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RESEARCH ARTICLE (ORIGINAL)

The Use of Technologies in The Development of Preschool Children: Parents' Perspectives

A Utilização das Tecnologias no Desenvolvimento da Criança em Idade Pré-Escolar: A Perspetiva dos Pais

El El Uso de la Tecnología en el Desarrollo de los Niños en Edad Preescolar: La Perspectiva de los Padres

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Abstract
Background: The use of technology by preschool children has increased in recent years, with the first exposure occurring at an earlier age, which can influence their development and family dynamics.
Objective: To analyze parents' perspectives on the influence of technology use on the development of preschool children.
Methodology: Descriptive study with a mixed approach. Data were collected through a questionnaire sent to parents of children aged 12 months to 6 years between June 9 and June 15, 2023.
Results: The sample consisted of 152 parents. In total, 94.2% of the children used technologies, with 56% using them daily. The most frequent positive aspect was the acquisition of new knowledge, and the most frequent negative aspect was dependence.
Conclusion: Parents' perspectives on the influence of technology on the development of preschool children proved to be relevant as technology is increasingly present in their daily lives. Parents believe that technology use supports the development of their children, but it can also lead to dependence.

Keywords: child, preschool; digital technology; child development; nursing

Resumo
Enquadramento: A utilização de tecnologias pelas crianças em idade pré-escolar tem aumentado nos últimos anos, com a primeira exposição cada vez mais precoce, o que pode influenciar o seu desenvolvimento e a dinâmica familiar.
Objetivo: Analisar a perspetiva dos pais sobre a utilização das tecnologias no desenvolvimento da criança em idade pré-escolar.
Metodologia: Estudo descritivo de abordagem mista. A recolha de dados foi realizada através de questionário a pais de crianças entre os 12 meses e os 6 anos no período de 9 a 15 de junho de 2023.
Resultados: Participaram no estudo 152 pais. Desses, 94,2% das crianças utilizam tecnologias, sendo que 56% utilizam-nas diariamente. O aspeto positivo mais identificado é a aquisição de novos conhecimentos e o aspeto negativo a dependência.
Conclusão: A perspetiva dos pais sobre as tecnologias no desenvolvimento da criança em idade pré-escolar demonstrou-se relevante, sendo que estão cada vez mais presentes no seu quotidiano. Os pais percecionam a utilização das tecnologias como um recurso que estimula o desenvolvimento, mas prejudicial devido à dependência que causa.

Palavras-chave: criança pré-escolar; tecnologia digital; desenvolvimento infantil; enfermagem

Resumen
Marco contextual: El uso de la tecnología por parte de los niños en edad preescolar ha aumentado en los últimos años y su primera exposición se produce a una edad cada vez más temprana, lo que puede influir en su desarrollo y en la dinámica familiar.
Objetivo: Analizar las perspectivas de los padres sobre el uso de la tecnología en el desarrollo de los niños en edad preescolar.
Metodología: Estudio descriptivo con un enfoque mixto. Los datos se recogieron mediante cuestionario a los padres de niños de edades comprendidas entre los 12 meses y los 6 años, del 9 al 15 de junio de 2023.
Resultados: En el estudio participaron 152 padres. De ellos, el 94,2% utiliza la tecnología y el 56% lo hace a diario. El aspecto positivo más identificado es la adquisición de nuevos conocimientos y el negativo, la dependencia.
Conclusión: Las perspectivas de los padres sobre la tecnología en el desarrollo de los niños en edad preescolar han demostrado ser relevantes, ya que está cada vez más presente en su vida cotidiana. Los padres perciben el uso de la tecnología como un recurso que estimula el desarrollo, pero perjudicial por la dependencia que provoca.

Palabras clave: niño en edad preescolar; tecnología digital; desarrollo infantil; enfermería

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Introduction

Preschool refers to the period between 12 months and 6 years of age (school entry age). It is at this stage of development that changes in autonomy, initiative, and confidence occur (Ramos et al., 2020). The skills acquired by children at this age have an impact on their mental health, which in turn can influence their educational and professional trajectories (Carson & Kuzik, 2021).

