Culture and Education

Parents' Perceptions of Their Children's Smartphone Use

--Manuscript Draft--

Full Title:	Parents' Perceptions of Their Children's Smartphone Use
Manuscript Number:	
Order of Authors:	Pablo-César Muñoz-Carril, Ph.D
	Isabel Dans Álvarez de Sotomayor, phd
	Eduardo-José Fuentes-Abeledo, Phd
	María-Lidia Platas-Ferreiro
Article Type:	Special Issue Paper
Keywords:	mobile phones; primary education; minors; parental perceptions
Abstract:	The aim of this study was to identify parents' perceptions about how much and how often their primary-school-aged children used mobile phones and what kinds of activities they used them for. The study used a quantitative methodology with a survey-based design. A total of 1135 subjects participated. The results indicated that there were three main uses for mobile phones: social interaction, school- and information-related tasks, and leisure. Overall, the level of mobile phone use was low or moderate, with the consumption of video content and videogames standing out. Statistically significant differences, via MANOVA tests, were found between the types of uses and variables such as gender, school year, hours spent using the mobile phone each day, and impact on school performance.
Funding Information:	Ministerio de Ciencia, Innovación y Universidades (RTI 2018-095690-B-I00) — Not applicable
Additional Information:	
Question	**Response**

Parents' Perceptions of Their Children's Smartphone Use

Percepciones de las familias sobre el uso de móviles

Abstract

The aim of this study was to identify parents' perceptions about how much and how often their primary-school-aged children used mobile phones and what kinds of activities they used them for. The study used a quantitative methodology with a survey-based design. A total of 1135 subjects participated. The results indicated that there were three main uses for mobile phones: social interaction, school- and information-related tasks, and leisure. Overall, the level of mobile phone use was low or moderate, with the consumption of video content and videogames standing out. Statistically significant differences, via MANOVA tests, were found between the types of uses and variables such as gender, school year, hours spent using the mobile phone each day, and impact on school performance.

Keywords: mobile phones, primary education, minors, parental perceptions.

Acknowledgements

This article was produced as part of the "IV Convocatoria de Proyectos de Innovación Educativa en Aprendizaje-Servicio (ApS)" by the University of Santiago de Compostela, and as part of the researchs projects entitled: "How the best university teachers learn: impact on learning ecologies on quality of teaching" [*Cómo aprenden los mejores docentes universitarios en la era digital: Impacto de las ecologías de aprendizaje en la calidad de la docencia*"] (Reference: EDU2015-67907-R) and "Learning Ecologies in the digital age: new opportunities for secondary-school teacher training" ["*Ecologías de aprendizaje en la era digital: nuevas oportunidades para la formación del profesorado de educación secundaria"*] (ECO4LEARN-SE) (Reference: RTI 2018-095690-B-I00), partly financed by the Spanish Ministry of Science, Innovation and Universities.

Pablo-César Muñoz-Carril*
* Corresponding autor.
pablocesar.munoz@usc.es
Dpto. de Pedagogía y Didáctica.
Facultad de Formación del Profesorado
Avda. Ramón Ferreiro s/n., CP 27002. Lugo (España).
Universidad de Santiago de Compostela

Isabel Dans-Álvarez-de-Sotomayor
isabel.dans@usc.es
Dpto. de Pedagogía y Didáctica
Facultad de Ciencias de la Educación
Rúa Prof. Vicente Fráiz Andón, s/n, CP 15782.Santiago de Compostela (España)
Universidad de Santiago de Compostela

Eduardo-José Fuentes-Abeledo
eduardo.fuentes@usc.es
Dpto. de Pedagogía y Didáctica
Facultad de Ciencias de la Educación
Rúa Prof. Vicente Fráiz Andón, s/n, CP 15782.Santiago de Compostela (España)
Universidad de Santiago de Compostela

María-Lidia Platas-Ferreiro
lidia.platas@usc.es
Dpto. de Pedagogía y Didáctica.
Facultad de Formación del Profesorado
Avda. Ramón Ferreiro s/n., CP 27002. Lugo (España).
Universidad de Santiago de Compostela

It is 45 years since the first mobile phone call was made and the world has become exponentially more high-tech and hyperconnected (Eurostat, 2021). Our lives today are affected by this digital revolution, the speed of which over the last ten years is unmatched in human history. The proximity of mobile phones and our constant use of them make them key elements in the digital condition. The risks of living our social and cultural lives via mobile phones (Suárez, 2020) have given rise to various studies aimed at understanding how digital environments are forged and developed which characterize contemporary society, and particularly how this context affects minors and their families.

Studies about how smartphones have been incorporated into our society show that there has been enormous growth in various countries. In the USA in 2021, 97% of the population had a mobile phone, 85% of which were smartphones (Pew Research Center, 2021). The increase has been significant: ten years ago, according to data from the same survey, only 35% of Americans had a mobile phone. In the same region, children aged between zero and eight years old have access to mobile devices in 97% of homes (Rideout & Roob, 2020). Data from studies in other countries about the possession and use of mobile phones show similarities. For example, a study in Turkey (Kulakci-Altintas, 2020) with 500 families who had children aged 0-3 years old, 40.8% reported that their children had used a mobile phone. In Spain in 2020, the statistics indicate that 69.5% of 10 to 15 year-olds had a mobile device (the terms mobile phone and smartphone are used interchangeably in the rest of the text) (INE, 2020).

As the EU Kids Online report (Smahel et al., 2020) noted, providing data about children aged between 9 and 16 years old in 19 countries, access to the internet determines the conditions in which they can make use of online opportunities, as well as the risks they run. In Spain, 76% of the children surveyed reported using their devices to access the internet at least once a day (Smahel et al., 2020).

These numbers also have an impact on adults and family relationships, as the frequent use of mobile phones impacts socioemotional wellbeing, affects early interactions with children, and has repercussions on children's education (Auxier et al., 2020; Desmurget, 2020; Hansen, 2021; Hosokawa & Katsura, 2018; Syvaoja et al., 2013; Pew Research Center, 2018).

More media, booming education opportunities

Over the last two decades, the mobile phone has radically changed the nature of how we interact with each other, how we work, and how we enjoy ourselves, weaving itself into part of a digital ecosystem (González Sanmamed et al., 2019) which feeds into and affects daily life. The formerly common concern about the effects of watching television have been superseded, children can now find their favorite programs on demand in any room in the house and a variety of circumstances and settings. Businesses design digital products for infants, and offer endless activities online, as their algorithms predict children's behaviors and preferences.

We still need to make efforts in research related to this sociocultural turn of events in order to analyze the impact following the pandemic, as the effects of hyperconnectivity triggered by COVID-19, home confinement, and enforced online education are yet to be fully investigated. The first results warn of a dangerous increase in online connection in early childhood (Cartanyá-Hueso et al., 2021), severe risks of addiction in primary education (Serra et al., 2021), and an irreparable digital divide due to limited internet access for learning at home

(Ofcom, 2021). Christakis (2018) and colleagues have examined the effects of screen time in early childhood for many years and have warned of possible effects on the still-developing brain. Similar warnings have been raised by pediatrics organizations in various countries (American Academy of Pediatrics, 2016). Desmurget (2020) warned against children's abusive use of screens and the consequences on infant brain development, as well as providing a critical study of publications in books and magazines which, with little scientific rigor, have rejected, minimized, or covered up the dangers of screen time.

Authors such as Radesky et al. (2020) reported that, for the first time, small children were spending more time watching videos online than any other screen-related activity. They also noted concern about the content on sites such as YouTube and TikTok as having little educational value, often accompanied by the danger of commercialization, violence, or other content that is inappropriate for these ages. Platforms providing free audiovisual content, such as YouTube for videos and cartoons, and paid platforms, such as Netflix and Disney+ for films, have become established amongst children and are widening the digital divide in a worrying manner (Radesky et al., 2020).

The omnipresence of such media has not only presented new educational challenges in terms of the consequences noted above, but also with regard to the formation of identity. For the youngest in society, as Suárez (2020) puts it, "the digital is their reality" (p.11). The creation of their own channels and following people such as influencers, who are seen as examples to aspire to, speak to an unprecedented cultural change.

In this context of an increasing amount of accessible digital media, digital education emerges strongly. Learning is no longer wholly determined by the school system, but instead, mobile devices refer mainly to what happens outside the school gates. In primary-school children, the use of mobile phones is key in informal learning. This is helped by schools usually having rules restricting their use and that it is also limited in the family setting (Hadad et al., 2020). It is becoming more usual that when children want to learn something, they go directly to a video channel or to a search engine on the internet through their mobile phones. This produces what is called invisible learning, which educates for life, and is part of expanded learning (Uribe-Zapata, 2018; Vázquez & López, 2021).

This break in where and when learning occurs raises various questions for those responsible for children's education, firstly due to the influence of known and unknown contacts that they interact with online and through their mobile devices, although it is worth noting that children do not turn to technology to enhance communication with school friends or classmates (Pew Research Center, 2021; Radesky et al., 202; Smahel et al., 2020). The second issue is that schools do not entertain the possibility of using mobile phones in in-person learning, instead they use somewhat locked-down tablets or laptops. The scientific community has produced data supporting the general opinion that mobile phone use has a negative effect on school performance (Desmurget, 2020; Kates et al., 2018), which has not helped incorporate them into classrooms. Families, in any case, do allow mobile phones to be used to access school-related content, and many homes have additional, more sophisticated devices (INE, 2020), with much learning being done freely, spontaneously, and in isolation when children surf for entertainment on social networks in order to do activities such as create musical videos on audiovisual platforms with all kinds of shared images.

Researchers such as Martínez et al. (2020) have found that in the 9 to 12 age range, boys are given more liberty in using phone cameras, while in the 13 to 17 age range, both sexes have similar restrictions. Hence, parental mediation in digital devices is more restrictive for girls

(Bartau-Rojas et al., 2020). Other studies have looked at changes in the context of family life with regard to time spent in conversation, relaxation, and distraction mediated by screens (Madigan et al., 2019; Pew Research Center, 2018). Children's addiction to mobile phones is linked to parents' own dependency on their phones rather than to gender or age (Son et al., 2021). In fact, the time children spend with their families at weekends has been shown to have positive effects on the risks of smartphones, even in children with low self-esteem (Kim & Jhang, 2019). Other lines of research have focused on parental styles as factors influencing how mobile devices are managed (Hadad et al., 2020; Martínez et al., 2020).

Study aims and objectives

The aim of this study was to identify parents' perceptions of how often their primary-school-aged children used mobile phones and the kinds of activities they used them for. The following objectives were established:

- Determine what parents think about how much their children use mobile phones for social interaction, school tasks, and leisure.
- Determine whether children's gender influences the type of use they make of mobile phones.
- Examine whether school year is a variable related to primary-school students' use of mobile phones.
- Assess whether there are statistically significant differences in the time spent using mobile phones based on the type and frequency of mobile phone use.
- Determine from the parents' perspectives, what impact their children's use of mobile phones has had on their school performance.

Methodology

This study used a quantitative methodology with an ex post facto design, using a non-experimental survey-based method (Cohen & Manion, 2002; McMillan & Schumacher, 2005). Given the aim of the study, it was descriptive and correlational.

Participants and sociodemographic characteristics

The present study was part of a larger piece of research examining parents' perceptions of their children's use of mobile phones. Data collection was done using a convenience sample, consisting of 1,135 parents of children in the six years of primary education in 23 schools (state-funded, private, and independent) in the city of Lugo (Spain).

Data collection was in two phases. The first was a pilot study with 250 subjects, which allowed content and construct validation of the data collection instrument. In the second phase, the survey was applied to the final sample, made up of 885 subjects, whose sociodemographic characteristics are given in Tables 1 and 2.

INSERT TABLES 1 and 2

Data collection instrument

The study used a questionnaire, designed *ad hoc* and structured in eight thematic sections: parent's sociodemographic data; children's sociodemographic data; identification of mobile phone use; time spent using the mobile phone; actions and tasks done using the mobile; parental rules or control of mobile phone use; habits of mobile phone use; and dangers and opportunities of mobile phone use. The scale analyzed in this study was part of a section about the actions and tasks children used their mobile phones to do, made up of 13 items (see Table 3) each with five response options from 1 (never) to 5 (always).

