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Parental control measures to regulate smartphones use by children

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Keywords

Mobile devices
Primary education
Minors
Parental mediation

Abstract

The complexity of the current digital ecosystem calls for the development of parental control mechanisms to guide minors in their use of technology. This study aims to identify the type of parental control measures used by parents to monitor the use that school-age children (6 to 12 years old) make of smartphones. An *ex post facto* design was prepared after conducting a survey in which 885 people (68.7% mothers) took part. The results showed that 93.7% of the parents surveyed used some type of parental control system to regulate the use of the smartphone. The most frequently strategies were limiting the time when the device could be used and restricting access through passwords. The analysis revealed that parents with higher education used a greater number of control mechanisms. Similarly, the length of time the children were connected was related to the level and intensity of the parental control strategies used. Parents applied a greater number of parental control strategies with pre-adolescent children, in the last years of primary education. Finally, the challenges and opportunities that the use of smartphones can bring to children are discussed, and also the active role that the family should play in digital training and education.

Estrategias de control parental en la regulación del uso del móvil durante la infancia

Palabras clave

Dispositivos móviles
Educación primaria
Menores
Mediación parental

Resumen

La complejidad del actual ecosistema digital reclama el desarrollo de mecanismos de mediación parental que orienten a los menores en su relación con la tecnología. Desde esta perspectiva, se presenta un estudio descriptivo cuyo propósito ha sido identificar el tipo de medidas de control parental utilizadas por progenitores respecto al uso que sus hijos e hijas en edad escolar (6 a 12 años) hacían con los teléfonos inteligentes. Se empleó un diseño *ex post facto* mediante el método de encuesta. Participaron 885 sujetos (68.7% madres). Los resultados mostraron que un 93.7% de los padres y madres encuestados utilizaron algún tipo de sistema de control parental para regular el uso del *smartphone*. Las medidas más empleadas fueron la elección del horario sobre cuándo podía ser utilizado el dispositivo y la restricción de acceso a través de claves. Los análisis también revelaron que los progenitores con estudios superiores fueron los que usaron un mayor número de mecanismos de control. Asimismo, el tiempo de conexión por parte de los menores se relacionó con el nivel e intensidad de las medidas de control parental utilizadas. Igualmente, los padres y madres aplicaban un mayor número de estrategias de control parental con hijos e hijas preadolescentes, matriculados en los últimos cursos de educación primaria. Finalmente, se discute sobre los desafíos y oportunidades que comporta el uso de *smartphones* por parte de los infantes y se analiza el papel activo que la familia debería desempeñar en su capacitación digital.

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Smartphones have become omnipresent devices in our day to day lives. They are now a predominant technology that has begun to affect many aspects of the rhythm of daily life, where the borders between the physical and the virtual have narrowed in a perpetually hyperconnected society (Gaines, 2019; Hansen, 2021). In this context, the significant level of intrusion of smartphones into the family arena means that children are nowadays exposed to screens more and more. Studies such as Smahel et al. (2020) have shown that the average time minors spend online in Spain is 180 minutes a day (double the time spent ten years ago), with 76% of that access to the internet via smartphones. In addition, various studies have indicated that the age at which children start to use smartphones continues to drop (Andrade et al., 2021; Sola et al., 2019). This early use is also reflected in the high percentage of children who have their own mobile devices (Rideout & Roob, 2020).

Within this complex multifaceted ecosystem, in which smartphones feature prominently, parents face significant challenges that affect how they raise their children (Cánovas, 2021; Livingstone & Blum-Ross, 2020). Among the challenges to consider in children's digital education, the scientific literature has paid particular attention to the importance of suitable parental monitoring and control mechanisms to prevent the problematic situations children may have to face if they abuse or make irresponsible use of smartphones (Kim & Jahng, 2019). In this regard, one of the family's main responsibilities is to establish clear rules and limits that help to mitigate the dangers and risky behaviors arising from improperly using this technology. In addition, the family should provide a safe environment in which children can explore opportunities to interact with other people, learn, and improve their digital skills (Rodríguez-de-Dios et al., 2018).

