. Bian and Leung used eight of these items to create an addiction measure based on Young's internet addiction criteria. While the items were originally coded from 1 (*never*) to 5 (*most of the time*), Bian and Leung considered only response categories 4 (*many times*) and 5 (*most of the time*) for the evaluation of addiction. Following Bian and Leung's criteria, these eight items were initially dichotomized (values 1 to 3 were recoded as 0, and values 4 to 5 were recoded as 1) and summed, resulting in a score ranging from 0 to 8. Higher scores on the scale indicate more symptoms of smartphone addiction. The scale also classifies participants as addicts or non-addicts using a cutoff criterion of 5. Participants scoring between 5 and 8 are considered addicts, whereas those scoring below the cutoff point are not. The present study uses both types of information from the SAPS to estimate the evolution of SAS (latent growth curve models) as well as the evolution of users identified as addicts based on their scores on the scale (survival curve analyses). Individual trajectories of the participants were estimated using a set of waves with matching samples from 2017 to 2021 (9-time panels).

#### *Depressive Symptomatology*

A 7-item version of the Center for Epidemiologic Studies Depression Scale (CESD; Herrero & Gracia, 2007; Juarros-Basterretxea et al., 2021) was used by the CCSHNS. The CESD is a validated self-report scale designed to measure depressive symptoms in the general population. Items referred to experiences over the past week (e.g., "I felt that I could not shake off the blues even with the help of my family or friends"). Response categories ranged from 1 = *rarely/never* to 4 = *all or most of the time.* As no cutoff point is provided for CESD-7 scores, the average of the raw scale scores (with reverse coding applied where necessary) is indicative of depressive symptomatology. Individual trajectories of participants' depressive symptoms were estimated using a set of waves with matching samples from 2017 to 2021 (9-time panels).

#### *Social Support*

The CCSHNS used the Strong-Tie Support Scale (Lin et al., 1981) to measure social support from intimate and confidant relationships, using three items rated on a five-point scale from 1 *never* to 5 *most of the time.* The three items refer to (1) a close companion, (2) family, and (3) friends. The scale represents the extent to which respondents felt that their support needs were met by their close companions and is a highly recommended measure of social support for large surveys (Herrero et al., 2011). Individual trajectories of participants' social support were estimated using a set of waves with matching samples from 2017 to 2021 (9-time panels).

#### *Sociodemographic*

Gender (1 = men, 2= women) and age group (1= 18-24 years old, 2 = 25-34 years old, 3 = 35-44 years old, 4= 45-54 years old, and 5 = older than 54 years old) were used as sociodemographic variables in the study.

### Control Variable

### Potential Response Bias

The Strahan and Gerbasi (1972) short form of the Marlowe–Crowne Social Desirability Scale was used to control for potential response bias. This form includes 10 true-false items from the original 33-item scale (1 = true, 2 = false). Negative items were reverse-coded so that higher scale scores reflect higher levels of social desirability. Scores on all 10 items were averaged.

## Analytical Strategy

First, the national distribution of SAS, depressive symptoms, and social support was analyzed in each panel using survey weights to ensure the national representativeness of the results.

Second, given that the series with matching samples began in the second half of 2017 and continued until the second half of 2021 (nine-time panels), the analyses of the trajectories of these variables were calculated using regression weights from the second half of 2017. At this stage, we conducted attrition analyses and MAR analyses. Under the Missing At Random (MAR) assumption, which holds when missingness depends on observed variables but not on unobserved outcomes, Full Information maximum likelihood (FIML) uses all available data to provide robust and unbiased parameter estimates. Thus, even in the presence of partial attrition, the longitudinal trajectories of smartphone addiction, depressive symptoms, and social support could be estimated accurately using FIML estimation.

We estimated a latent growth curve for each participant and examined the mean growth rates (slopes) and scores at the beginning of the study (intercepts) across gender and age groups. After calculating the temporal trajectories of smartphone addiction, depressive symptoms, and social support, we estimated a set of models to analyze the relationships between these trajectories among the participants of the study. At this stage of the study, we examined the relationships between growth rates of SAS and growth rates of depressive symptoms and social support by estimating the covariances between slopes. To analyze the probability that participants would be classified as addicts over time, we estimated discrete-time survival curves for the dichotomous non-addict/addict variable.

All models were estimated using maximum likelihood estimation with robust standard errors and full-information maximum likelihood for missing data. All models were conducted using Mplus version 8.7 (Muthén & Muthén, 2017).