In order to ensure suitable psychometric conditions, the production of the questionnaire addressed issues such as content validity, construct validity, and internal consistency. For content validity, the instrument was validated by a panel of eight experts from four countries (Spain, Costa Rica, Brazil, and Ecuador). All of the panel members were specialists in research methodology and educational technology. They addressed aspects such as whether each item was unambiguous, relevant, and important, and their valuable comments allowed the initial survey content to be modified, restructured, and improved.

Subsequently, in order to analyze the instrument's construct validity, a pilot test (n=250) was done using exploratory factor analysis (EFA). Prior to that, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's sphericity test were performed, both giving suitable results ensuring the conditions of sample applicability and suitability. The EFA was performed using the maximum likelihood method with oblimin rotation, following calculation of a Pearson correlation matrix. Three factors were identified in the scale of actions and tasks done with the mobile phone, explaining 54.26% of the total variance. Factor 1 ("using the mobile phone for social interaction") explained 30.46% of the variance, Factor 2 ("using the mobile phone for school or information-related tasks") explained 13.10% of the variance, and the third factor ("using the mobile phone for leisure related tasks) explained 10.70% of the variance.

Following the application of the EFA, 2 items were removed from the original scale due to exhibiting factor loadings below .40. They were: "creating their own content (e.g., videos or photo editing)" and "gambling online".

Following the EFA and the identification of the factorial structure underlying the scale, confirmatory factor analysis (CFA) was carried out based on a model of three correlated factors (Table 3) using the total sample (n=885). The estimator was DWLS (*Diagonally Weighted Least Squares*) (Jöreskog et al., 2001; Morata-Ramírez et al., 2015), as that is a robust algorithm when analyzing polychoric correlation matrices with ordinal variables (Flora & Curran, 2004; Holgado et al., 2010; Li, 2016; Şimşek & Noyan, 2012; Xia & Yang, 2019).

INSERT TABLE 3

A variety of statistics were used to evaluate the fit of the model. These included the comparative fit index (CFI) and the Tucker Lewis index (TLI), both needing to be ≥ .90 (Bentler & Bonett, 1980; Hair et al., 2006). In addition, the root mean square error of approximation (RMSEA) was used, with values < .08 indicating reasonable fit, and the standardized root mean square residual (SRMR), where values between .05 and .08 indicate good fit (Steiger, 2016).

The results indicated adequate fit for the model with three correlated factors: CFI=.947; TLI=.934; RMSEA=.064 (90% CI [.056 - .071]); SRMR=.067.

Lastly, the index of internal consistency for the total scale was calculated using Cronbach's alpha (α=.797) and McDonald's omega (ω=.802), producing suitable indices of reliability.

Field work and data analysis

Collecting the data required the participation of primary-school students' parents in order to discover their opinions about their children's use of mobile phones. The strategy used was to go to the school gates at the times when adults accompanied their children either arriving at or leaving school. After confirming that the subjects had children in primary school and that they used mobile phones, the aim of the study was explained and they were asked to participate, with detailed instructions being given if they agreed. The anonymity of their responses and the confidentiality of their data was emphasized. Contact was also made with parent teacher associations, and, where necessary to access school grounds, permission was sought from school authorities.

In order to cover a variety of socio-economic strata and achieve maximum representativeness, data was collected from all of the 23 schools in the city of Lugo (Spain) providing primary education, including state-funded, private, and independent (*concertado*) schools. The data collection process lasted for 2 months.

Once the data was collected and collated, Microsoft Excel for Office 365, SPSS v.20, and JASP v.0.14.0.0 were used to tabulate and code the information for subsequent statistical treatment. That statistical treatment consisted of analyzing descriptive statistics (e.g., frequencies, percentages, means, standard deviations, asymmetry, kurtosis, and bivariate correlations) and multivariate analysis of variance (MANOVA). Three factors of mobile phone use were used (see Table 3) as dependent variables tested with various categorical independent variables such as the children's gender, school year, daily hours of mobile phone use, and impact on academic performance.

Results

Descriptive analysis of the frequency and type of mobile phone use

Table 4 shows the descriptive statistics for each item, organized in the three dimensions considered in this study. It indicates which activities and tasks parents thought that their children did most and least using mobile phones.

Overall, considering all of the items, the frequency of mobile phone use was low and moderate. The parents' indicated that the activities their children did least often were, "sharing information with others" (M=1.45; SD=0.855) or "consulting news portals, online magazines, etc." (M=1.43; SD=0.807). The actions the children engaged in most often, according to their parents, were "watching videos" (M=3.51; SD= 0.993), "playing videogames" (M=3.12; SD: 1.221), and "listening to music" (M=3.09; SD=1.201).

In terms of dispersion, the greatest variability in responses was in items such as: "playing videogames" (SD=1.221), "using instant messaging apps" (SD=1.218), and "listening to

music" (SD=1.201). The lowest standard deviations were in the items, "sharing information with others" (SD=0.855) and "consulting news portals, online magazines, etc." (SD=0.807).

INSERT TABLE 4

Table 5 shows the means, standard deviations, asymmetry, kurtosis, and Pearson correlation coefficients between each of the dependent variables studied related to the different uses of mobile phones. There were significant, positive correlations between them. The criteria described by Finney and DiStefano (2006) were used to examine the normality of the distribution. They indicate maximum values of two for asymmetry and seven for kurtosis, which means the variables in the study exhibited normal distributions.

The results show greater use of mobile phones in leisure-related activities (M=3.24; SD=.878), with little use in activities related to social interaction (M=1.96; SD=.721), or school- and information-related tasks (M=1.99; DT=.825).

INSERT TABLE 5

Multivariate analysis of primary-school students' levels of mobile phone use.

A multivariate analysis of variance (MANOVA) was performed to determine whether there were statistically significant differences in the three types of mobile phone use (see Table 5), acting as dependent variables, with respect to other independent variables, including student gender, school year, amount of mobile phone use, and impact on academic performance.

With regard to gender, examining the homogeneity of covariance using *Box's M* test showed that the observed covariance matrices of the dependent variables were equal in all of the groups (*Box's M*= 8.906, *F*=1.479, *p*=.181). The MANOVA indicated that there were differences in the types of use of mobile phones based on the children's gender (*Wilks' Lambda* = .984, $F_{(3,880)}$= 4.892, *p*=.002, η^2 = .016), with a small effect size. More specifically, as Table 6 shows, girls were scored higher than boys in the level of use they made of mobile phones in activities related to social interaction, to education and information, and to leisure.

INSERT TABLE 6

With regard to school year, *Box's M* test showed that there was no homogeneity of covariance (*Box's M*=118.004, *F*=9.774, *p*<.001). Hence, following the recommendations by Tabachnick and Fidell (2001), *Pillai's trace* was used to analyze the multivariate significance of the principal effects. The results were significant, with a large effect size (*Pillai's trace*=.230, $F_{(6,1760)}$= 4.892; *p*<.001; η^2 = .115). As a preliminary step for doing *post hoc* tests, the homogeneity of variance was evaluated via Levene's test of homogeneity of variance, using the *Games-Howell* statistic for the variables "use of mobile phone for social interaction activities" and "use of mobile phone for school and information related activities" as in neither case was there homoscedasticity, while for the variable "use of mobile phone for leisure-related

activities" was assessed using *Sheffé's* test. The results showed that students in later school years made more use of mobile phones for all types of tasks. Table 7 gives more details regarding the differences in means between each school year.

INSERT TABLE 7

Another of the aspects analyzed in the study was to determine whether the amount of time spent on mobile phones each day could be related to the different types of activities they were used for. As *Box's M* test did not demonstrate equality of covariance (*Box's M*=33.777, *F*=2.790, *p*<.001), *Pillai's trace* was used in the MANOVA (*Pillai's trace*=.142, $F_{(6,1760)}$= 22.399; *p*<.001; η^2 = .071), which gave a significant result with a moderate effect size. *Post hoc* tests showed differences in means between subjects who spent more than three hours a day on their phones, those who used them for between one and three hours per day, and those who used them for less than one hour a day. As Table 8 shows, the more time spent on a mobile phone, the more frequent the use, especially in leisure related activities.

INSERT TABLE 8

Lastly, a MANOVA was performed to determine whether there were statistically significant differences between the groups based on the independent variable "do you think that use of a mobile phone has an impact on your child's school performance?" with regard to the dependent variables about types of mobile phone use. *Pillai's trace* was used, as *Box´s M* test showed that there was no homogeneity of variance (*Box's M*=56.771, *F*=3.115, *p*<.001). The results indicated that there were significant differences, with a small effect size (*Pillai's trace*=.060, $F_{(9,2640)}$= 22.399; *p*<.001; η^2 = .020). Subsequent univariate ANOVA gave some interesting results which are shown as means and standard deviations in Table 9. For "use of mobile phones for social interaction activities", there was a clear disparity between parents who thought that mobile phone use had negative impacts on academic performance (M=2.06) and those who responded that there was no negative impact (M=1.85).

For "use of mobile phones for school and information related activity", there were statistically significant differences between parents who felt that mobile phone use had a positive impact on their children's school performance (M=2.44) and those who felt it had a negative impact (M=2.03) or no impact (M=1.89).

Finally, for "use of mobile phones for leisure related activities", there were differences in means between the "yes, positively" group and the "no impact" group (difference in means=.136) and between parents who responded "don't know" and those who indicated that there is "no impact" (difference in means=.361).

INSERT TABLE 9

Discussion and conclusions

The enormous penetration of technology into society in recent years has meant that nowadays children are ever more exposed to screens and to smartphones in particular. Various studies have noted that mobile phones are starting to be used at increasingly younger ages (Lee & Park, 2018; Sola et al., 2019;). In this regard, families bear an important responsibility for initiation into the use these devices, as early use by children is very often parents' means of entertaining them or keeping them quiet (Kabali et al. 2015; Kulakci-Altintas, 2020;), very commonly using entertaining apps which captivate very young children (e.g., videogames, animated films, etc.) (Hosokawa & Katsura, 2018). Beyond mere entertainment, mobile phones have become tools with notable potential in the area of expanded learning (Uribe-Zapata, 2018) and have an unarguable capacity for social interaction.

In this study, we were able to describe the nature of primary-school children's digital exposure according to their parents' views, analyzing the usage patterns of mobile phones from three perspectives: use for social interaction activities, use for school and information-related activities, and use for leisure activities.

In general, the frequency with which the children used mobile phones in those activities was low to moderate, with entertainment-related activity standing out, such as watching videos and playing videogames. This is in line with other studies that have also analyzed parents' perceptions of their children's use of this type of technology (Fernández & Álvarez, 2021; Genc, 2014).

In terms of gender, girls were seen to use mobile phones more than boys. This is consistent with studies in other age groups, such as adolescents, indicating that girls make more use of mobile phones than boys (Sabater & Fernández, 2015). In addition, data from the National Observatory of Telecommunications and the Information Society (*Observatorio Nacional de Telecomunicaciones y de la Sociedad de la Información*: ONTSI) (2019) about child and adolescent use of mobile devices (age 10 to 15) notes girls using mobile phones more (71.6%) than boys (68.2%).

The present study also confirmed that children's school year is a variable that has an impact on the level of use of mobile phones. Children in the later years of primary school (grades 5 and 6, generally aged 10-11 years old), make more frequent use of mobile phones for the activities examined than younger students. Similar results, from a variety of educational stages, are discussed in research, such as the studies by Can et al. (2020).

In addition, our study shows that the amount of time spent on mobile phones is directly related to doing more activities with them. Previous studies have warned of the risks of excessive screen time to the very young (Tamana et al., 2019). Nonetheless, faced with this rather depressing argument about mobile phones, it is also worth highlighting the enormous learning opportunities such as m-learning. Recent studies such as Criollo-C et al. (2021), have reported the benefits of learning done with the support of mobile devices, for example in issues related to accessibility, ubiquity, and portability; with motivation and the capacity for collaborative learning; as well as with adaptation to learners' needs. Those authors also highlighted how mobile phones could help strengthen students' self-directed learning processes, as well as the possibilities for participating in both formal and informal learning environments.