Within this action framework, it is important to emphasize that the latest European guidelines and resolutions about children's digital rights (European Commission, 2018, 2022) recommend that parental control of devices meet appropriate norms of protection, respecting the principle of proportionality and transparency for the child, making them into an active participant, aware of monitoring, data-gathering, and tracking applications used by digital services online. From this perspective, notable initiatives such as the BIK+ strategy, adopted by the European Union on 11 May 2022, aim to develop a battery of measures to ensure children are protected in the digital arena, enhancing their skills, empowering them and giving them the ability to safely shape and enjoy their lives on the internet. This ambitious project requires various educational agents (teachers and parents) to be trained in order to achieve young people's digital wellbeing.

Factors that influence parents' strategies for mediation and control in children's digital education

Parental mediation is a strategy that influences how children use technology and is useful not only for preventing problem behaviors and conflict online (Matthes et al., 2021), but also for providing learning opportunities and acquisition of critical skills (Sánchez-Valle et al., 2017).

There is broad consensus in the literature on the identification of two main categories of parental styles (Chen & Chng, 2016; Livingstone et al., 2017): enabling or active mediation, linked to positive use of technology, in which parents offer guidance and recommendations; and restrictive mediation, which controls children's activities through rules and limiting screen time. Along with these two types, Smahel et al. (2020) expanded the classification in the report *EU Kids Online 2020*, adding technical strategies (which involve parents using programs or mobile applications to control time, set tracking systems, apply filters, etc.), monitoring or tracking (tracing children's activities on various platforms), and inverse mediation strategies (where the children ask adults for help or intervention).

Nonetheless, studies have not produced conclusive results when it comes to establishing the ideal parental control style in children's digital education (Sánchez-Valle et al., 2017). Results vary in terms of how the level of parental monitoring and supervision can play an important role in smartphone use (Chang et al., 2019; Shin & Li, 2017). Some experts, such as Kalmus et al. (2015), believe that monitoring measures are more effective when children are younger and face unpleasant experiences online, reducing the harm they may be exposed to. These authors noted that parental mediation based on monitoring and tracking have notable effects in reducing the risk of cyberbullying. However, these types of measures have been criticized as being intrusive and potentially invading privacy (Symons et al. 2017), as well as for holding to a reductionist view that focuses mainly on dangers, without considering alternatives such as active mediation (Shin & Lwin, 2016). Active mediation encourages children's digital wellbeing through dialog, where parents assertively discuss the use of technology with their children, sharing activities online, and explaining how to deal with problematic or unexpected situations (Dedkova & Smahel, 2020). Another reason for various authors to consider active mediation a suitable measure in digital education is because it improves children's understanding about technology, allowing them to improve their self-regulation with ICT and modeling healthier and more responsible coping skills (Dedkova & Smahel, 2020).

Recent studies have noted various factors that influence the levels of parental mediation and control styles applied to the use of technology, particularly smartphones (Dedkova & Smahel, 2020; Geržičáková et al., 2022; Warren & Aloia, 2019). The children's age is a key variable, families use more rules and are more inflexible with younger children than with adolescents (Glatz et al., 2018; Smahel et al., 2020). The age of the parents is also an important aspect that affects how they regulate their children's online activities. The older the parents, the more lax the monitoring and control of their offspring, while younger parents tend to be more involved in support, guidance, and social interaction with their children (Livingstone et al. 2017; Padilla et al., 2015; Talves & Kalmus, 2015).

Parents' socio-educational level is also an important factor affecting supervision. Recent studies have shown that variables such as parents' professional category and educational attainment influence the type of mediation they engage in around their children's use of smartphones and online consumption (Martínez et al., 2020; Ramírez-García et al., 2023). More specifically, higher

educational attainment and higher status employment increase the likelihood of applying diverse mechanisms for parental control and monitoring. This control is more commonly executed by mothers than fathers, which indicates women's significant role and responsibility in their children's digital education (Dedkova & Smahel, 2020; Jiménez-Morales et al., 2020).

Gender has also been identified as an important variable if we focus on the child, as there is greater control over girls than boys, something that some authors have attributed to greater concern that girls may talk to strangers or fear of cyberbullying (Pastor Ruiz et al., 2019; Ramos-Soler et al., 2018).

In addition, families' socio-economic status is associated with how much children are exposed to screens (Männikkö et al., 2020). Parents from lower socio-economic backgrounds use fewer parental control strategies over their children's digital activities (Smahel et al., 2020).