The growing concern about technology use is related to the fact that children between the ages of 2 and 5 are exposed to technology for an average of 2.39 hours per day, which has been associated with developmental delays in language and communication. Children who are exposed to technology an average of 3 hours per day are 3.9 times more likely to have developmental delays (Adams et al., 2022).

Health behaviors in adulthood are influenced by habits acquired in childhood and affect the biological, psychological, and socio-cultural dimensions. This premise is evidenced in Nola Pender's Health Promotion Model, which posits that the person actively seeks to manage their health behaviors through their capacity for reflexive self-awareness. Thus, the person exerts influence on the environment and is simultaneously influenced by it. This model also highlights the role of the health professional as an integral part of the interpersonal environment, exerting influence on patients throughout their lifespan (Alligood, 2018). It is crucial for nurses to intervene in health promotion by empowering parents with knowledge about the influence of technology on the development of preschool children. This study aims to analyze parents' perceptions of the use of technology in the development of preschool children.

Background

The world of technology has evolved exponentially over the past few decades, and easy access to devices has allowed its use to expand globally. The increase in the use of technologies is mainly due to their portability, as they are lightweight, versatile, and intuitive (Guedes et al., 2020). The industry is also growing steadily, indicating a greater interest in the use of technologies (Fink et al., 2019).

Children's use of technological devices has increased in recent years (Byrne et al., 2021; Guedes et al., 2020), and initial exposure to technology is occurring at an increasingly earlier age (Byrne et al., 2021). The wide range of technologies (Byrne et al., 2021; Fink et al., 2019), combined with the reduction of recreational spaces in urban centers and fewer opportunities for children to play and maintain a physically active lifestyle, has led to an exponential increase in technology use (Fink et al., 2019). They have become an integral part of family life, as evidenced by the fact that children under the age of 2 spend an average of 3.05 hours per day using them (Ricci et al., 2023).

The World Health Organization recommends that children under the age of 2 should not have access to technology (Ricci et al, 2023). On the other hand, the Portuguese Society of Pediatrics advises total restriction of access until 18 months and recommends that only educational content should be introduced between 18 months and 2 years. Between the ages of 2 and 5, technology use should be limited to one hour per day, always supervised by the parents who can decode and explain the content to their children (Sociedade Portuguesa de Pediatria, 2019).

Parents allow their children to use technology as a distraction and to reestablish their leisure time at home. They allow their children to use these devices when they are irritable and need to calm down, when they are sick, in public places, while traveling, to put them to bed at home, and in situations of exhaustion (Adams et al., 2022). Several factors are associated with children's use of technology, including socioeconomic conditions, parents' mental health, children's sleep, and lack of regular reading (Madigan et al., 2019).

Socioeconomic factors influence parents' perceptions of technology use. Parents with a lower socioeconomic status tend to allow more screen exposure time due to the lack of resources for other extracurricular activities, often using technological devices as a form of entertainment or education. On the other hand, parents' educational attainment influences their perception and regulation of technology use and screen time (Mollborn et al., 2022). Parents with higher literacy levels tend to expose their children to technology later and to limit screen time (Adams et al., 2022). Parents also use technology as a resource for educational purposes, mostly for problem-solving, learning math-related content, introduction to reading, and promotion of executive functions and language (Ricci et al., 2023).

The parent-child relationship is fundamental to the socio-emotional development of children (Carson & Kuzik, 2021). However, the use of technology within the family can hinder or even prevent or interrupt parent-child interactions, affecting the quality of interpersonal relationships (Adams et al., 2022; Carson & Kuzik, 2021).