# Results

## Descriptives of Study Variables from the Years 2016 to 2023

Table 1 shows the weighted means of the study variables across the 14-time panels from 2016 to 2023. Reading each row from left to right provides an initial overview of variations in the study variables over the seven years analyzed.

## Smartphone Addiction Symptoms

From 2016 to 2023, there was a steady increase in SAS, rising from a national average of 0.93 in 2016 to 1.93 in 2023. While some fluctuations occurred, the overall upward trend in symptoms is evident. A comparison of addiction symptom levels in 2016 and 2023 reveals an increase of approximately 200%. According to the addiction indicator provided by SAPS, there was a clear increase in the percentage of addicts in the general population over the seven-year study period. In 2016, it was estimated that approximately 4.90% of the Spanish adult population could be classified as smartphone addicts. Single-digit averages remained, with some exceptions, until the first half of 2019, when they rose to double digits. This figure remained consistent until the study's conclusion, at which point approximately 16% of the participants were identified as smartphone addicts. From 2016 to 2023, the proportion of addictive smartphone users in the Spanish adult population increased from 1 in 20 to 6 in 20.

## Depressive Symptoms

From 2016 to 2023, there was a steady increase in depressive symptoms, rising from a national average of 1.81 in 2016 to 1.96 in 2023. An overall upward trend is observed.

## Social Support

From 2016 to 2023, there has been a steady decrease in social support, from a national average of 3.52 in 2016 to 3.43 in 2023.

**Table 1.** Descriptive Statistics and Internal Consistency of Study Variables Across 14 Time Panels[1,2]

| | 2016 (2) | 2017 (1) | 2017 (2) | 2018 (1) | 2018 (2) | 2019 (1) | 2019 (2) | 2020 (1) | 2020 (2) | 2021 (1) | 2021 (2) | 2022 (1) | 2022 (2) | 2023 (2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *N* | 3,516 | 3,666 | 3,695 | 3,512 | 3,824 | 3,619 | 3,738 | 3,659 | 3,703 | 3,711 | 4,031 | 3,721 | 3,620 | 3,371 |
| SAS | 0.93 | 1.14 | 1.21 | 1.23 | 1.47 | 1.34 | 1.62 | 1.53 | 1.57 | 1.57 | 1.90 | 2.04 | 1.97 | 1.93 |
| % Addicted | 4.90 | 8.73 | 8.10 | 8.07 | 12.45 | 9.60 | 14.47 | 13.62 | 12.25 | 11.76 | 16.35 | 18.48 | 16.73 | 16.58 |
| Depressive Symptoms | 1.81 | 1.83 | 1.80 | 1.81 | 1.84 | 1.84 | 1.87 | 1.87 | 1.90 | 1.93 | 1.95 | 1.96 | 1.95 | 1.96 |
| Social Support | 3.52 | 3.61 | 3.59 | 3.60 | 3.59 | 3.56 | 3.59 | 3.49 | 3.42 | 3.42 | 3.39 | 3.37 | 3.40 | 3.43 |
| Internal Consistency | | | | | | | | | | | | | | |
| SAS | | | | | | | | | | | | | | |
| Cronbach's α[2] | .78 | .82 | .82 | .83 | .83 | .85 | .85 | .84 | .84 | .85 | .86 | .87 | .86 | .86 |
| Depressive Symptoms | | | | | | | | | | | | | | |
| Cronbach's α | .88 | .88 | .88 | .88 | .89 | .88 | .88 | .89 | .89 | .89 | .89 | .90 | .91 | .90 |
| McDonell's ω | .88 | .88 | .88 | .88 | .89 | .88 | .89 | .89 | .89 | .89 | .89 | .90 | .91 | .90 |
| Social Support | | | | | | | | | | | | | | |
| Cronbach's α | .70 | .69 | .67 | .68 | .73 | .69 | .69 | .72 | .63 | .62 | .65 | .68 | .70 | .71 |
| McDonell's ω | .71 | .71 | .69 | .72 | .83 | .71 | .71 | .73 | .68 | .67 | .69 | .71 | .72 | .72 |

*Note.* (1) and (2) refer to the first (January-June) and second (July-December) semesters of each year, respectively.
[1]All figures are weighted using the survey weights.
[2]For dichotomous items Cronbach's α is Kuder-Richardson's 20 (KR-20).
SAS = Smartphone addiction symptoms.