More recently, new research trends have been looking more deeply into parents' perceived lack of control due to children being hyper-connected. This entails a sense of resignation and frustration around the loss of control over the activities children engage in with their mobile devices (Charisi et al., 2022).

Academics have also paid particular attention to parents' low levels of digital skills, time spent online, and excessive use of smartphones. These variables may have a notable impact on children developing problematic behaviors in their use of digital devices (Matthes et al., 2021; Schmuck et al., 2023; Yang et al., 2023), with significant repercussions on their school lives, academic performance, and wellbeing (Eoh et al., 2022).

As noted previously, children are gaining access to smartphones at increasingly younger ages (Andrade et al., 2021; Rideout & Roob, 2020; Sola et al., 2019). However, most research has so far focused on the adolescent population (e.g., Andrade et al., 2021; Smahel et al., 2020). In addition, although recent years have seen the beginnings of analysis of the role families play in their children's digital education, compared to other lines of research, the results so far have been limited. Our current study aims to contribute to improving this theoretical corpus and the research in this field. More specifically, the objective of the study was to identify the parental control measures employed by parents over their primary-school-aged (6 to 12 years old) children's use of smartphones. The specific objectives were: 1) to determine the types of parental control mechanisms parents used to regulate what their children do with their smartphones, 2) to examine whether the parents' educational attainment was related to the level of parental control over the children's smartphone use, 3) to determine if there was a relationship between the amount of time children spent online each day and the level of parental control, and 4) to assess whether the primary school year the children were in influenced the number of parental control mechanisms used to regulate children's smartphone use.

Method

The study used a quantitative methodology. More specifically, an *ex post facto*, descriptive, transversal design via a survey (McMillan & Schumacher, 2005).

Participants

A total of 1,135 parents with children in primary education participated in the study. The children attended 23 schools (private, public, and independent) in the city of Lugo (Spain).

We used convenience sampling in two phases. In the first phase, a pilot study was performed with 250 subjects, which allowed us to validate the questionnaire used to collect the information. The second phase involved applying the survey to the parents making up the final sample, made up of 885 people.

Just under a third (31.3%; $n = 277$) of the participants were men, 68.7% ($n = 608$) were women, and the mean age of the participants was 42.28 years ($SD = 5.56$). The majority of the participants (71.6%; $n = 634$) were married, 7% ($n = 62$) were single, 6.7% ($n = 59$) were separated, while 7.1% ($n = 63$) were divorced, and 1% ($n = 9$) were widowed. A small number (6%; $n = 53$) were in civil partnerships or cohabiting, while only 0.1% ($n = 1$) were in a polygamous marriage. Finally, 0.5% ($n = 4$) of the sample did not provide their civil status.

In terms of educational attainment, 6.2% ($n = 55$) had a primary education or equivalent, 20.1% ($n = 178$) had compulsory or higher secondary education, 30.5% ($n = 270$) had vocational training qualifications, while 42.8% ($n = 379$) had university-level or equivalent education. Lastly, 0.3% ($n = 3$) stated that they did not have any qualifications.

The vast majority of the parents were in employment (87.7%; $n = 776$), and a much smaller proportion (11.2%; $n = 99$) were unemployed. A small number (0.8%; $n = 7$) reported being retired, while only 0.3% ($n = 3$) of the subjects did not respond about their employment.

The mean age of the participants' children was 9.28 years old ($SD = 1.75$) and The mean age of starting to use smartphones was 6.77 years ($SD = 2.3$). It is worth noting that, as Table 1 indicated. Table 1 shows the main sociodemographic characteristics of the study participants' children.

Instrument

The data were collected using a questionnaire created for the study in various topic blocks: identification of smartphone use, time spent using the device, activity and tasks done using the smartphone, parental rules and control of smartphone use, smartphone use habits, and benefits and dangers of smartphones. These blocks were preceded by a section for collecting the parent's and child's sociodemographic data.

The multiple choice items analyzed in the present study were in the block about parental controls and rules for smartphone use (see Table 2).

The validation process for the instrument addressed questions such as content validity, construct validity, and internal consistency. The questionnaire was validated by a panel of eight international specialists who were experts in research methodology and educational technology. They examined aspects such as each item's uniqueness, relevance, and importance (Fleiss' Kappa = .848), and provided various comments that helped us to modify, restructure, and optimize the initial content of

the questionnaire. We also performed a pilot study ($n = 250$) that helped improve the final instrument via the respondents' observations and responses. In addition, we performed various exploratory and confirmatory factor analyses on the items in the questionnaire that met the necessary measurement requirements (Muñoz-Carril et al., 2022). We also calculated the index of internal consistency using Cronbach's alpha, which gave an adequate level of reliability ($\alpha = .797$).