The use of technology has changed the paradigm of play, which is essential for the development of motor skills, socialization, and interaction (Fink et al., 2019). Early exposure and the prevalence of technology use before the age of 2 are associated with cognitive changes in preschool ages (Adams et al., 2022), namely a decrease in executive functions and language (Adams et al., 2022; Byrne et al., 2021; Desmurget, 2021; Guedes et al., 2020; Madigan et al., 2019; Ricci et al., 2023), as well as a reduction in learning capacity (Madigan et al., 2019).

The touch screen mechanism has a negative influence on the development of fine motor skills (Adams et al., 2022). In the socio-behavioral domain, technologies influence the ability to socialize (Adams et al., 2022; Byrne et al., 2021; Ricci et al., 2023), reduce the development of emotional (Byrne et al., 2021; Ricci et al., 2023) and behavioral skills (Madigan et al., 2019), and compromise self-regulation (Guedes et al., 2020; Ricci et al., 2023).

Sleep is also affected by technology use, with a reduction in sleep quality and a higher prevalence of night terrors,

nightmares, and insomnia (Byrne et al., 2021; Guedes et al., 2020; Melo et al., 2022; Ricci et al., 2023).

There is an association between technology use and the risk of a sedentary lifestyle due to the decrease in physical activity and its negative impact on neuropsychomotor development (Byrne et al., 2021; Fink et al., 2019; Guedes et al., 2020). Obesity is associated with sedentary lifestyles and unhealthy eating behaviors (Bozzola et al., 2018).

Excessive use of technology causes symptoms of separation anxiety and can exacerbate anxiety, panic, and depression in children with mental health conditions (Ricci et al., 2023). As children integrate technology into their daily routines, such as mealtimes, bedtimes, and social interactions, they express feelings and behaviors of anger and frustration when they are asked to turn off their devices so that they can continue using them (Adams et al., 2022).

When technology use is adjusted and mediated by parents, children can develop skills (Adams et al., 2022; Fink et al., 2019) that have a positive impact on their development, particularly in terms of cognition (Adams et al., 2022; Bozzola et al., 2018), language, learning, and attention (Fink et al., 2019).

Video chatting with family members or caregivers are the primary means of socialization (Adams et al., 2022).

Motor skills are developed through the touch model, and there is a positive association between the use of interactive technologies and fine motor skills (Guedes et al., 2020).

The use of computers in education promotes learning, knowledge acquisition, and can be used for assessing child development (Melo et al., 2022).

Children have integrated technology into their daily routines, and it is important that children's use of technology is moderated and limited by their parents (Ricci et al., 2023). Therefore, this study aimed to analyze parents' perceptions of the influence of technology on children's development, in order to prevent complications arising from knowledge on this subject.

Research question

What are parents' perceptions of the influence of the use of technology on the development of preschool children?

Methodology

This is a descriptive study with a mixed approach. After receiving the opinion of the Ethics Committee of the Portuguese Red Cross School of Health, Lisbon (Opinion no. 19/2023) data were collected through an anonymous and confidential online questionnaire using the Google Forms platform. The questionnaire was sent through the researchers' network of contacts to 195 parents of children aged 12 months to 6 years between June 9 and 15, 2023, representing a nonprobability convenience sample. A total of 152 complete questionnaires were obtained. Questions about social, economic, or geographic background were not included to protect the confidentiality of the data. The questionnaire included multiple-choice questions and open-ended questions to analyze parents' perspectives on the impact of technology use on children. The results of the questionnaires were processed using descriptive statistics for quantitative data and content analysis for qualitative data. Informed consent was presented to the parents beforehand, and filling out the questionnaire was considered consenting.

Results

The results helped analyze parents' perspectives on the use of technology by children aged 12 months to 6 years. The parents in this sample had preschool children at the following ages: 1 year - 20%, 2 years - 11.4%, 3 years - 22.1%, 4 years - 17.9%, 5 years - 12.8%, and 6 years - 15.8%. Around 89.3% of the children attended nursery school or kindergarten.

The parents in this study had a high level of education: 1% had primary education, 24% had secondary education, 53% had a bachelor's degree, 1% had a postgraduate degree, 19% had a master's degree, and 1% had a doctorate. The majority of families in this study were nuclear (83%), followed by extended and single-parent families (8%) and shared custody (1%).