When it comes to parent's views of the impact of children's mobile phone use on school performance, it is important to highlight the positive effects they ascribe to these devices, particularly in school and information-related activities. However, in aspects more closely linked to social interaction, without educational aims, the prevailing parental opinion was that smartphones are distracting elements which have negative impacts on school performance. Nonetheless, it is worth noting that meta-analysis, such as Kates et al. (2018), have concluded that there is no clear consensus in the scientific literature about the effects of mobile phone use on academic performance. Ochoa and Relch (2020) noted a clear duality in parents' beliefs about their children's use of mobile phones. More than three-quarters (77%) of parental opinions indicated that children could learn new academic concepts and linguistic skills via videos on mobile devices, whereas 40% thought that they could do so using various apps. However, in contrast to this favorable opinion of mobile phone use, 35% of parents expressed concern that excessive screen use could have a negative impact on social interactions. In addition, 45% of those surveyed indicated unease about the possibility of children becoming more and more dependent on or addicted to mobile phones.

As Hosokawa and Katsura (2018) noted, there is still limited evidence about the impact of children's mobile phone use, hence future lines of research should be directed towards unravelling important questions from a multidisciplinary perspective. These questions include the importance of parental styles in digital early education; the role of schools in training citizens who approach technology responsibly and with a critical eye; the social, contextual, economic, and pedagogical factors that affect the use of mobile phones; and the dangers and risks minors are exposed to in cyberspace.

Acknowledgements

This article was produced as part of the "IV Convocatoria de Proyectos de Innovación Educativa en Aprendizaje-Servicio (ApS)" by the University of Santiago de Compostela, and as part of the researchs projects entitled: "How the best university teachers learn: impact on learning ecologies on quality of teaching" [Cómo aprenden los mejores docentes universitarios en la era digital: Impacto de las ecologías de aprendizaje en la calidad de la docencia"] (Reference: EDU2015-67907-R) and "Learning Ecologies in the digital age: new opportunities for secondary-school teacher training" ["Ecologías de aprendizaje en la era digital: nuevas oportunidades para la formación del profesorado de educación secundaria"] (ECO4LEARN-SE) (Reference: RTI 2018-095690-B-I00), partly financed by the Spanish Ministry of Science, Innovation and Universities.

Conflicts of interest

The authors declare that there are no potential conflicts of interest related to this article.

References

American Academy of Pediatrics Council on Communications and Media. (2016). Media and young minds. *Pediatrics*, *138*(5), e20162591. https://doi.org/10.1542/peds.2016-2591.

Auxier, B., Anderson, M., Perrin, A., & E. Turner (2020). *Parenting children in the age of screens.* Pew Research Center. https://cutt.ly/4EyEXgB.

Bartau-Rojas, I., Aierbe Barandiaran, A., & Oregui González, E. (2020). Mediación parental del uso de internet desde una perspectiva de género. *Revista Electrónica de Investigación Educativa*, 22, 1-14. https://doi.org/10.24320/redie.2020.22.e02.2075

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88, 588-606. https://doi.org/10.1037/0033-2909.88.3.588.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen y J. S. Long (Eds.), *Testing structural equation models* (pp. 136–162). Sage.

Can, T., Kucuk, S., & Simsek, I. (2020). Examining K-12 students' preferences and attitudes on mobile learning. *International Journal of Technology in Teaching and Learning*, *15*(2), 95-108. https://eric.ed.gov/?id=EJ1276249.

Cartanyà-Hueso, À., Lidón-Moyano, C., Cassanello, P., Díez-Izquierdo, A., Martín Sánchez, J., Balaguer, A., & Martínez-Sánchez, J. (2021). Smartphone and Tablet Usage during COVID-19 Pandemic Confinement in Children under 48 Months in Barcelona. *Healthcare* (Basel). *9*(1), 1-8. https://doi.org/10.3390/healthcare9010096.

Christakis, D. A., Ramirez, J. S. B., Ferguson, S. M., Ravinder, S., & Ramirez, J. M. (2018). How early media exposure may affect cognitive function: A review of results from observations in humans and experiments in mice. *Proceedings of the National Academy of Sciences*, *115*(40), 9851-9858. https://doi.org/10.1073/pnas.1711548115.

Cohen, L. & Manion, L. (2002). *Métodos de investigación educativa.* La Muralla.

Criollo-C, S., Guerrero-Arias, A., Jaramillo-Alcázar, Á., & Luján-Mora, S. (2021) Mobile Learning Technologies for Education: Benefits and Pending Issues. *Applied Sciences*, 11, 4111. https://doi.org/10.3390/app11094111.

Eurostat (2021, Mayo). *Trust, security and privacy - smartphones. https://cutt.ly/vEyQaR0.*

Desmurget, M. (2020). *La fábrica de cretinos digitales.* Península.

Fernández R., & Álvarez, L. (2021). Estudio piloto de la percepción parental y de la infancia sobre el uso de las TIC en el tiempo libre: repercusiones familiares y sociopersonales. En Aznar Díaz, I. et al., *Desempeño docente y formación en competencia digital en la era SARS COV 2* (pp.368-380). Dykinson.

Finney, S.J., & Distefano, C. (2006). A second course in structural equation modeling. In Hancock, G.R., y Mueller, R.O. (Eds.), *Non-normal and categorical data in structural equation modeling* (pp. 439–492). IAP Information Age Publishing. https://bit.ly/2NI26Vq.

Flora, D. B., & Curran, P. J. (2004). An empirical evaluation of alternative methods of estimation for confirmatory factor analysis with ordinal data. P*sychological Methods*, *9(4)*, 466-491. https://doi.org/10.1037/1082-989X.9.4.466.

Genc, Z. (2014). Parent´s Perceptions about the Mobile Technology Use of Preschool Aged Children. *Procedia. Social and Behavioral Sciences*, 156, 55-60. https://doi.org/10.1016/j.sbspro.2014.08.086.

González-Sanmamed, M., Muñoz-Carril, P.C., & Santos-Caamaño, F.J. (2019). Key components of learning ecologies: A Delphi assessment. *British Journal of Educational Technology*, *50*(4), 1639-1655. https://doi.org/10.1111/bjet.12805.

Hadad, S., Meishar-Tal, H., & Blau, I. (2020). The parents' tale: Why parents resist the educational use of smartphones at schools?, *Computers & Education*, *157*, 1-13. https://doi.org/10.1016/j.compedu.2020.103984.

Hair, J., Black, W. C., Babin, B., Anderson, R. E., & Tatham, R. (2006). *Multivariate data analyses*. Prentice-Hall.

Hansen, A. (2021). *Insta-Brain. Cómo nos afecta la dependencia digital en la salud y en la felicidad.* RBA.

Holgado, F. P., Chacón, S., Barbero, I., & Vila, E. (2010). Polychoric versus Pearson correlations in exploratory and confirmatory factor analysis of ordinal variables. *Quality & Quantity: International Journal of Methodology*, *44*(1), 153-166. https://doi.org/10.1007/s11135-008-9190-y.

Hosokawa, R., & Katsura, T. (2018). Association between mobile technology use and child adjustment in early elementary school age. *PLoS ONE*, *13*(7), 1-17. https://doi.org/10.1371/journal.pone.0208844.

INE (2020). *Encuesta sobre equipamiento y uso de tecnologías de información y comunicación en los hogares.* https://cutt.ly/BEyQ067.

Jöreskog, K. G., & Sörbom, D. (1993). *LISREL 8: Structural equation modeling with the SIMPLIS command language.* Scientific Software International.

Jöreskog, K. G., Sörbom, D., Du Totit, S., y Du Toit, M. (2001). *LISREL 8: New statistical features*. Scientific Sofware International.

Kabali, H. K., Irigoyen, M. M., Nunez-Davis, R., Budacki, J. G., Mohanty, S. H., Leister, K. P., & Bonner, R. L. (2015). Exposure and use of mobile media devices by young children. *Pediatrics*, *136*(6), 1044-1050. https://doi.org/10.1542/peds.2015-2151.

Kates, A. W., Wu, H., & Coryn, C. L. (2018). The effects of mobile phone use on academic performance: A meta-analysis. *Computers & Education*, *127*, 107-112. https://dx.doi.org/10.1016/j.compedu.2018.08.

Kim, D., & Jahng, K. E. (2019). Children's self-esteem and problematic smartphone use: The moderating effect of family rituals. *Journal of Child and Family Studies*, *28*(12), 3446-3454. https://doi.org/10.1007/s10826-019-01526-1.

Kulakci-Altintas, H. (2020). Technological device use among 0-3 year old children and attitudes and behaviors of their parents towards technological devices. *Journal of Child and Family Studies*, *29*(1), 55-61. https://doi.org/10.1007/s10826-019-01457-x.

Lee, M., & Park, S. (2018). Factors associated with Smartphone Overdependency in Preschool Children. *Child Health Nursing Research*, *24*(4), 383-392. https://doi.org/10.4094/chnr.2018.24.4.383.

Li, CH. (2016). The performance of ML, DWLS, and ULS estimation with robust corrections in structural equation models with ordinal variables. *Psychological Methods*, *21*(3), 369–387. https://doi.org/10.1037/met0000093.

Madigan, S., Browne, D., Racine, N., Mori, C., & Tough, S. (2019). Association between screen time and children's performance on a developmental screening test. *JAMA pediatrics*, *173*(3), 244-250. https://doi.org/10.1001/jamapediatrics.2018.5056.

Martínez, G., Casado, M. Á., & Garitaonandia, C. (2020). Estrategias online de mediación parental en contextos familiares de España. *Comunicar: Revista Científica de Comunicación y Educación*, *28*(65), 67-76. https://doi.org/10.3916/C65-2020-06.

McMillan, J., & Schumacher, S. (2005). *Investigación educativa*. Pearson Addison Wesley.

Morata-Ramírez, M. A., Holgado-Tello, F. P., Barbero-García, I., & Méndez, G. (2015). Análisis Factorial Confirmatorio. Recomendaciones sobre Mínimos Cuadrados No Ponderados en función del error Tipo I de Ji-cuadrado y RMSEA. *Acción Psicológica*, *12*(1), 79-90. https://dx.doi.org/doi.org/10.5944/ap.12.1.14362.

Observatorio Nacional de Telecomunicaciones y de la Sociedad de la Información (Ed.) (2019). *Indicadores sobre uso de TIC por menores en España*. https://bit.ly/33Ef9xv

Ochoa, W., & Reich, S.M. (2020). Parents' Beliefs About the Benefits and Detriments of Mobile Screen Technologies for Their Young Children's Learning: A Focus on Diverse Latine Mothers and Fathers. *Frontiers in Psychology*, 11, 1-14. https://www.doi.org/10.3389/fpsyg.2020.570712.

Ofcom (2021). *Children and parents: media use and attitudes report 2020/21*. https://cutt.ly/4EyRpEU.

Pew Research Center (2018). *Many Turn to YouTube for Children's Content, News, How-To Lessons*. https://cutt.ly/AEyRxjE.

Pew Research Center (2021). *Mobile Technology and Home Broadband 2021*. https://cutt.ly/EEyQinS.

Radesky, J. S., Schaller, A., Yeo, S. L., Weeks, H. M., & Robb, M.B. (2020). *Young kids and YouTube: How ads, toys, and games dominate viewing*. Common Sense Media. https://cutt.ly/vEyRTa6.

Rideout, V., & Robb, M. B. (2020). *The Common Sense census: Media use by kids age zero to eight, 2020*. Common Sense Media. https://cutt.ly/AEyQXw9.

Sabater, C., & Fernández, J.B. (2015). Estereotipos de género y uso de las nuevas tecnologías. *Icono 14*, 13, 208-246. https://doi.org/10.7195/ri14.v13i1.722.

Serra, G., Lo Scalzo, L., Giuffrè M., Ferrara P., & Corsello, G. (2021). Smartphone use and addiction during the coronavirus disease 2019 (COVID-19) pandemic: cohort study on 184 Italian children and adolescents. *Italian Journal of Pediatrics*, *47*(150) https://doi.org/10.1186/s13052-021-01102-8.

Şimşek, G.G., & Noyan, F. (2012). Structural equation modeling with ordinal variables: a large sample case study. *Quality & Quantity: International Journal of Methodology ,46*, 1571-1581. https://doi.org/10.1007/s11135-011-9467-4 .