**Table 2.** Model Fit for Gender and Age Groups of Latent Growth of Smartphone Addiction, Depression and Social Support

| | Model Fit | | | Likelihood Ratio Test | | |
|---|---|---|---|---|---|---|
| | $\chi^2(df)$ | CFI | RMSEA (90% CI) | $\Delta\chi^2$ | $\Delta df$ | $p$ |
| | | | SAS | | | |
| Gender | | | | | | |
| Model A | 123.72(80)** | .98 | .02 (.01, .02) | - | - | - |
| Model B | 134.96(82)*** | .98 | .02 (.01, .02) | 9.52 | 2 | .001 |
| Model C | 130.21(81)*** | .98 | .02 (.01, .02) | 4.77 | 1 | .046 |
| Model D | 127.67(81) *** | .98 | .02 (.01, .02) | 2.23 | 1 | .312 |
| Age | | | | | | |
| Model A | 549.10(200)*** | .94 | .05 (.04, .05) | | | |
| Model B | 775.47(208)*** | .90 | .06 (.06, .07) | 226.37 | 8 | .001 |
| Model C | 754.27(204)*** | .91 | .06 (.06, .07) | 205.17 | 4 | .001 |
| Model D | 549.99(204) *** | .94 | .05 (.04, .05) | 0.89 | 4 | .998 |
| | | | Depressive Symptoms | | | |
| Gender | | | | | | |
| Model A | 161.72(80)** | .98 | .02 (.01, .02) | - | - | - |
| Model B | 197.97(82)*** | .98 | .02 (.02, .03) | 36.25 | 2 | < .001 |
| Model C | 175.82(81)*** | .98 | .02 (.02, .03) | 14.10 | 1 | < .001 |
| Model D | 171.73(81) *** | .98 | .02 (.02, .03) | 10.01 | 1 | .002 |
| Age | | | | | | |
| Model A | 400.92(200)*** | .98 | .03 (.03, .04) | | | |
| Model B | 483.98(208)*** | .97 | .04 (.03, .05) | 83.06 | 8 | < .001 |
| Model C | 456.67(204)*** | .97 | .05 (.04, .06) | 55.75 | 4 | < .001 |
| Model D | 410.44(204) *** | .98 | .04 (.03, .04) | 9.48 | 4 | .050 |
| | | | Social Support | | | |
| Gender | | | | | | |
| Model A | 139.87(80)*** | .99 | .02 (.01, .03) | - | - | - |
| Model B | 151.92(82)*** | .98 | .02 (.02, .03) | 12.03 | 2 | .002 |
| Model C | 143.82(81)*** | .98 | .02 (.02, .03) | 3.95 | 1 | .046 |
| Model D | 142.63(81) *** | .98 | .02 (.02, .03) | 2.76 | 1 | .096 |
| Age | | | | | | |
| Model A | 346.69(200)*** | .98 | .03 (.03, .04) | | | |
| Model B | 506.54(208)*** | .96 | .04 (.04, .05) | 159.85 | 8 | < .001 |
| Model C | 491.21(204)*** | .96 | .04 (.04, .05) | 144.52 | 4 | < .001 |
| Model D | 365.97(204) *** | .98 | .03 (.03, .04) | 19.28 | 4 | < .001 |

*Note.* Models estimated across groups are as follows: Model A (different intercepts and slopes), Model B (equal intercepts and slopes), Model C (equal intercepts and different slopes), and Model D (different intercepts and equal slopes). Models B, C, and D are compared with Model A using the likelihood ratio test (LRT). Comparisons of means across age groups are Bonferroni-corrected.
**$p$ < .01, ***$p$ < .001

The lower part of Table 1 shows the internal consistency of the scales used at the 14 time points. Acceptable levels of internal consistency were observed throughout the study.

The analysis of the descriptive statistics revealed several key findings. First, there was an increase in symptoms of smartphone addiction. Second, there was a rise in the percentage of the Spanish population addicted to smartphones. Third, there was an increase in depressive symptoms. Fourth, social support decreased.

## Attrition Analyses

Participants who dropped out at the beginning of the study exhibited slightly higher baseline levels of depressive symptoms ($M$ = 1.88 vs. 1.81, $t$ = 3.21, $p$ < .01), higher smartphone addiction symptoms ($M$ = 1.20 vs. 1.12, $t$ = 2.87, $p$ < .01), and lower social support ($M$ = 3.48 vs. 3.53, $t$ = -2.55, $p$ = .01) than those who remained in the study. However, gender and age distributions did not differ significantly between the groups ($p$ > .10). Overall, more than 75% of participants had valid data in at least three panels ($n$ = 2,696), supporting the stability of the FIML estimates.