Procedure

The questionnaires were administered during January and February 2020 to parents of primary-school children to ascertain the types of parental control mechanisms that were being applied to children's smartphone use. They were applied before and after school, when parents accompanied their children to and from the school gates. We also contacted parent groups, and where access was needed to school premises, we sought permission from the school authorities.

After confirming that the person being surveyed had children of the required age who used smartphones, we explained the study aim in detail (as a prior step to applying the questionnaire), and asked for voluntary participation, making it clear that the data would be collected completely anonymously and in line with data protection legislation and ethics. Parents were assured that the questionnaire would not collect any identifying or personal information and that they were free to not give an answer to any of the questions. They were also told that they could freely decide to stop answering at any time or even revoke their informed consent (in which case the collected answers would be destroyed).

Data analysis

To address the study objectives, and given the categorical nature of the study variables, we performed a descriptive analysis (frequencies and percentages) and bivariate analysis via Chi-squared tests (setting the significance level at 5%). Cramer's *V* statistics and the Gamma test were used to measure effect size. The statistical treatment was done using Microsoft Excel for Office 365, SPSS v.20, and JASP v.0.14.0.0.

Results

Results of the descriptive analysis of parental control mechanisms

As Table 2 shows, the most commonly-reported mechanisms by the parents were *Choosing when children could and could not use the device* (69.49%); *Using passwords, PINs, or passcodes to control access to smartphones* (51.98%), and *Setting limits on internet use, searches and applications* (48.81%).

The least-commonly used parental control mechanisms were *Device tracking and location systems* (9.72%), *Blocking*

Table 1

Sociodemographic characteristics of the study participants' primary-school aged children

Variables	Categories	*n*	%
Gender	Boy	425	48
	Girl	460	52
Type of school attended	Public (state funded)	463	52.3
	Independent	319	36.1
	Private	103	11.6
School years	Initial Phase (1st and 2nd year primary school, ages 6-7)	168	19
	Middle Phase (3rd and 4th year primary school, ages 8-9)	236	26.7
	Upper Phase (5th and 6th year primary school, ages 10-12)	481	54.3

Table 2

Descriptive statistics with frequencies and percentages about the types of parental control mechanisms use in relation to their children's smartphone use

	Yes		No	
	n	%	*n*	%
Choose when children can or cannot use their device	615	69.49	270	30.51
Set limits on internet use, searches, and applications	432	48.81	453	51.19
Use applications or messages the can block unwanted or adult content	252	28.47	633	71.53
Control or blocking calls and SMS messages	91	10.28	794	89.72
Use device tracking and location services	86	9.72	799	90.28
Produce daily reports of children's smartphone activity	106	11.98	779	88.02
Use passwords, PINs, or passcodes for smartphone access	460	51.98	425	48.02

or control of calls and SMS messages (10.28%), *Producing daily reports of their children's smartphone activity* (11.98%), and finally *Using applications or mechanisms for blocking unwanted or adult content* (28.47%).

A more detailed analysis (see Table 3) shows that 93.7% of the parents used some kind of parental control mechanism (indicated in Table 2) to regulate their children's smartphone use. The data confirms the importance parents place on implementing mediation strategies to supervise the content their children are exposed to, as well as the types of interactions they have about using their devices.

Results of bivariate analysis of parental control mechanisms for smartphone use

In order to identify statistically significant differences between the variables in Table 4, we performed bivariate analysis via the Chi-squared test for independence.