Smahel, D., Machackova, H., Mascheroni, G., Dedkova, L., Staksrud, E., Ólafsson, K., Livingstone, S., & Hasebrink, U. (2020). *EU Kids Online 2020: Survey results from 19 countries.* EU Kids Online. https://doi.org/10.21953/lse.47fdeqj01ofo.

Sola Reche, J.M., García Vidal, M., & Ortega Navas, M. (2019). Las implicaciones del uso de dispositivos móviles en el proceso de enseñanza aprendizaje en alumnos de 5º y 6º de primaria. *Pixel-bit*, 55, 117-131. https://doi.org/10.12795/pixelbit.2019.i55.07.

Son, H.-G., Cho, H.J., & Jeong, K.-H. The Effects of Korean Parents' Smartphone Addiction on Korean Children's Smartphone Addiction: Moderating Effects of Children's Gender and Age. *International Journal of Environmental Research and Public Health*, *18*, 6685. https:// doi.org/10.3390/ijerph18136685.

Steiger, J. H. (2016). Notes on the Steiger–Lind (1980) Handout. *Structural Equation Modeling: A Multidisciplinary Journal*, *23*(6), 777-781. https://doi.org/10.1080/10705511.2016.1217487.

Suarez, J.L. (2020). La condición digital. *Revista de Occidente*, 472, 2-20.

Syvaoja, H. J., Kantomaa, M., Ahonen, T.; Hakonen, H., Kankaanpää, A., & Tammelin, T. (2013). Physical activity, sedentary behavior, and academic performance in Finnish children. *Medicine & Science in Sports & Exercise*, *45*(11), 2098-2104. https://doi.org/10.1249/MSS.0b013e318296d7b8.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. HarperCollins.

Tamana S.K., Ezeugwu V., Chikuma J., Lefebvre D.L., Azad M.B., Moraes T.J., Subbarao, P., Becker, A., Turvey, S., Sears, M., Dick, B., Carson, V., Rasmussen, C., Pei, J., & Mandhane, P. (2019). Screen-time is associated with inattention problems in preschoolers: Results from the CHILD birth cohort study. *PLoS ONE*, *14*(4), 1-15. http://doi.org/10.1371/journal.pone.0213995.

Uribe-Zapata, A. (2018). Concepto y prácticas de educación expandida: una revisión de la literatura académica. *El Ágora U.S.B.*, *18*(1), 278–293. https://doi.org/10.21500/16578031.3456.

Vázquez, B., & López, R. (2021). Análisis crítico del concepto "aprendizaje ubicuo" a través de la Cartografía Conceptual. *RED. Revista de Educación a Distancia*, *66*(21), 1-28. http://dx.doi.org/10.6018/red.430841.

Xia, Y., & Yang, Y. (2019) RMSEA, CFI, and TLI in structural equation modeling with ordered categorical data: The story they tell depends on the estimation methods. *Behavior Research Methods*, 51, 409-428. https://doi.org/10.3758/s13428-018-1055-2.

LIST OF TABLES

Table 1. Sociodemographic characteristics of the parents surveyed.

Variables	**Categories**	***n***	***%***
Gender	Man	277	31.3
	Woman	608	68.7
Civil Status	NA/NK	4	.5
	Married	634	71.6
	Single	62	7.0
	Widowed	9	1.0
	Separated	59	6.7
	Divorced	63	7.1
	Common law marriage	53	6.0
	Polygamous marriage	1	0.1
Educational qualifications	No qualifications	3	.3
	Primary school or equivalent	55	6.2
	Secondary school or equivalent	178	20.1
	Vocational training	270	30.5
	University degree or equivalent	379	42.8
Working situation	NA/NK	3	0.3
	Unemployed	99	11.2
	Employed	776	87.7
	Retired	7	0.8
Age	Mean age of parents surveyed was 42.28 years (SD=5.557)		

Table 2. Sociodemographic characteristics of the primary-school-aged children of the parents surveyed.

Variables	**Categories**	***n***	***%***
Gender	Boy	425	48
	Girl	460	52
Type of school	State-funded	463	52.3
	Independent (*concertado*)	319	36.1
	Private	103	11.6
School year	Lower Primary (1st and 2nd year: generally aged 6-7)	168	19.0
	Middle Primary (3rd and 4th year: generally aged 8-9)	236	26.7
	Upper Primary (5th and 6th year: generally aged 10-11)	481	54.3
Age	The children's mean age was 9.28 years (SD=1.749)		
Age when mobile phone use began	The mean age when children began using mobile phones was 6.77 years (SD=2.297)		

Table 3. Factor loadings from confirmatory factor analysis (CFA) on the scale: "how often do you think your child does the following activities with a mobile phone" (*n*=885).

	Factors		
	Factor 1	Factor 2	Factor 3
Makes telephone calls	0.534		
Uses instant messaging (WhatsApp, Telegram, Line, SnapChat, etc.)	0.903		
Uses social networks (Facebook, Twitter, Instagram, etc.)	0.592		
Makes video calls	0.438		
Takes photos and share them	0.699		
Follows "influencers"	0.693		
Shares information with other people	0.561		
Searches for information		0.479	
Does school tasks		0.621	
Consults news portals, online magazines etc.		0.987	
Plays videogames			0.830
Watches videos			0.795
Listens to music			0.461

Note: Factor 1= mobile phone use for social interaction activities; Factor 2= mobile phone use for school and information related activities; Factor 3= mobile phone use for leisure activities.

Table 4. Descriptive statistics (grouped by type of use) reflecting parents' opinions of how often their primary-school-aged children use mobile phones to do certain activities (*n*=885).

	NA/NK		Never		Almost never		Sometimes		Almost always		Always		Mean	SD
	n	%	n	%	n	%	n	%	n	%	n	%		
Mobile phone use for social interaction activities														
Make phone calls	3	0.3	302	34.1	288	32.5	227	25.6	46	5.2	19	2.1	2.08	0.998
Use instant messaging (WhatsApp, Telegram, Line, SnapChat, etc.)	3	0.3	360	40.7	186	21.0	203	22.9	85	9.6	48	5.4	2.18	1.218
Use social networks (Facebook, Twitter. Instagram, etc.)	2	0.2	598	67.6	92	10.4	112	12.7	60	6.8	21	2.4	1.66	1.083
Make video calls	5	0.6	544	61.5	155	17.5	120	13.6	47	5.3	14	1.6	1.67	1.003
Take photos and share them	6	0.7	131	14.8	188	21.2	336	38.0	134	15.1	90	10.2	2.85	1.162
Follow "influencers"	7	0.8	534	60.3	101	11.4	141	15.9	73	8.2	29	3.3	1.82	1.169
Share information with other people	15	1.7	637	72.0	124	14.0	72	8.1	28	3.2	9	1.0	1.45	0.855
Mobile phone use for school and information related activities														
Search for information	2	0.2	264	29.8	177	20.0	316	35.7	90	10.2	36	4.1	2.39	1.133
Do school tasks	4	.5	334	37.7	198	22.4	239	27.0	81	9.2	29	3.3	2.17	1.134
Consult news portals, online magazines etc.	3	.3	649	73.3	120	13.6	89	10.1	18	2.0	6	.7	1.43	0.807
Mobile phone use for leisure activities														
Play videogames	2	0.2	111	12.5	141	15.9	296	33.4	199	22.5	136	15.4	3.12	1.221
Watch videos	6	0.7	24	2.7	90	10.2	343	38.8	261	29.5	161	18.2	3.51	0.993
Listen to music	2	0.2	113	12.8	135	15.3	318	35.9	192	21.7	125	14.1	3.09	1.201

Table 5. Correlation matrix and descriptive statistics by type of mobile phone use

	1	2	3	Mean	SD	Min	Max	Asymmetry	Kurtosis
1. Mobile phone use for social interaction activities	-			1.96	.721	1	4.57	1.066	.921
2. Mobile phone use for school and information related activities	455**	-		1.99	.825	1	5	.682	-.040
3. Mobile phone use for leisure activities	372**	.251**	-	3.24	.878	1	5	.105	-.384

Note: ** $p<.01$

Table 6. Comparison of means and standard deviations of mobile phone use by gender.

		Mobile phone use for social interaction activities		Mobile phone use for school and information related activities		Mobile phone use for leisure activities	
Gender	*N*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Male	425	1.87	.68	1.97	.81	3.25	.89
Female	459	2.03	.74	2.02	.83	3.22	.86

Table 7. Comparison of means and standard deviations for mobile phone use by school year.

		Mobile phone use for social interaction activities		Mobile phone use for school and information related activities		Mobile phone use for leisure activities	
Curso	*N*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Lower Primary (1st and 2nd year: generally aged 6-7)	167	1.52	.416	1.40	.579	3.09	.906
Middle Primary (3rd and 4th year: generally aged 8-9)	236	1.73	.557	1.90	.737	3.10	.877
Upper Primary (5th and 6th year: generally aged 10-11)	481	2.22	.764	2.24	.824	3.35	.853

Table 8. Comparison of means and standard deviations of mobile phone use by amount of time spent connected.

		Mobile phone use for social interaction activities		Mobile phone use for school and information related activities		Mobile phone use for leisure activities	
Time spent on the phone	*N*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Less than one hour a day	442	1.76	.615	1.88	.770	2.98	.820
Between one and three hours a day	359	2.07	.710	2.06	.855	3.42	.855
More than three hours a day	83	2.48	.901	2.31	.868	3.79	.832

Table 9. Comparison of means and standard deviations of mobile phone use by parent's opinions of the impact on school performance.

		Mobile phone use for social interaction activities		Mobile phone use for school and information related activities		Mobile phone use for leisure activities	
Impact on school performance	*N*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Yes, positive	56	1.95	.74	2.44	.991	3.33	.92
Yes, negative	285	2.06	.79	2.03	.836	3.34	.98
There is no impact	449	1.85	.63	1.89	.791	3.11	.79
Don't know	94	2.11	.79	2.10	.740	3.47	.81

Parents' Perceptions of Their Children's Smartphone Use

Percepciones de las familias sobre el uso de móviles

Abstract

The aim of this study was to identify parents' perceptions about how much and how often their primary-school-aged children used mobile phones and what kinds of activities they used them for. The study used a quantitative methodology with a survey-based design. A total of 1135 subjects participated. The results indicated that there were three main uses for mobile phones: social interaction, school- and information-related tasks, and leisure. Overall, the level of mobile phone use was low or moderate, with the consumption of video content and videogames standing out. Statistically significant differences, via MANOVA tests, were found between the types of uses and variables such as gender, school year, hours spent using the mobile phone each day, and impact on school performance.

Keywords: mobile phones, primary education, minors, parental perceptions.

Acknowledgements

This article was produced as part of the "IV Convocatoria de Proyectos de Innovación Educativa en Aprendizaje-Servicio (ApS)" by the University of Santiago de Compostela, and as part of the researchs projects entitled: "How the best university teachers learn: impact on learning ecologies on quality of teaching" [*Cómo aprenden los mejores docentes universitarios en la era digital: Impacto de las ecologías de aprendizaje en la calidad de la docencia*"] (Reference: EDU2015-67907-R) and "Learning Ecologies in the digital age: new opportunities for secondary-school teacher training" ["*Ecologías de aprendizaje en la era digital: nuevas oportunidades para la formación del profesorado de educación secundaria"*] (ECO4LEARN-SE) (Reference: RTI 2018-095690-B-I00), partly financed by the Spanish Ministry of Science, Innovation and Universities.

It is 45 years since the first mobile phone call was made and the world has become exponentially more high-tech and hyperconnected (Eurostat, 2021). Our lives today are affected by this digital revolution, the speed of which over the last ten years is unmatched in human history. The proximity of mobile phones and our constant use of them make them key elements in the digital condition. The risks of living our social and cultural lives via mobile phones (Suárez, 2020) have given rise to various studies aimed at understanding how digital environments are forged and developed which characterize contemporary society, and particularly how this context affects minors and their families.