## Latent Growth Analyses

As illustrated in Table 1, national average trends suggested potential relationships among the study variables. There was an increase in smartphone addiction symptoms, accompanied by worsening psychological and social adjustment. Specifically, there was an increase in depressive symptoms and a decrease in social support. In Table 3, we present the unstandardized coefficients of the average growth trajectory estimates for each study variable across sex and age groups. Several models were estimated. First, in model A, we estimated the intercepts and slopes freely across groups. In a second model (Model B), we imposed the constraint that the intercepts and slopes were equal across groups. A third model (Model C) constrained the intercepts to be equal across groups while allowing slopes to vary. In the final model (Model D), intercepts were freely estimated and slopes were constrained to be equal across groups. Model A was statistically compared to Models B, C, and D, using the likelihood ratio test (LRT).

The models estimated across groups are as follows: Model A (different intercepts and slopes), Model B (equal intercepts and slopes), Model C (equal intercepts and different slopes), and

**Table 3.** Comparisons of Intercepts and Slopes Across Gender and Age Groups

| | Gender | | | | Age Group | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Intercepts | | Slopes | | Intercepts | | | | | Slopes | | | | |
| | Men | Women | Men | Women | 18-24 | 25-34 | 35-44 | 45-54 | +55 | 18-24 | 25-34 | 35-44 | 45-54 | +55 |
| SAS | 1.10b | 1.26a | 0.16 | 0.16 | 1.91a | 1.59b | 1.04c | 0.84d | 0.60e | 0.16 | 0.16 | 0.16 | 0.16 | 0.16 |
| Depressive Symptoms | 1.70b | 1.80a | 0.00b | 0.01a | 1.97a | 1.83b | 1.76c | 1.73d | 1.70d | 0.00c | 0.15[a] | 0.00c | 0.01b | 0.01b |
| Social Support | 3.67a | 3.57b | -0.17 | -0.17 | 3.31d | 3.49c | 3.65b | 3.82a | 3.83a | 0.00a | -0.02b | -0.01b | -0.03c | -0.03c |

*Note.* SAS = smartphone addiction symptoms.
a > b > c > d > e
*$p$ < .05

Model D (different intercepts and equal slopes). Models B, C, and D are compared with Model A using the likelihood ratio test (LRT). Comparisons of means across age groups are Bonferroni-corrected (see Table 2).

### *SAS*

**Gender.** The estimated models showed a good fit to the data (CFI = .98, RMSEA = .02, 90% CI [.01, .02]). LRT results indicated that Model D (with different intercepts and equal slopes across male and female participants) provided the best fit to the data ($\Delta\chi^2$ = 2.23, *df* = 1, $p$ = .312).

**Age.** Models A and D showed the best fit to the data (CFI = .98, RMSEA = .05, 90% CI [.04, .05]); though Model D showed a statistical improvement over Model A ($\Delta\chi^2$ = 0.89, *df* = 4, $p$ = .998). This suggested that SAS intercepts differed by age group, whereas slopes did not.

### *Depressive Symptoms*

**Gender.** The estimated models showed a good fit to the data (CFI = .98, RMSEA = .02, 90% CI [.02-.03]). LRT results indicated that Model A (with different intercepts and slopes for male and female participants) provided the best fit to the data, as Models B, C, and D did not provide a statistically significant improvement over Model A.

**Age.** All models showed a good fit to the data (CFI's ≥ .97, RMSEA ≤ .05, 90% CI [.03, .06]). However, Model D showed a statistical improvement over Model A ($\Delta\chi^2$ = 9.48, *df* = 4, $p$ = .05). This suggested that depressive symptom intercepts differed by age group, but slopes did not.

### *Social Support*

**Gender.** The estimated models showed a good fit to the data (CFI = .98, RMSEA = .02, 90% CI [.02, .03]). According to the LRT results, Model D (with different intercepts and equal slopes for male and female participants) provided the best fit to the data ($\Delta\chi^2$ = 2.76, *df* = 1, $p$ = .096), outperforming Model A.

**Age.** All models showed a good fit to the data (CFI's ≥ .96, RMSEA ≤ .04, 90% CI [.03, .05]). LRT results indicated that Model A (with different intercepts and slopes for male and female participants) provided the best fit to the data, as Models B, C, and D did not show a statistically significant improvement over Model A.