The results indicate that there was a significant relationship between the *Time spent connected with a smartphone* and the *Level of parental control*, $\chi^2(2) = 9.57$, $p = .008$, with a small effect size (Cramer's $V = .106$). Children whose parents were less strict in applying control measures tended to

Table 3

Frequencies and percentages for the number of parental control mechanisms used

	n	%
No parental control mechanism used	56	6.3
Uses one parental control mechanism	255	28.8
Uses two parental control mechanisms	248	28
Uses three parental control mechanisms	210	23.8
Uses four parental control mechanisms	72	8.1
Uses five or more parental control mechanisms	44	5
Total	885	100

Table 4

Test variables used in the study with their respective re-coded categories

Independent variables		Dependent variables	
Time spent connected with a smartphone	<=3 hours	Level of parental control	Low parental control
	>3 hours		Medium parental control
			High parental control
Parents' educational attainment	Low		
	Moderate		
	High		
Children's school year	Initial phase (1st and 2nd year primary)		
	Middle phase (3rd and 4th year primary)		
	Upper phase (5th and 6th year primary)		

Table 5

*Contingency table: Time spent connected with a smartphone * Level of parental control*

			Level of parental control		
			LOW	MODERATE	HIGH
Time spent connected with a smartphone	<= 3 hours	Count	250	395	111
		Expected frequency	259.9	393.9	102.2
		% within Time spent using smartphone	33.1	52.2	14.7
		% within Level of parental control	84.7	88.4	95.7
		Corrected residuals	-2.2	0.2	2.7
	> 3 hours	Count	45	52	5
		Expected frequency	35.1	53.1	13.8
		% within Time spent using smartphone	44.1	51	4.9
		% within Level of parental control	15.3	11.6	4.3
			2.2	-0.2	-2.7

use their smartphones for more than three hours a day, unlike children whose parents applied more control mechanisms.

There were also statistically significant differences in the *Level of parental control* according to *Parents' educational attainment* ($\chi^2(4) = 15.394$, $p = .004$). These differences are shown in Table 6. To measure the strength of the association between the two variables, the Gamma test gave a value of Gamma = .117 ($p < .05$), which is a small effect size.

Finally, there were statistically significant differences in the level of parental control according to the children's school year, $\chi^2(4) = 10.906$, $p < .05$, with a small effect size (Gamma = -.021). As Table 7 shows, parents applied more control mechanisms with pre-adolescent children who were in the last two years of primary education (5th and 6th year).

It is worth noting that, as Table 1 indicated, the six school years were re-coded in three categories: initial phase (1st

Table 6

*Contingency table: Parents' educational attainment * Level of parental control*

			Level of parental control		
			LOW	MODERATE	HIGH
Parents' Educational attainment	LOW	Count	30	20	8
		Expected frequency	20.4	30.0	7.6
		% within Parental educational attainment	51.7	34.5	13.8
		% within Level of parental control	9.6	4.4	6.9
		Corrected residuals	2.7	-2.7	0.2
	MODERATE	Count	154	248	46
		Expected frequency	157.4	231.8	58.7
		% within Parental educational attainment	34.4	55.4	10.3
		% within Level of parental control	49.5	54.1	39.7
		Corrected residuals	-.5	2.2	-2.5
	HIGH	Count	127	190	62
		Expected frequency	133.2	196.1	49.7
		% within Parental educational attainment	33.5	50.1	16.4
		% within Level of parental control	40.8	41.5	53.4
			-0.9	-0.8	2.5

Table 7

*Contingency table for the variables: School year * Level of parental control*

			Level of parental control		
			LOW	MODERATE	HIGH
School year	Initial phase (1st and 2nd year primary)	Count	64	71	33
		Expected frequency	59	86.9	22
		% within School year	38.1	42.3	19.6
		% within Level of parental control	20.6	15.5	28.4
		Corrected residuals	0.9	-2.7	2.8
	Middle phase (3rd and 4th year primary)	Count	81	127	28
		Expected frequency	82.9	122.1	30.9
		% within School year	34.3	53.8	11.9
		% within Level of parental control	26	27.7	24.1
		Corrected residuals	-0.3	0.7	-0.7
	Upper phase (5th and 6th year primary)	Count	166	260	55
		Expected frequency	169	248.9	63
		% within School year	34.5	54.1	11.4
		% within Level of parental control	53.4	56.8	47.4
		Corrected residuals	-0.4	1.5	-1.6

and 2nd years), middle phase (3rd and 4th years), and upper phase (5th and 6th years). There is a link with age, as the initial phase covers ages 6 to 7, the middle phase covers 8 to 9 year-olds, and the upper phase is for 10 and 11 year-olds.

Discussion

Smartphones have become largely intrinsic and integral to family life. This means a significant challenge for parents, who are responsible for setting up mechanisms of parental mediation and control that not only help to avoid problems, but also provide a safe digital environment for their children, as well as seeking education based on critical, responsible use of the technology (Livingstone & Bloom-Ross, 2020; Sánchez-Valle et al., 2017).