Studies about how smartphones have been incorporated into our society show that there has been enormous growth in various countries. In the USA in 2021, 97% of the population had a mobile phone, 85% of which were smartphones (Pew Research Center, 2021). The increase has been significant: ten years ago, according to data from the same survey, only 35% of Americans had a mobile phone. In the same region, children aged between zero and eight years old have access to mobile devices in 97% of homes (Rideout & Roob, 2020). Data from studies in other countries about the possession and use of mobile phones show similarities. For example, a study in Turkey (Kulakci-Altintas, 2020) with 500 families who had children aged 0-3 years old, 40.8% reported that their children had used a mobile phone. In Spain in 2020, the statistics indicate that 69.5% of 10 to 15 year-olds had a mobile device (the terms mobile phone and smartphone are used interchangeably in the rest of the text) (INE, 2020).

As the EU Kids Online report (Smahel et al., 2020) noted, providing data about children aged between 9 and 16 years old in 19 countries, access to the internet determines the conditions in which they can make use of online opportunities, as well as the risks they run. In Spain, 76% of the children surveyed reported using their devices to access the internet at least once a day (Smahel et al., 2020).

These numbers also have an impact on adults and family relationships, as the frequent use of mobile phones impacts socioemotional wellbeing, affects early interactions with children, and has repercussions on children's education (Auxier et al., 2020; Desmurget, 2020; Hansen, 2021; Hosokawa & Katsura, 2018; Syvaoja et al., 2013; Pew Research Center, 2018).

More media, booming education opportunities

Over the last two decades, the mobile phone has radically changed the nature of how we interact with each other, how we work, and how we enjoy ourselves, weaving itself into part of a digital ecosystem (González Sanmamed et al., 2019) which feeds into and affects daily life. The formerly common concern about the effects of watching television have been superseded, children can now find their favorite programs on demand in any room in the house and a variety of circumstances and settings. Businesses design digital products for infants, and offer endless activities online, as their algorithms predict children's behaviors and preferences.

We still need to make efforts in research related to this sociocultural turn of events in order to analyze the impact following the pandemic, as the effects of hyperconnectivity triggered by COVID-19, home confinement, and enforced online education are yet to be fully investigated. The first results warn of a dangerous increase in online connection in early childhood (Cartanyá-Hueso et al., 2021), severe risks of addiction in primary education (Serra et al.,

2021), and an irreparable digital divide due to limited internet access for learning at home (Ofcom, 2021). Christakis (2018) and colleagues have examined the effects of screen time in early childhood for many years and have warned of possible effects on the still-developing brain. Similar warnings have been raised by pediatrics organizations in various countries (American Academy of Pediatrics, 2016). Desmurget (2020) warned against children's abusive use of screens and the consequences on infant brain development, as well as providing a critical study of publications in books and magazines which, with little scientific rigor, have rejected, minimized, or covered up the dangers of screen time.

Authors such as Radesky et al. (2020) reported that, for the first time, small children were spending more time watching videos online than any other screen-related activity. They also noted concern about the content on sites such as YouTube and TikTok as having little educational value, often accompanied by the danger of commercialization, violence, or other content that is inappropriate for these ages. Platforms providing free audiovisual content, such as YouTube for videos and cartoons, and paid platforms, such as Netflix and Disney+ for films, have become established amongst children and are widening the digital divide in a worrying manner (Radesky et al., 2020).

The omnipresence of such media has not only presented new educational challenges in terms of the consequences noted above, but also with regard to the formation of identity. For the youngest in society, as Suárez (2020) puts it, "the digital is their reality" (p.11). The creation of their own channels and following people such as influencers, who are seen as examples to aspire to, speak to an unprecedented cultural change.

In this context of an increasing amount of accessible digital media, digital education emerges strongly. Learning is no longer wholly determined by the school system, but instead, mobile devices refer mainly to what happens outside the school gates. In primary-school children, the use of mobile phones is key in informal learning. This is helped by schools usually having rules restricting their use and that it is also limited in the family setting (Hadad et al., 2020). It is becoming more usual that when children want to learn something, they go directly to a video channel or to a search engine on the internet through their mobile phones. This produces what is called invisible learning, which educates for life, and is part of expanded learning (Uribe-Zapata, 2018; Vázquez & López, 2021).

This break in where and when learning occurs raises various questions for those responsible for children's education, firstly due to the influence of known and unknown contacts that they interact with online and through their mobile devices, although it is worth noting that children do not turn to technology to enhance communication with school friends or classmates (Pew Research Center, 2021; Radesky et al., 202; Smahel et al., 2020). The second issue is that schools do not entertain the possibility of using mobile phones in in-person learning, instead they use somewhat locked-down tablets or laptops. The scientific community has produced data supporting the general opinion that mobile phone use has a negative effect on school performance (Desmurget, 2020; Kates et al., 2018), which has not helped incorporate them into classrooms. Families, in any case, do allow mobile phones to be used to access school-related content, and many homes have additional, more sophisticated devices (INE, 2020), with much learning being done freely, spontaneously, and in isolation when children surf for entertainment on social networks in order to do activities such as create musical videos on audiovisual platforms with all kinds of shared images.

Researchers such as Martínez et al. (2020) have found that in the 9 to 12 age range, boys are given more liberty in using phone cameras, while in the 13 to 17 age range, both sexes have

similar restrictions. Hence, parental mediation in digital devices is more restrictive for girls (Bartau-Rojas et al., 2020). Other studies have looked at changes in the context of family life with regard to time spent in conversation, relaxation, and distraction mediated by screens (Madigan et al., 2019; Pew Research Center, 2018). Children's addiction to mobile phones is linked to parents' own dependency on their phones rather than to gender or age (Son et al., 2021). In fact, the time children spend with their families at weekends has been shown to have positive effects on the risks of smartphones, even in children with low self-esteem (Kim & Jhang, 2019). Other lines of research have focused on parental styles as factors influencing how mobile devices are managed (Hadad et al., 2020; Martínez et al., 2020).

Study aims and objectives

The aim of this study was to identify parents' perceptions of how often their primary-school-aged children used mobile phones and the kinds of activities they used them for. The following objectives were established:

- Determine what parents think about how much their children use mobile phones for social interaction, school tasks, and leisure.
- Determine whether children's gender influences the type of use they make of mobile phones.
- Examine whether school year is a variable related to primary-school students' use of mobile phones.
- Assess whether there are statistically significant differences in the time spent using mobile phones based on the type and frequency of mobile phone use.
- Determine from the parents' perspectives, what impact their children's use of mobile phones has had on their school performance.

Methodology

This study used a quantitative methodology with an ex post facto design, using a non-experimental survey-based method (Cohen & Manion, 2002; McMillan & Schumacher, 2005). Given the aim of the study, it was descriptive and correlational.

Participants and sociodemographic characteristics

The present study was part of a larger piece of research examining parents' perceptions of their children's use of mobile phones. Data collection was done using a convenience sample, consisting of 1,135 parents of children in the six years of primary education in 23 schools (state-funded, private, and independent) in the city of Lugo (Spain).

Data collection was in two phases. The first was a pilot study with 250 subjects, which allowed content and construct validation of the data collection instrument. In the second phase, the survey was applied to the final sample, made up of 885 subjects, whose sociodemographic characteristics are given in Tables 1 and 2.

INSERT TABLES 1 and 2

Data collection instrument

The study used a questionnaire, designed *ad hoc* and structured in eight thematic sections: parent's sociodemographic data; children's sociodemographic data; identification of mobile phone use; time spent using the mobile phone; actions and tasks done using the mobile; parental rules or control of mobile phone use; habits of mobile phone use; and dangers and opportunities of mobile phone use. The scale analyzed in this study was part of a section about the actions and tasks children used their mobile phones to do, made up of 13 items (see Table 3) each with five response options from 1 (never) to 5 (always).

In order to ensure suitable psychometric conditions, the production of the questionnaire addressed issues such as content validity, construct validity, and internal consistency. For content validity, the instrument was validated by a panel of eight experts from four countries (Spain, Costa Rica, Brazil, and Ecuador). All of the panel members were specialists in research methodology and educational technology. They addressed aspects such as whether each item was unambiguous, relevant, and important, and their valuable comments allowed the initial survey content to be modified, restructured, and improved.

Subsequently, in order to analyze the instrument's construct validity, a pilot test (n=250) was done using exploratory factor analysis (EFA). Prior to that, the Kaiser-Meyer-Olkin (KMO) test and Bartlett's sphericity test were performed, both giving suitable results ensuring the conditions of sample applicability and suitability. The EFA was performed using the maximum likelihood method with oblimin rotation, following calculation of a Pearson correlation matrix. Three factors were identified in the scale of actions and tasks done with the mobile phone, explaining 54.26% of the total variance. Factor 1 ("using the mobile phone for social interaction") explained 30.46% of the variance, Factor 2 ("using the mobile phone for school or information-related tasks") explained 13.10% of the variance, and the third factor ("using the mobile phone for leisure related tasks) explained 10.70% of the variance.

Following the application of the EFA, 2 items were removed from the original scale due to exhibiting factor loadings below .40. They were: "creating their own content (e.g., videos or photo editing)" and "gambling online".

Following the EFA and the identification of the factorial structure underlying the scale, confirmatory factor analysis (CFA) was carried out based on a model of three correlated factors (Table 3) using the total sample (n=885). The estimator was DWLS (*Diagonally Weighted Least Squares*) (Jöreskog et al., 2001; Morata-Ramírez et al., 2015), as that is a robust algorithm when analyzing polychoric correlation matrices with ordinal variables (Flora & Curran, 2004; Holgado et al., 2010; Li, 2016; Şimşek & Noyan, 2012; Xia & Yang, 2019).

INSERT TABLE 3

A variety of statistics were used to evaluate the fit of the model. These included the comparative fit index (CFI) and the Tucker Lewis index (TLI), both needing to be ≥ .90 (Bentler & Bonett, 1980; Hair et al., 2006). In addition, the root mean square error of approximation (RMSEA)

was used, with values < .08 indicating reasonable fit, and the standardized root mean square residual (SRMR), where values between .05 and .08 indicate good fit (Steiger, 2016).

The results indicated adequate fit for the model with three correlated factors: CFI=.947; TLI=.934; RMSEA=.064 (90% CI [.056 - .071]); SRMR=.067.

Lastly, the index of internal consistency for the total scale was calculated using Cronbach's alpha (α=.797) and McDonald's omega (ω=.802), producing suitable indices of reliability.

Field work and data analysis

Collecting the data required the participation of primary-school students' parents in order to discover their opinions about their children's use of mobile phones. The strategy used was to go to the school gates at the times when adults accompanied their children either arriving at or leaving school. After confirming that the subjects had children in primary school and that they used mobile phones, the aim of the study was explained and they were asked to participate, with detailed instructions being given if they agreed. The anonymity of their responses and the confidentiality of their data was emphasized. Contact was also made with parent teacher associations, and, where necessary to access school grounds, permission was sought from school authorities.

In order to cover a variety of socio-economic strata and achieve maximum representativeness, data was collected from all of the 23 schools in the city of Lugo (Spain) providing primary education, including state-funded, private, and independent (*concertado*) schools. The data collection process lasted for 2 months.

Once the data was collected and collated, Microsoft Excel for Office 365, SPSS v.20, and JASP v.0.14.0.0 were used to tabulate and code the information for subsequent statistical treatment. That statistical treatment consisted of analyzing descriptive statistics (e.g., frequencies, percentages, means, standard deviations, asymmetry, kurtosis, and bivariate correlations) and multivariate analysis of variance (MANOVA). Three factors of mobile phone use were used (see Table 3) as dependent variables tested with various categorical independent variables such as the children's gender, school year, daily hours of mobile phone use, and impact on academic performance.

Results

Descriptive analysis of the frequency and type of mobile phone use

Table 4 shows the descriptive statistics for each item, organized in the three dimensions considered in this study. It indicates which activities and tasks parents thought that their children did most and least using mobile phones.

Overall, considering all of the items, the frequency of mobile phone use was low and moderate. The parents' indicated that the activities their children did least often were, "sharing information with others" (M=1.45; SD=0.855) or "consulting news portals, online magazines, etc." (M=1.43; SD=0.807). The actions the children engaged in most often, according to their parents, were "watching videos" (M=3.51; SD= 0.993), "playing videogames" (M=3.12; SD: 1.221), and "listening to music" (M=3.09; SD=1.201).

In terms of dispersion, the greatest variability in responses was in items such as: "playing videogames" (SD=1.221), "using instant messaging apps" (SD=1.218), and "listening to music" (SD=1.201). The lowest standard deviations were in the items, "sharing information with others" (SD=0.855) and "consulting news portals, online magazines, etc." (SD=0.807).