Table 3 presents the statistical comparisons performed on the intercepts and slopes across gender and age groups. For smartphone addiction, the slope was estimated at 0.16 ($p$ < .001) for both men and women across all age groups. At the beginning of the study, women scored higher than men on SAS (1.26 > 1.10, $p$ < .05), and intercepts significantly declined across age groups.

Women reported higher levels of depressive symptoms than men (1.80 > 1.70, $p$ < .05) at the beginning of the study, as well as a higher rate of increase in depressive symptoms over time (.01 > .00, $p$ < .05). Younger participants scored higher on depressive symptoms at the beginning of the study than older participants. However, only the 25-34 age group showed an increasing rate of depressive symptoms over time compared with other age groups.

Male participants reported higher levels of social support than female participants at the beginning of the study (3.67 vs. 3.57, $p$ < .05). The estimated rate at which social support declined over time for both men and women was -0.19 ($p$ < .001). Although younger participants reported lower levels of social support at the beginning of the study (intercept = 3.31), they did not show a decline in social support over time (slope = 0.00, *ns*). The sharpest decreases in social support over time were observed among the older populations (45-54 and ≥ 55 years old) (slopes = -0.03, $p$ < .001).

### *Relationships among Trajectories of Smartphone Addiction, Depressive Symptoms, and Social Support over Time*

We estimated a general model to examine the relationships between trajectories of smartphone addiction, depressive symptoms, and social support across the entire sample. Based on the analysis already carried out and presented in Table 2, for each trajectory, we maintained the equality or difference in intercepts and slopes previously verified. For the evolution of SAS, different intercepts and equal slopes were hypothesized for men and women. For the evolution of depressive symptoms, different intercepts and slopes were hypothesized for men and women. Finally, for the evolution of social support, different intercepts and equal slopes were hypothesized for men and women. The model fit the data well: $\chi^2$ = 1128.07, *df* = 704, $p$ < .001, CFI = .97, RMSEA = .02, 90% CI [.02, .02]. To verify whether the estimated covariances between the trajectories of SAS, depressive symptoms, and social support could be considered equal for men and women, a model was estimated that imposed these equalities across gender groups. This model also fit the data well: $\chi^2$ = 1130.62, *df* = 707, $p$ < .001, CFI = .97, RMSEA = .02, 90% CI [.02, .02]. LRT results indicated that equality of covariances for men and women was a tenable hypothesis: ($\Delta\chi^2$ = 2.23, *df* = 3, $p$ = .466). The standardized estimated slopes were as follows: SAS ($\beta$ = .23, $p$ <.001), depressive symptoms ($\beta$ = .25, $p$ < .001), and social support ($\beta$ = -.39, $p$ < .001). The standardized estimated trajectories all significantly covaried: SAS and depressive symptoms ($r$ = .61, $p$ < .001); SAS and social support ($r$ = -.50, $p$ < .001); and depressive symptoms and social support ($r$ = -.57, $p$ < .001). These findings indicate a significant relationship between the escalation of SAS over time and the augmentation of depressive symptoms, with a corresponding decline in social support observed among both male and female participants.

After examining the results in Table 2, it was hypothesized that there would be different intercepts and equal slopes for SAS and depressive symptoms across age groups. Additionally, it was hypothesized that there would be different intercepts and slopes for the evolution of social support across age groups. The model fit

the data well: $\chi^2$ = 3502.37, *df* = 1763, *p* < .001, CFI = .95, RMSEA = .03, 90% CI [.03, .04]. To verify whether the estimated covariances between the trajectories of SAS, depressive symptoms, and social support could be considered equal, a model was estimated that imposed these equalities across the age groups. This model also fit the data well: $\chi^2$ = 3525.44, *df* = 1775, *p* <.001, CFI = .95, RMSEA = .04, 90% CI [.03, .04]. LRT results indicated that the equality of covariances across age groups was not a tenable hypothesis: ($\Delta\chi^2$ = 23.07, *df* = 12, *p* = .027). Inspection of results indicated that it was not tenable that the covariance of SAS and depressive symptoms were equal for the over 55 years old group and the rest of age groups. We released this equality constraint and estimated the model, which showed a significant improvement: ($\Delta\chi^2$ = 19.45, *df* = 11, *p* = .053). Inspection of results of this final model showed that SAS trajectories were significantly correlated with depressive symptom trajectories (*r* = .24, *p* < .01) and social support trajectories (*r* = -.27, *p* < .01). Depressive symptom and social support trajectories were significantly related (*r* = -.46, *p* < .001). For the over-54 age group, the correlation between SAS and depressive symptom trajectories was *r* = .20, although non-significant.