Bearing that in mind, the results of our study showed that 93.7% of parents used a variety of strategies to regulate their children's smartphone use, which shows the importance parents attach to setting guidelines on using these devices. The most commonly used mechanisms were limiting screen time, setting times for device use, and using passwords for smartphone access. The importance of parental mediation in digital society is also reflected by other studies, such as Condeza et al. (2019) in Chile, where a large proportion of surveyed parents showed that the main parental mediation practices in Information and communications technology (ICT) use included checking what their children did on the internet (89.7%) and using applications to block what they felt was inappropriate content (63.7%).

Our study was able to identify various factors that affect the extent of parental control, such as parents' educational attainment, how long the children spend online on their smartphones, and what year the children are in at school. More specifically, and in line with previous research (Jiménez-Morales et al., 2020), greater parental educational attainment increases the likelihood of using various parental mediation and control measures, with the educational level of the parents being closely related to their digital competence, which is another predictor of mediation (Dedkova & Smahel, 2020). In this regard, greater levels of digital self-efficacy in the parents mean putting different types of mediation actions into practice, including those involving control and tracking (Nikken & Schols, 2015; Talves & Kalmus, 2015).

This alerts us to a digital socio-educational divide, which is why it should be a priority to provide digital skilling to all families, especially those in vulnerable situations. In line with this, other studies (Glatz et al., 2018) have reported that parents educational levels are positively related to all of the strategies that they use to mediate their children's online activity, except for active mediation. Those authors noted that when parents used mediation strategies they were able to gain a deeper understanding of the possible risks their children faced online, and that this understanding could be linked to the perception of how much influence they had over their children's online activity.

Our results in relation to how long children spend connected each day show that there was a significant relationship between the number of hours children were online via smartphone each day and the level of parental control. Children whose parents used more parental control mechanisms tended to use their smartphones for less time that children whose parents were less strict in applying controls. A recent study by Álvarez et al. (2020) concluded that the time children spent in front of screens had negative effects on the development of their social skills, which shows how important it is for families to monitor times and establish certain strategies to control screen time. However, it is also important not to demonize or focus solely on risks and possible harm that might come to children from irresponsible smartphone use, as these devices also offer notable educational, cultural, and communicative potential (Criollo-C et al., 2002). It is a technology that also offers applications where children can, among other things, develop their creativity, improve their digital skills, forge their own identities, and project their own personalities and concerns. As Martín-Ramallal and Ruiz-Mondaza (2022) put it, "Minors must enjoy all rights and freedoms, and they must be provided with guarantees for their self-realisation" (p. 31). From this point of view, the family's role is key in providing active measures (not only restrictive, control, or tracking measures) that reinforce the child's autonomy and personal growth within a framework of trans-media literacy.

Finally, we found that parents applied more control mechanisms to children aged 10 to 12 years old, in the final years of primary education (5th and 6th years). In line with this, the study by Glatz et al. (2018) identified the school year (as an indicator of age) as a variable that was correlated to the level of parental mediation, with parents of adolescent children in later school years (17 and 18 years old) taking fewer control-based mediation actions compared to the higher level of monitoring parents did of children in lower school years (11 to 12 years old). The study by Smahel et al. (2020) similarly noted that families used more rules and were more inflexible with younger children than adolescents. This may be because of greater respect for older children's privacy and autonomy, who are also considered to be more digitally competent (López-De-Ayala et al., 2019; Ramos-Soler et al., 2018) and therefore supposedly able to avoid negative consequences of their smartphone or digital device use (Rodríguez-de-Dios et al., 2018; Sonck & de Haan, 2014).

It is clear that parental mediation is a reality for families, evidence of a growing social concern. However, children's digital education must include measures of co-responsibility that incorporate schools, public administrations, and the companies that design the technology; and it must have the children's active participation in the process (Livingstone & Bloom-Ross, 2020). Similarly, educating parents in the skills needed to properly use these technologies is crucial (Condeza et al., 2019). This will allow them to positively assess the technology's benefits, not just its risks, make decisions about parental styles to apply and, in short, more effectively guide their children's development towards autonomy in a hyperconnected world.

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The authors declare that there is no conflict of interest.

Data availability statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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