INSERT TABLE 4

Table 5 shows the means, standard deviations, asymmetry, kurtosis, and Pearson correlation coefficients between each of the dependent variables studied related to the different uses of mobile phones. There were significant, positive correlations between them. The criteria described by Finney and DiStefano (2006) were used to examine the normality of the distribution. They indicate maximum values of two for asymmetry and seven for kurtosis, which means the variables in the study exhibited normal distributions.

The results show greater use of mobile phones in leisure-related activities (M=3.24; SD=.878), with little use in activities related to social interaction (M=1.96; SD=.721), or school- and information-related tasks (M=1.99; DT=.825).

INSERT TABLE 5

Multivariate analysis of primary-school students' levels of mobile phone use.

A multivariate analysis of variance (MANOVA) was performed to determine whether there were statistically significant differences in the three types of mobile phone use (see Table 5), acting as dependent variables, with respect to other independent variables, including student gender, school year, amount of mobile phone use, and impact on academic performance.

With regard to gender, examining the homogeneity of covariance using *Box's M* test showed that the observed covariance matrices of the dependent variables were equal in all of the groups (*Box's M*= 8.906, *F*=1.479, *p*=.181). The MANOVA indicated that there were differences in the types of use of mobile phones based on the children's gender (*Wilks' Lambda* = .984, $F_{(3,880)}$= 4.892, *p*=.002, η^2 = .016), with a small effect size. More specifically, as Table 6 shows, girls were scored higher than boys in the level of use they made of mobile phones in activities related to social interaction, to education and information, and to leisure.

INSERT TABLE 6

With regard to school year, *Box's M* test showed that there was no homogeneity of covariance (*Box's M*=118.004, *F*=9.774, *p*<.001). Hence, following the recommendations by Tabachnick and Fidell (2001), *Pillai's trace* was used to analyze the multivariate significance of the principal effects. The results were significant, with a large effect size (*Pillai's trace*=.230, $F_{(6,1760)}$= 4.892; *p*<.001; η^2 = .115). As a preliminary step for doing *post hoc* tests, the homogeneity of variance was evaluated via Levene's test of homogeneity of variance, using the *Games-Howell* statistic for the variables "use of mobile phone for social interaction

activities" and "use of mobile phone for school and information related activities" as in neither case was there homoscedasticity, while for the variable "use of mobile phone for leisure-related activities" was assessed using *Sheffé's* test. The results showed that students in later school years made more use of mobile phones for all types of tasks. Table 7 gives more details regarding the differences in means between each school year.

INSERT TABLE 7

Another of the aspects analyzed in the study was to determine whether the amount of time spent on mobile phones each day could be related to the different types of activities they were used for. As *Box's M* test did not demonstrate equality of covariance (*Box's M*=33.777, *F*=2.790, *p*<.001), *Pillai's trace* was used in the MANOVA (*Pillai's trace*=.142, $F_{(6,1760)}$= 22.399; *p*<.001; η^2 = .071), which gave a significant result with a moderate effect size. *Post hoc* tests showed differences in means between subjects who spent more than three hours a day on their phones, those who used them for between one and three hours per day, and those who used them for less than one hour a day. As Table 8 shows, the more time spent on a mobile phone, the more frequent the use, especially in leisure related activities.

INSERT TABLE 8

Lastly, a MANOVA was performed to determine whether there were statistically significant differences between the groups based on the independent variable "do you think that use of a mobile phone has an impact on your child's school performance?" with regard to the dependent variables about types of mobile phone use. *Pillai's trace* was used, as *Box´s M* test showed that there was no homogeneity of variance (*Box's M*=56.771, *F*=3.115, *p*<.001). The results indicated that there were significant differences, with a small effect size (*Pillai's trace*=.060, $F_{(9,2640)}$= 22.399; *p*<.001; η^2 = .020). Subsequent univariate ANOVA gave some interesting results which are shown as means and standard deviations in Table 9. For "use of mobile phones for social interaction activities", there was a clear disparity between parents who thought that mobile phone use had negative impacts on academic performance (M=2.06) and those who responded that there was no negative impact (M=1.85).

For "use of mobile phones for school and information related activity", there were statistically significant differences between parents who felt that mobile phone use had a positive impact on their children's school performance (M=2.44) and those who felt it had a negative impact (M=2.03) or no impact (M=1.89).

Finally, for "use of mobile phones for leisure related activities", there were differences in means between the "yes, positively" group and the "no impact" group (difference in means=.136) and between parents who responded "don't know" and those who indicated that there is "no impact" (difference in means=.361).

INSERT TABLE 9

Discussion and conclusions

The enormous penetration of technology into society in recent years has meant that nowadays children are ever more exposed to screens and to smartphones in particular. Various studies have noted that mobile phones are starting to be used at increasingly younger ages (Lee & Park, 2018; Sola et al., 2019;). In this regard, families bear an important responsibility for initiation into the use these devices, as early use by children is very often parents' means of entertaining them or keeping them quiet (Kabali et al. 2015; Kulakci-Altintas, 2020;), very commonly using entertaining apps which captivate very young children (e.g., videogames, animated films, etc.) (Hosokawa & Katsura, 2018). Beyond mere entertainment, mobile phones have become tools with notable potential in the area of expanded learning (Uribe-Zapata, 2018) and have an unarguable capacity for social interaction.

In this study, we were able to describe the nature of primary-school children's digital exposure according to their parents' views, analyzing the usage patterns of mobile phones from three perspectives: use for social interaction activities, use for school and information-related activities, and use for leisure activities.

In general, the frequency with which the children used mobile phones in those activities was low to moderate, with entertainment-related activity standing out, such as watching videos and playing videogames. This is in line with other studies that have also analyzed parents' perceptions of their children's use of this type of technology (Fernández & Álvarez, 2021; Genc, 2014).

In terms of gender, girls were seen to use mobile phones more than boys. This is consistent with studies in other age groups, such as adolescents, indicating that girls make more use of mobile phones than boys (Sabater & Fernández, 2015). In addition, data from the National Observatory of Telecommunications and the Information Society (*Observatorio Nacional de Telecomunicaciones y de la Sociedad de la Información*: ONTSI) (2019) about child and adolescent use of mobile devices (age 10 to 15) notes girls using mobile phones more (71.6%) than boys (68.2%).

The present study also confirmed that children's school year is a variable that has an impact on the level of use of mobile phones. Children in the later years of primary school (grades 5 and 6, generally aged 10-11 years old), make more frequent use of mobile phones for the activities examined than younger students. Similar results, from a variety of educational stages, are discussed in research, such as the studies by Can et al. (2020).

In addition, our study shows that the amount of time spent on mobile phones is directly related to doing more activities with them. Previous studies have warned of the risks of excessive screen time to the very young (Tamana et al., 2019). Nonetheless, faced with this rather depressing argument about mobile phones, it is also worth highlighting the enormous learning opportunities such as m-learning. Recent studies such as Criollo-C et al. (2021), have reported the benefits of learning done with the support of mobile devices, for example in issues related to accessibility, ubiquity, and portability; with motivation and the capacity for collaborative learning; as well as with adaptation to learners' needs. Those authors also highlighted how mobile phones could help strengthen students' self-directed learning processes, as well as the possibilities for participating in both formal and informal learning environments.

When it comes to parent's views of the impact of children's mobile phone use on school performance, it is important to highlight the positive effects they ascribe to these devices, particularly in school and information-related activities. However, in aspects more closely linked to social interaction, without educational aims, the prevailing parental opinion was that smartphones are distracting elements which have negative impacts on school performance. Nonetheless, it is worth noting that meta-analysis, such as Kates et al. (2018), have concluded that there is no clear consensus in the scientific literature about the effects of mobile phone use on academic performance. Ochoa and Relch (2020) noted a clear duality in parents' beliefs about their children's use of mobile phones. More than three-quarters (77%) of parental opinions indicated that children could learn new academic concepts and linguistic skills via videos on mobile devices, whereas 40% thought that they could do so using various apps. However, in contrast to this favorable opinion of mobile phone use, 35% of parents expressed concern that excessive screen use could have a negative impact on social interactions. In addition, 45% of those surveyed indicated unease about the possibility of children becoming more and more dependent on or addicted to mobile phones.

As Hosokawa and Katsura (2018) noted, there is still limited evidence about the impact of children's mobile phone use, hence future lines of research should be directed towards unravelling important questions from a multidisciplinary perspective. These questions include the importance of parental styles in digital early education; the role of schools in training citizens who approach technology responsibly and with a critical eye; the social, contextual, economic, and pedagogical factors that affect the use of mobile phones; and the dangers and risks minors are exposed to in cyberspace.

Acknowledgements

This article was produced as part of the "IV Convocatoria de Proyectos de Innovación Educativa en Aprendizaje-Servicio (ApS)" by the University of Santiago de Compostela, and as part of the researchs projects entitled: "How the best university teachers learn: impact on learning ecologies on quality of teaching" [Cómo aprenden los mejores docentes universitarios en la era digital: Impacto de las ecologías de aprendizaje en la calidad de la docencia"] (Reference: EDU2015-67907-R) and "Learning Ecologies in the digital age: new opportunities for secondary-school teacher training" ["Ecologías de aprendizaje en la era digital: nuevas oportunidades para la formación del profesorado de educación secundaria"] (ECO4LEARN-SE) (Reference: RTI 2018-095690-B-I00), partly financed by the Spanish Ministry of Science, Innovation and Universities.

Conflicts of interest

The authors declare that there are no potential conflicts of interest related to this article.

References

American Academy of Pediatrics Council on Communications and Media. (2016). Media and young minds. *Pediatrics*, *138*(5), e20162591. https://doi.org/10.1542/peds.2016-2591.

Auxier, B., Anderson, M., Perrin, A., & E. Turner (2020). *Parenting children in the age of screens.* Pew Research Center. https://cutt.ly/4EyEXgB.

Bartau-Rojas, I., Aierbe Barandiaran, A., & Oregui González, E. (2020). Mediación parental del uso de internet desde una perspectiva de género. *Revista Electrónica de Investigación Educativa*, 22, 1-14. https://doi.org/10.24320/redie.2020.22.e02.2075

Bentler, P. M., & Bonett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88, 588-606. https://doi.org/10.1037/0033-2909.88.3.588.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen y J. S. Long (Eds.), *Testing structural equation models* (pp. 136–162). Sage.

Can, T., Kucuk, S., & Simsek, I. (2020). Examining K-12 students' preferences and attitudes on mobile learning. *International Journal of Technology in Teaching and Learning*, *15*(2), 95-108. https://eric.ed.gov/?id=EJ1276249.

Cartanyà-Hueso, À., Lidón-Moyano, C., Cassanello, P., Díez-Izquierdo, A., Martín Sánchez, J., Balaguer, A., & Martínez-Sánchez, J. (2021). Smartphone and Tablet Usage during COVID-19 Pandemic Confinement in Children under 48 Months in Barcelona. *Healthcare* (Basel). *9*(1), 1-8. https://doi.org/10.3390/healthcare9010096.

Christakis, D. A., Ramirez, J. S. B., Ferguson, S. M., Ravinder, S., & Ramirez, J. M. (2018). How early media exposure may affect cognitive function: A review of results from observations in humans and experiments in mice. *Proceedings of the National Academy of Sciences*, *115*(40), 9851-9858. https://doi.org/10.1073/pnas.1711548115.

Cohen, L. & Manion, L. (2002). *Métodos de investigación educativa.* La Muralla.

Criollo-C, S., Guerrero-Arias, A., Jaramillo-Alcázar, Á., & Luján-Mora, S. (2021) Mobile Learning Technologies for Education: Benefits and Pending Issues. *Applied Sciences*, 11, 4111. https://doi.org/10.3390/app11094111.

Eurostat (2021, Mayo). *Trust, security and privacy - smartphones. https://cutt.ly/vEyQaR0.*

Desmurget, M. (2020). *La fábrica de cretinos digitales.* Península.

Fernández R., & Álvarez, L. (2021). Estudio piloto de la percepción parental y de la infancia sobre el uso de las TIC en el tiempo libre: repercusiones familiares y sociopersonales. En Aznar Díaz, I. et al., *Desempeño docente y formación en competencia digital en la era SARS COV 2* (pp.368-380). Dykinson.