### Discrete-Time Survival Analysis

Previous analyses gave us a clear idea of the relationship between SAS, depressive symptoms, and social support. However, average symptom levels in the population were low. Therefore, the results described above do not fully capture the extent of SAS risk in the Spanish population or how this risk relates to the study variables. To address this, we estimated a survival curve analysis of the study participants over time to account for the evolution of those classified as smartphone addicts on the SAPS (with a score greater than or equal to 5).

#### *Gender*

The survival rates for the gender groups at the end of the study were as follows: men = 69.94%; women = 63.74%. The estimated addiction rate was higher in women (β = .24, *p* < .01) than in men.

#### *Age*

The survival rates for the age groups at the end of the study were as follows: 18-24 years = 45.25%; 25-34 years = 56.47%; 35-44 years = 71.89%, 45-54 years = 76.76%, over 54 years = 85.17%. Compared to the younger age group, all other groups showed a slower increase in addicts over time except for the 25-34 age group: 25-34 years (β = -.22, *ns*); 35-44 years (β = -.81, *p* < .001); 45-54 years old (β = -.95, *p* < .001); and over-54 years (β = -1.25, *p* < .001).

Overall, 30% of men and 36% of women were classified as smartphone addicts at some point during the follow-up study. These percentages increased among the younger population, reaching 44% to 54% among participants under 35 years of age.

In the final stage of the analyses, we aimed to identify study variables that would shorten the time it took for participants to be classified as smartphone addicts. We entered depressive symptoms, social support, and sociodemographic factors, such as gender and age, as predictors of the survival curve. Potential response bias (i.e., social desirability) was also included as a predictor. The standardized results showed that, over time, being classified as an addict was negatively associated with age (β = -.46, *p* < .001). Lower levels of social support (β = -.42, *p* < .001) and higher levels of depressive symptoms (β = .43, *p* < .001) were predictive of addiction over time. Finally, social desirability was predictive of self-reported lower addiction (β = -.22, *p* < .01).

## Discussion

The objective of this study was to present the analysis of follow-up data on the evolution of smartphone addiction symptoms and psychological and social adjustment (depressive symptoms and social support) in the Spanish population aged 18-75, collected by the CCHNSH from 2016 to 2023. To this end, the complete time series is analyzed, to provide a detailed overview of what has happened in Spain over these seven years in terms of technological dependencies and their relationship with the psychological and social adjustment of the Spanish adult population. We aimed to provide researchers and public policy makers with information on changes that have occurred in the Spanish adult population. To this end, the complete CCNCSH data set was analyzed using growth curves and survival curves, with particular attention to differences by gender and age groups, as well as the relationships between trajectories of smartphone addiction and psychological and social adjustment (depressive symptoms and social support). Regarding depressive symptoms, the change observed over the seven years is modest in magnitude and that statistical significance may partly reflect the large sample size. However, we also note that even relatively small shifts in population-level mental health indicators may have meaningful implications for public health when observed at the national level. Changes from 1.81 to 1.96 reflect a national average increase in depressive symptoms of 8.3%, which is of practical relevance for public policy.

A thorough analysis of the evolution of SAS revealed an almost twofold increase on average between 2016 and 2023. The national average, however, remained below the addiction threshold. In contrast, the rate of smartphone addiction (as defined by the SAPS cut-off criterion) showed a substantial increase, rising from less than 10% in the early years of the study to well above this threshold by its conclusion. At the start of the study, approximately one in 20 Spanish adults exhibited symptoms consistent with smartphone addiction. By the end of the study, this proportion had risen to six out of 20 Spanish adults.

This increase in SAS and in the percentage of individuals who met diagnostic criteria for addiction was accompanied by a deterioration in psychological and social adjustment in the population, as indicated by increased depressive symptoms and decreased social support. Inferential analyses using latent growth curves demonstrated that the increase in SAS was significantly correlated with the rise in depressive symptoms and the decline in social support over the seven years under scrutiny. Furthermore, survival curve analysis demonstrated that the probability of being classified as a smartphone addict was higher among participants with higher levels of depression and lower levels of social support at the start of the study.

The present study examined the participants' trajectories of SAS, depressive symptoms, and social support across gender and age groups, providing additional information on these processes in the Spanish adult population. Regarding the evolution of SAS, the increase was consistent across both men and women, and across all age groups examined. However, the prevalence of SAS varied across gender and age groups. Women reported higher rates of SAS than men, and younger participants (under 34) exhibited higher rates than older participants at the start of the study. Regardless of these initial levels, all participants showed a comparable increase in their SAS. These results suggest that the capacity of intensive smartphone use to generate addiction is independent of gender and age.

The study's findings revealed significant relationships between the development of SAS and psychological and social adjustment across all gender and age groups, except for the oldest group in the sample (over 54 years old). Although the relationships across gender and age groups were in the same direction, the relationship

did not reach statistical significance in the oldest age group. These results suggest that the association between smartphone addiction and psychological and social adjustment is relatively independent of gender and age. This seems to contradict the popular view that certain vulnerable populations, such as young people and adolescents may be more sensitive to its negative consequences. Our findings offer a valuable clarification: although the association between smartphone addiction and its outcomes is comparable across demographic groups, the levels of addiction themselves vary. From this perspective, it is foreseeable that young people and women will experience the negative outcomes of smartphone addiction more intensely, precisely because they exhibit higher levels of addiction.

Some relevant issues in the study deserve further consideration. First, the results are based on a seven-year follow-up of the national adult population, which enhances their significance. Second, the results of the statistical analyses implemented suggested relationships over time, a distinctive feature that is absent in most studies in this area. Third, partly due to the previous two points, the study's findings provide a detailed—and probably extrapolable—insight into how citizens of highly digitized societies may experience negative outcomes (Herrero et al., 2025) in their psychological and social adjustment as a result of excessive use of mobile communication and information technologies (i.e., smartphone addiction). For this reason, this comprehensive empirical overview may offer researchers and public policymakers valuable insights to guide public policies in the field.

## Conflict of Interest

The authors of this article declare no conflict of interest.

## Data Availability

Data is freely available at https://www.observaciber.es/#estudios. The code used to generate the estimated models are available from the authors upon request.

## References


Augner, C., Vlasak, T., Aichhorn, W., & Barth, A. (2023). The association between problematic smartphone use and symptoms of anxiety and depression—a meta-analysis. *Journal of Public Health, 45*(1), 193-201. https://doi.org/10.1093/pubmed/fdab350

Bian, M., & Leung, L. (2015). Linking loneliness, shyness, smartphone addiction symptoms, and patterns of smartphone use to social capital. *Social Science Computer Review, 33*(1), 61-79. https://doi.org/10.1177/0894439314528779

Elhai, J. D., Dvorak, R. D., Levine, J. C., & Hall, B. J. (2017). Problematic smartphone use: A conceptual overview and systematic review of relations with anxiety and depression psychopathology. *Journal of Affective Disorders, 207*, 251-259. https://psycnet.apa.org/doi/10.1016/j.jad.2016.08.030

Erdem, H. D., Herrero, J., & Urueña, A. (2025). The bidirectional relationships between social pressure in digital contexts, depression, and social support over time. *Psychosocial Intervention, 34*(3), 189 - 200. https://doi.org/10.5093/pi2025a15

Fineberg, N. A., Demetrovics, Z., Potenza, M. N., Mestre-Bach, G., Ekhtiari, H., Roman-Urrestarazu, A., & Stein, D. J. (2025). Global action on problematic usage of the internet: Announcing a Lancet Psychiatry Commission. *The Lancet Psychiatry, 12*(1), 11-13. https://doi.org/10.1016/s2215-0366(24)00323-7

Fischer-Grote, L., Kothgassner, O. D., & Felnhofer, A. (2021). The impact of problematic smartphone use on children's and adolescents quality of life: A systematic review. *Acta Paediatrica, 110*(5), 1417-1424. https://doi.org/10.1111/apa.15714

Haidt, J. (2024). *The anxious generation: How the great rewiring of childhood is causing an epidemic of mental illness.* Penguin Press.