Finney, S.J., & Distefano, C. (2006). A second course in structural equation modeling. In Hancock, G.R., y Mueller, R.O. (Eds.), *Non-normal and categorical data in structural equation modeling* (pp. 439–492). IAP Information Age Publishing. https://bit.ly/2NI26Vq.

Flora, D. B., & Curran, P. J. (2004). An empirical evaluation of alternative methods of estimation for confirmatory factor analysis with ordinal data. P*sychological Methods*, *9(4)*, 466-491. https://doi.org/10.1037/1082-989X.9.4.466.

Genc, Z. (2014). Parent´s Perceptions about the Mobile Technology Use of Preschool Aged Children. *Procedia. Social and Behavioral Sciences*, 156, 55-60. https://doi.org/10.1016/j.sbspro.2014.08.086.

González-Sanmamed, M., Muñoz-Carril, P.C., & Santos-Caamaño, F.J. (2019). Key components of learning ecologies: A Delphi assessment. *British Journal of Educational Technology*, *50*(4), 1639-1655. https://doi.org/10.1111/bjet.12805.

Hadad, S., Meishar-Tal, H., & Blau, I. (2020). The parents' tale: Why parents resist the educational use of smartphones at schools?, *Computers & Education*, *157*, 1-13. https://doi.org/10.1016/j.compedu.2020.103984.

Hair, J., Black, W. C., Babin, B., Anderson, R. E., & Tatham, R. (2006). *Multivariate data analyses*. Prentice-Hall.

Hansen, A. (2021). *Insta-Brain. Cómo nos afecta la dependencia digital en la salud y en la felicidad.* RBA.

Holgado, F. P., Chacón, S., Barbero, I., & Vila, E. (2010). Polychoric versus Pearson correlations in exploratory and confirmatory factor analysis of ordinal variables. *Quality & Quantity: International Journal of Methodology*, *44*(1), 153-166. https://doi.org/10.1007/s11135-008-9190-y.

Hosokawa, R., & Katsura, T. (2018). Association between mobile technology use and child adjustment in early elementary school age. *PLoS ONE*, *13*(7), 1-17. https://doi.org/10.1371/journal.pone.0208844.

INE (2020). *Encuesta sobre equipamiento y uso de tecnologías de información y comunicación en los hogares.* https://cutt.ly/BEyQ067.

Jöreskog, K. G., & Sörbom, D. (1993). *LISREL 8: Structural equation modeling with the SIMPLIS command language.* Scientific Software International.

Jöreskog, K. G., Sörbom, D., Du Totit, S., y Du Toit, M. (2001). *LISREL 8: New statistical features*. Scientific Sofware International.

Kabali, H. K., Irigoyen, M. M., Nunez-Davis, R., Budacki, J. G., Mohanty, S. H., Leister, K. P., & Bonner, R. L. (2015). Exposure and use of mobile media devices by young children. *Pediatrics*, *136*(6), 1044-1050. https://doi.org/10.1542/peds.2015-2151.

Kates, A. W., Wu, H., & Coryn, C. L. (2018). The effects of mobile phone use on academic performance: A meta-analysis. *Computers & Education*, *127*, 107-112. https://dx.doi.org/10.1016/j.compedu.2018.08.

Kim, D., & Jahng, K. E. (2019). Children's self-esteem and problematic smartphone use: The moderating effect of family rituals. *Journal of Child and Family Studies*, *28*(12), 3446-3454. https://doi.org/10.1007/s10826-019-01526-1.

Kulakci-Altintas, H. (2020). Technological device use among 0-3 year old children and attitudes and behaviors of their parents towards technological devices. *Journal of Child and Family Studies*, *29*(1), 55-61. https://doi.org/10.1007/s10826-019-01457-x.

Lee, M., & Park, S. (2018). Factors associated with Smartphone Overdependency in Preschool Children. *Child Health Nursing Research*, *24*(4), 383-392. https://doi.org/10.4094/chnr.2018.24.4.383.

Li, CH. (2016). The performance of ML, DWLS, and ULS estimation with robust corrections in structural equation models with ordinal variables. *Psychological Methods*, *21*(3), 369–387. https://doi.org/10.1037/met0000093.

Madigan, S., Browne, D., Racine, N., Mori, C., & Tough, S. (2019). Association between screen time and children's performance on a developmental screening test. *JAMA pediatrics*, *173*(3), 244-250. https://doi.org/10.1001/jamapediatrics.2018.5056.

Martínez, G., Casado, M. Á., & Garitaonandia, C. (2020). Estrategias online de mediación parental en contextos familiares de España. *Comunicar: Revista Científica de Comunicación y Educación*, *28*(65), 67-76. https://doi.org/10.3916/C65-2020-06.

McMillan, J., & Schumacher, S. (2005). *Investigación educativa*. Pearson Addison Wesley.

Morata-Ramírez, M. A., Holgado-Tello, F. P., Barbero-García, I., & Méndez, G. (2015). Análisis Factorial Confirmatorio. Recomendaciones sobre Mínimos Cuadrados No Ponderados en función del error Tipo I de Ji-cuadrado y RMSEA. *Acción Psicológica*, *12*(1), 79-90. https://dx.doi.org/doi.org/10.5944/ap.12.1.14362.

Observatorio Nacional de Telecomunicaciones y de la Sociedad de la Información (Ed.) (2019). *Indicadores sobre uso de TIC por menores en España*. https://bit.ly/33Ef9xv

Ochoa, W., & Reich, S.M. (2020). Parents' Beliefs About the Benefits and Detriments of Mobile Screen Technologies for Their Young Children's Learning: A Focus on Diverse Latine Mothers and Fathers. *Frontiers in Psychology*, 11, 1-14. https://www.doi.org/10.3389/fpsyg.2020.570712.

Ofcom (2021). *Children and parents: media use and attitudes report 2020/21*. https://cutt.ly/4EyRpEU.

Pew Research Center (2018). *Many Turn to YouTube for Children's Content, News, How-To Lessons*. https://cutt.ly/AEyRxjE.

Pew Research Center (2021). *Mobile Technology and Home Broadband 2021*. https://cutt.ly/EEyQinS.

Radesky, J. S., Schaller, A., Yeo, S. L., Weeks, H. M., & Robb, M.B. (2020). *Young kids and YouTube: How ads, toys, and games dominate viewing*. Common Sense Media. https://cutt.ly/vEyRTa6.

Rideout, V., & Robb, M. B. (2020). *The Common Sense census: Media use by kids age zero to eight, 2020*. Common Sense Media. https://cutt.ly/AEyQXw9.

Sabater, C., & Fernández, J.B. (2015). Estereotipos de género y uso de las nuevas tecnologías. *Icono 14*, 13, 208-246. https://doi.org/10.7195/ri14.v13i1.722.

Serra, G., Lo Scalzo, L., Giuffrè M., Ferrara P., & Corsello, G. (2021). Smartphone use and addiction during the coronavirus disease 2019 (COVID-19) pandemic: cohort study on 184 Italian children and adolescents. *Italian Journal of Pediatrics*, *47*(150) https://doi.org/10.1186/s13052-021-01102-8.

Şimşek, G.G., & Noyan, F. (2012). Structural equation modeling with ordinal variables: a large sample case study. *Quality & Quantity: International Journal of Methodology ,46*, 1571-1581. https://doi.org/10.1007/s11135-011-9467-4 .

Smahel, D., Machackova, H., Mascheroni, G., Dedkova, L., Staksrud, E., Ólafsson, K., Livingstone, S., & Hasebrink, U. (2020). *EU Kids Online 2020: Survey results from 19 countries.* EU Kids Online. https://doi.org/10.21953/lse.47fdeqj01ofo.

Sola Reche, J.M., García Vidal, M., & Ortega Navas, M. (2019). Las implicaciones del uso de dispositivos móviles en el proceso de enseñanza aprendizaje en alumnos de 5º y 6º de primaria. *Pixel-bit*, 55, 117-131. https://doi.org/10.12795/pixelbit.2019.i55.07.

Son, H.-G., Cho, H.J., & Jeong, K.-H. The Effects of Korean Parents' Smartphone Addiction on Korean Children's Smartphone Addiction: Moderating Effects of Children's Gender and Age. *International Journal of Environmental Research and Public Health*, *18*, 6685. https:// doi.org/10.3390/ijerph18136685.

Steiger, J. H. (2016). Notes on the Steiger–Lind (1980) Handout. *Structural Equation Modeling: A Multidisciplinary Journal*, *23*(6), 777-781. https://doi.org/10.1080/10705511.2016.1217487.

Suarez, J.L. (2020). La condición digital. *Revista de Occidente*, 472, 2-20.

Syvaoja, H. J., Kantomaa, M., Ahonen, T.; Hakonen, H., Kankaanpää, A., & Tammelin, T. (2013). Physical activity, sedentary behavior, and academic performance in Finnish children. *Medicine & Science in Sports & Exercise*, *45*(11), 2098-2104. https://doi.org/10.1249/MSS.0b013e318296d7b8.

Tabachnick, B. G., & Fidell, L. S. (2001). *Using multivariate statistics*. HarperCollins.

Tamana S.K., Ezeugwu V., Chikuma J., Lefebvre D.L., Azad M.B., Moraes T.J., Subbarao, P., Becker, A., Turvey, S., Sears, M., Dick, B., Carson, V., Rasmussen, C., Pei, J., & Mandhane, P. (2019). Screen-time is associated with inattention problems in preschoolers: Results from the CHILD birth cohort study. *PLoS ONE*, *14*(4), 1-15. http://doi.org/10.1371/journal.pone.0213995.

Uribe-Zapata, A. (2018). Concepto y prácticas de educación expandida: una revisión de la literatura académica. *El Ágora U.S.B.*, *18*(1), 278–293. https://doi.org/10.21500/16578031.3456.

Vázquez, B., & López, R. (2021). Análisis crítico del concepto "aprendizaje ubicuo" a través de la Cartografía Conceptual. *RED. Revista de Educación a Distancia*, *66*(21), 1-28. http://dx.doi.org/10.6018/red.430841.

Xia, Y., & Yang, Y. (2019) RMSEA, CFI, and TLI in structural equation modeling with ordered categorical data: The story they tell depends on the estimation methods. *Behavior Research Methods*, 51, 409-428. https://doi.org/10.3758/s13428-018-1055-2.

LIST OF TABLES

Table 1. Sociodemographic characteristics of the parents surveyed.

Variables	**Categories**	***n***	***%***
Gender	Man	277	31.3
	Woman	608	68.7
Civil Status	NA/NK	4	.5
	Married	634	71.6
	Single	62	7.0
	Widowed	9	1.0
	Separated	59	6.7
	Divorced	63	7.1
	Common law marriage	53	6.0
	Polygamous marriage	1	0.1
Educational qualifications	No qualifications	3	.3
	Primary school or equivalent	55	6.2
	Secondary school or equivalent	178	20.1
	Vocational training	270	30.5
	University degree or equivalent	379	42.8
Working situation	NA/NK	3	0.3
	Unemployed	99	11.2
	Employed	776	87.7
	Retired	7	0.8
Age	Mean age of parents surveyed was 42.28 years (SD=5.557)		

Table 2. Sociodemographic characteristics of the primary-school-aged children of the parents surveyed.

Variables	**Categories**	***n***	***%***
Gender	Boy	425	48
	Girl	460	52
Type of school	State-funded	463	52.3
	Independent (*concertado*)	319	36.1
	Private	103	11.6
School year	Lower Primary (1st and 2nd year: generally aged 6-7)	168	19.0
	Middle Primary (3rd and 4th year: generally aged 8-9)	236	26.7
	Upper Primary (5th and 6th year: generally aged 10-11)	481	54.3
Age	The children's mean age was 9.28 years (SD=1.749)		
Age when mobile phone use began	The mean age when children began using mobile phones was 6.77 years (SD=2.297)		

Table 3. Factor loadings from confirmatory factor analysis (CFA) on the scale: "how often do you think your child does the following activities with a mobile phone" (*n*=885).

	Factors		
	Factor 1	Factor 2	Factor 3
Makes telephone calls	0.534		
Uses instant messaging (WhatsApp, Telegram, Line, SnapChat, etc.)	0.903		
Uses social networks (Facebook, Twitter, Instagram, etc.)	0.592		
Makes video calls	0.438		
Takes photos and share them	0.699		
Follows "influencers"	0.693		
Shares information with other people	0.561		
Searches for information		0.479	
Does school tasks		0.621	
Consults news portals, online magazines etc.		0.987	
Plays videogames			0.830
Watches videos			0.795
Listens to music			0.461

Note: Factor 1= mobile phone use for social interaction activities; Factor 2= mobile phone use for school and information related activities; Factor 3= mobile phone use for leisure activities.

Table 4. Descriptive statistics (grouped by type of use) reflecting parents' opinions of how often their primary-school-aged children use mobile phones to do certain activities (*n*=885).

	NA/NK		Never		Almost never		Sometimes		Almost always		Always		Mean	SD
	n	%	n	%	n	%	n	%	n	%	n	%		
Mobile phone use for social interaction activities														
Make phone calls	3	0.3	302	34.1	288	32.5	227	25.6	46	5.2	19	2.1	2.08	0.998
Use instant messaging (WhatsApp, Telegram, Line, SnapChat, etc.)	3	0.3	360	40.7	186	21.0	203	22.9	85	9.6	48	5.4	2.18	1.218
Use social networks (Facebook, Twitter. Instagram, etc.)	2	0.2	598	67.6	92	10.4	112	12.7	60	6.8	21	2.4	1.66	1.083
Make video calls	5	0.6	544	61.5	155	17.5	120	13.6	47	5.3	14	1.6	1.67	1.003
Take photos and share them	6	0.7	131	14.8	188	21.2	336	38.0	134	15.1	90	10.2	2.85	1.162
Follow "influencers"	7	0.8	534	60.3	101	11.4	141	15.9	73	8.2	29	3.3	1.82	1.169
Share information with other people	15	1.7	637	72.0	124	14.0	72	8.1	28	3.2	9	1.0	1.45	0.855
Mobile phone use for school and information related activities														
Search for information	2	0.2	264	29.8	177	20.0	316	35.7	90	10.2	36	4.1	2.39	1.133
Do school tasks	4	.5	334	37.7	198	22.4	239	27.0	81	9.2	29	3.3	2.17	1.134
Consult news portals, online magazines etc.	3	.3	649	73.3	120	13.6	89	10.1	18	2.0	6	.7	1.43	0.807
Mobile phone use for leisure activities														
Play videogames	2	0.2	111	12.5	141	15.9	296	33.4	199	22.5	136	15.4	3.12	1.221
Watch videos	6	0.7	24	2.7	90	10.2	343	38.8	261	29.5	161	18.2	3.51	0.993
Listen to music	2	0.2	113	12.8	135	15.3	318	35.9	192	21.7	125	14.1	3.09	1.201

Table 5. Correlation matrix and descriptive statistics by type of mobile phone use

	1	2	3	Mean	SD	Min	Max	Asymmetry	Kurtosis
1. Mobile phone use for social interaction activities	-			1.96	.721	1	4.57	1.066	.921
2. Mobile phone use for school and information related activities	455**	-		1.99	.825	1	5	.682	-.040
3. Mobile phone use for leisure activities	372**	.251**	-	3.24	.878	1	5	.105	-.384

Note: ** $p<.01$

Table 6. Comparison of means and standard deviations of mobile phone use by gender.

		Mobile phone use for social interaction activities		Mobile phone use for school and information related activities		Mobile phone use for leisure activities	
Gender	*N*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Male	425	1.87	.68	1.97	.81	3.25	.89
Female	459	2.03	.74	2.02	.83	3.22	.86

Table 7. Comparison of means and standard deviations for mobile phone use by school year.

		Mobile phone use for social interaction activities		Mobile phone use for school and information related activities		Mobile phone use for leisure activities	
Curso	*N*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Lower Primary (1st and 2nd year: generally aged 6-7)	167	1.52	.416	1.40	.579	3.09	.906
Middle Primary (3rd and 4th year: generally aged 8-9)	236	1.73	.557	1.90	.737	3.10	.877
Upper Primary (5th and 6th year: generally aged 10-11)	481	2.22	.764	2.24	.824	3.35	.853

Table 8. Comparison of means and standard deviations of mobile phone use by amount of time spent connected.

		Mobile phone use for social interaction activities		Mobile phone use for school and information related activities		Mobile phone use for leisure activities	
Time spent on the phone	*N*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Less than one hour a day	442	1.76	.615	1.88	.770	2.98	.820
Between one and three hours a day	359	2.07	.710	2.06	.855	3.42	.855
More than three hours a day	83	2.48	.901	2.31	.868	3.79	.832

Table 9. Comparison of means and standard deviations of mobile phone use by parent's opinions of the impact on school performance.

		Mobile phone use for social interaction activities		Mobile phone use for school and information related activities		Mobile phone use for leisure activities	
Impact on school performance	*N*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Yes, positive	56	1.95	.74	2.44	.991	3.33	.92
Yes, negative	285	2.06	.79	2.03	.836	3.34	.98
There is no impact	449	1.85	.63	1.89	.791	3.11	.79
Don't know	94	2.11	.79	2.10	.740	3.47	.81

Parents' Perceptions of Their Children's Smartphone Use

Percepciones de las familias sobre el uso de móviles

LIST OF TABLES

Table 1. Sociodemographic characteristics of the parents surveyed.

Variables	**Categories**	***n***	***%***
Gender	Man	277	31.3
	Woman	608	68.7
Civil Status	NA/NK	4	.5
	Married	634	71.6
	Single	62	7.0
	Widowed	9	1.0
	Separated	59	6.7
	Divorced	63	7.1
	Common law marriage	53	6.0
	Polygamous marriage	1	0.1
Educational qualifications	No qualifications	3	.3
	Primary school or equivalent	55	6.2
	Secondary school or equivalent	178	20.1
	Vocational training	270	30.5
	University degree or equivalent	379	42.8
Working situation	NA/NK	3	0.3
	Unemployed	99	11.2
	Employed	776	87.7
	Retired	7	0.8
Age	Mean age of parents surveyed was (SD=5.557)	42.28	years

Table 2. Sociodemographic characteristics of the primary-school-aged children of the parents surveyed.

Variables	**Categories**	***n***	***%***
Gender	Boy	425	48
	Girl	460	52
Type of school	State-funded	463	52.3
	Independent (*concertado*)	319	36.1
	Private	103	11.6
School year	Lower Primary (1st and 2nd year: generally aged 6-7)	168	19.0
	Middle Primary (3rd and 4th year: generally aged 8-9)	236	26.7
	Upper Primary (5th and 6th year: generally aged 10-11)	481	54.3
Age	The children's mean age was 9.28 years (SD=1.749)		
Age when mobile phone use began	The mean age when children began using mobile phones was 6.77 years (SD=2.297)		

Table 3. Factor loadings from confirmatory factor analysis (CFA) on the scale: "how often do you think your child does the following activities with a mobile phone" (*n*=885).

	Factors		
	Factor 1	Factor 2	Factor 3
Makes telephone calls	0.534		
Uses instant messaging (WhatsApp, Telegram, Line, SnapChat, etc.)	0.903		
Uses social networks (Facebook, Twitter, Instagram, etc.)	0.592		
Makes video calls	0.438		
Takes photos and share them	0.699		
Follows "influencers"	0.693		
Shares information with other people	0.561		
Searches for information		0.479	
Does school tasks		0.621	
Consults news portals, online magazines etc.		0.987	
Plays videogames			0.830
Watches videos			0.795
Listens to music			0.461

Note: Factor 1= mobile phone use for social interaction activities; Factor 2= mobile phone use for school and information related activities; Factor 3= mobile phone use for leisure activities.

Table 4. Descriptive statistics (grouped by type of use) reflecting parents' opinions of how often their primary-school-aged children use mobile phones to do certain activities (*n*=885).

	NA/NK		Never		Almost never		Sometimes		Almost always		Always		Mean	SD
	n	%	n	%	n	%	n	%	n	%	n	%		
Mobile phone use for social interaction activities														
Make phone calls	3	0.3	302	34.1	288	32.5	227	25.6	46	5.2	19	2.1	2.08	0.998
Use instant messaging (WhatsApp, Telegram, Line, SnapChat, etc.)	3	0.3	360	40.7	186	21.0	203	22.9	85	9.6	48	5.4	2.18	1.218
Use social networks (Facebook, Twitter. Instagram, etc.)	2	0.2	598	67.6	92	10.4	112	12.7	60	6.8	21	2.4	1.66	1.083
Make video calls	5	0.6	544	61.5	155	17.5	120	13.6	47	5.3	14	1.6	1.67	1.003
Take photos and share them	6	0.7	131	14.8	188	21.2	336	38.0	134	15.1	90	10.2	2.85	1.162
Follow "influencers"	7	0.8	534	60.3	101	11.4	141	15.9	73	8.2	29	3.3	1.82	1.169
Share information with other people	15	1.7	637	72.0	124	14.0	72	8.1	28	3.2	9	1.0	1.45	0.855
Mobile phone use for school and information related activities														
Search for information	2	0.2	264	29.8	177	20.0	316	35.7	90	10.2	36	4.1	2.39	1.133
Do school tasks	4	.5	334	37.7	198	22.4	239	27.0	81	9.2	29	3.3	2.17	1.134
Consult news portals, online magazines etc.	3	.3	649	73.3	120	13.6	89	10.1	18	2.0	6	.7	1.43	0.807
Mobile phone use for leisure activities														
Play videogames	2	0.2	111	12.5	141	15.9	296	33.4	199	22.5	136	15.4	3.12	1.221
Watch videos	6	0.7	24	2.7	90	10.2	343	38.8	261	29.5	161	18.2	3.51	0.993
Listen to music	2	0.2	113	12.8	135	15.3	318	35.9	192	21.7	125	14.1	3.09	1.201

Table 5. Correlation matrix and descriptive statistics by type of mobile phone use

	1	2	3	Mean	SD	Min	Max	Asymmetry	Kurtosis
1. Mobile phone use for social interaction activities	-			1.96	.721	1	4.57	1.066	.921
2. Mobile phone use for school and information related activities	455**	-		1.99	.825	1	5	.682	-.040
3. Mobile phone use for leisure activities	372**	.251**	-	3.24	.878	1	5	.105	-.384

Note: ** $p<.01$

Table 6. Comparison of means and standard deviations of mobile phone use by gender.

		Mobile phone use for social interaction activities		Mobile phone use for school and information related activities		Mobile phone use for leisure activities	
Gender	*N*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Male	425	1.87	.68	1.97	.81	3.25	.89
Female	459	2.03	.74	2.02	.83	3.22	.86

Table 7. Comparison of means and standard deviations for mobile phone use by school year.

		Mobile phone use for social interaction activities		Mobile phone use for school and information related activities		Mobile phone use for leisure activities	
Curso	*N*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Lower Primary (1st and 2nd year: generally aged 6-7)	167	1.52	.416	1.40	.579	3.09	.906
Middle Primary (3rd and 4th year: generally aged 8-9)	236	1.73	.557	1.90	.737	3.10	.877
Upper Primary (5th and 6th year: generally aged 10-11)	481	2.22	.764	2.24	.824	3.35	.853

Table 8. Comparison of means and standard deviations of mobile phone use by amount of time spent connected.

		Mobile phone use for social interaction activities		Mobile phone use for school and information related activities		Mobile phone use for leisure activities	
Time spent on the phone	*N*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Less than one hour a day	442	1.76	.615	1.88	.770	2.98	.820
Between one and three hours a day	359	2.07	.710	2.06	.855	3.42	.855
More than three hours a day	83	2.48	.901	2.31	.868	3.79	.832

Table 9. Comparison of means and standard deviations of mobile phone use by parent's opinions of the impact on school performance.

		Mobile phone use for social interaction activities		Mobile phone use for school and information related activities		Mobile phone use for leisure activities	
Impact on school performance	*N*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Yes, positive	56	1.95	.74	2.44	.991	3.33	.92
Yes, negative	285	2.06	.79	2.03	.836	3.34	.98
There is no impact	449	1.85	.63	1.89	.791	3.11	.79
Don't know	94	2.11	.79	2.10	.740	3.47	.81