Hamaker, E. L. (2023). The within-between dispute in cross-lagged panel research and how to move forward. *Psychological Methods, 31*(1), 56–76. https://doi.org/10.1037/met0000600

Harris, B., Regan, T., Schueler, J., & Fields, S. A. (2020). Problematic mobile phone and smartphone use scales: A systematic review. *Frontiers in Psychology, 11,* Article 672. https://doi.org/10.3389/fpsyg.2020.00672

Herrero, J., Erdem, H. D., Torrres, A., & Urueña, A. (2025). Democracy dysfunctions and citizens' digital agency in highly contaminated digital information ecosystems. *Societies, 15*, Article 175. https://doi.org/10.3390/soc15070175

Herrero, J., Fuente, A., & Gracia, E. (2011). Covariates of subjective well-being among Latin American immigrants in Spain: The role of social integration in the community. *Journal of Community Psychology, 39*(7), 761–775. https://doi.org/10.1002/jcop.20468

Herrero, J., & Gracia, E. (2007). Una medida breve de la sintomatología depresiva (CESD-7) [A brief measure of depressive symptomatology] (CESD-7). *Salud Mental, 30*(5), 40–46.

Herrero, J., Rodríguez, F. J., & Urueña, A. (2023). Use of smartphone apps for mobile communication and social digital pressure: A longitudinal panel study. *Technological Forecasting and Social Change, 188*, Article 122292. https://doi.org/10.1016/j.techfore.2022.122292

Herrero, J., Torres, A., Vivas, P., & Urueña, A. (2019). Smartphone addiction and social support: A three-year longitudinal study. *Psychosocial Intervention, 28*(3), 111-118. https://doi.org/10.5093/pi2019a6

Herrero, J., Torres, A., Vivas, P., & Urueña, A. (2022). Smartphone addiction, social support, and cybercrime victimization: A discrete survival and growth mixture model. *Psychosocial Intervention, 31*(1), 59-66. https://doi.org/10.5093/pi2022a3

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

Juarros-Basterretxea, J., Escoda-Menéndez, P., Vilariño, M., Rodríguez-Díaz, F. J., & Herrero, J. (2021). Using the CES-D-7 as a screening instrument to detect major depression among the inmate population. *International Journal of Environmental Research and Public Health, 18*(3), Article 1361. https://doi.org/10.3390/ijerph18031361

Lazarotto Schroeder, G., Heckler, W., Francisco, R., & Barbosa, J. L. V. (2023). Problematic smartphone use on mental health: A systematic mapping study and taxonomy. *Behaviour & Information Technology, 42*(16), 2808-2831. https://doi.org/10.1080/0144929X.2022.2149422

Lin, N., Ensel, W., & Vaughn, J. (1981) Social resources and strength of ties: Structural factors in occupational status attainment. *American Sociological Review, 46,* 393-405. https://doi.org/10.2307/2095260

Lu, X., An, X., & Chen, S. (2024). Trends and influencing factors in problematic smartphone use prevalence (2012–2022): A systematic review and meta-analysis. *Cyberpsychology, Behavior, and Social Networking, 27*(9), 616-634. https://doi.org/10.1089/cyber.2023.0548

Meng, S.-Q., Cheng, J.-L., Li, Y.-Y., Yang, X.-Q., Zheng, J.-W., Chang, X.-W., Shi, Y., Chen, Y., Lu, L., Sun, Y., Bao, Y.-P., & Shi, J. (2022). Global prevalence of digital addiction in general population: A systematic review and meta-analysis. *Clinical Psychology Review, 92,* Article 102128. https://doi.org/10.1016/j.cpr.2022.102128

Muthén, L. K., & Muthén, B. O. (2017). *Mplus: Statistical analysis with latent variables: User's guide (Version 8).* Authors.

Nawaz, S., Bhowmik, J., Linden, T., & Mitchell, M. (2024). Validation of a modified problematic use of mobile phones scale to examine problematic smartphone use and dependence. *Heliyon, 10*(2), Article e24832. https://doi.org/10.1016/j.heliyon.2024.e24832

Rochat, L., Cruz, G. V., Aboujaoude, E., Courtois, R., Brahim, F. B., Khan, R., & Khazaal, Y. (2025). Problematic smartphone use in a representative sample of US adults: Prevalence and predictors. *Addictive Behaviors, 162,* Article 108228. https://doi.org/10.1016/j.addbeh.2024.108228

Strahan, R., & Gerbasi, K. C. (1972). Short, homogeneous versions of the Marlow-Crowne Social Desirability Scale. *Journal of Clinical Psychology, 28*(2), 191-193. https://doi.org/ 10.1002/1097-4679(197204)28:2<191::AID-JCLP2270280220>3.0.CO;2-G