Around 94.2% of the children used technology. As regards the age of onset of technology use, 33.9% started at age 1, 31.5% at age 2, 15% at age 3, 7% at age 4, and 4.7% at age 5. The remaining 2.1% started before the age of 1. The technological devices used were television (93.9%), cell phones (56.5%), tablets (39.7%), video games (11.5%), computers (4.6%), projectors (0.8%), and PlayStation (0.8%).

The most common types of content were cartoons (90.9%), educational videos (45.5%), music (44.7%), educational games (32.6%), and YouTube (26.5%). With regard to the presence of a television in the bedroom, 89.9% of the parents did not allow it, while the remaining 10.1% did.

In terms of frequency of use, 56% of the children used technology daily, 7% used it five to six times a week, 18% used it three to four times a week, 17% used it once or twice a week, and 1% used it every two weeks or rarely. As for exposure time, 47.7% used it less than 1 hour per day, 44.7% used it between 1 and 2 hours per day, 6.1% used it more than 2 hours per day, and 0.8% reported that it depended on the child's behavior or allowed 30 minutes per day.

Technologies were most commonly used in the following circumstances: 78.8% during leisure time, 29.5% while traveling, 22.7% during meals, 16.7% during social events, 6.1% during crying periods, and 4.5% to fall asleep.

Approximately 94% of parents reported that their children use technology when they are with them, 27.8% use technology alone, and 21.8% alternate between periods when their child uses technology alone and periods when they use it with them.

Sixty-two percent of parents reported that their child's use of technology had not increased during the COVID-19

pandemic, while 37.8% reported that it had increased. The questionnaire included open-ended questions about positive and negative aspects to analyze parents' perceptions of the impact of technology use on children. A total of 103 responses were received. A content analysis of the qualitative data was carried out to organize the results into categories. For the positive aspects, the following categories were defined: 1) New knowledge; 2) Language; 3) Creativity, imagination, memory and concentration; 4) Fine motor skills; 5) Distraction, and 6) Parent-child and family interaction.

Table 1

Content analysis of parents' perspectives on the positive aspects of the use of technology by preschool children

Categories	*n*	%
New knowledge	36	35%
Creativity, imagination, memory and concentration	32	31%
Language	23	22%
Fine motor skills	9	9%
Parent-child and family interaction	6	6%
Distraction	2	2%

Note. n = number of answers; % = Percentage of answers.

The main positive aspect was the acquisition of new knowledge through educational games, cartoons, and music videos: "I've learned a lot through cartoons and educational games" (sic).
Another positive aspect was the development of language, which allowed the acquisition of new vocabulary and languages: "In my case, the cartoons allow me to learn to speak Portuguese and learn to sing songs" (sic).
The promotion of creativity, imagination, memory, and concentration was also mentioned: "Creativity is boosted by cartoons" (sic) and "In terms of memory, [the child] memorizes a lot of things, songs, dances" (sic).
Using digital devices stimulates fine motor skills: "Greater knowledge of technology and better handling of technological devices" (sic).
Technology was identified as a way to distract children, mediate their behavior, and allow parents to have moments of leisure and time for other tasks: "Brief moments of tranquility for the family in exhausting situations" (sic).
In addition, encouraging interaction between children and parents as they use technology together improves parenting: "We like to watch things together and comment on what we're watching" (sic) and "Seeing family members who are geographically far away" (sic).
For the negative aspects, the following categories were defined: 1) Dependence, 2) Detachment from surroundings, 3) Limited acquisition of new skills, 4) Impaired emotional regulation, 5) Sedentary lifestyle, 6) Altered visual acuity, 7) Altered sleep patterns, and 8) Violent behavior.

Table 2

Content analysis of the parents' perspectives on the negative aspects of the use of technology by preschool children

Categories	*n*	%
Dependence	28	27%
Detachment from surroundings	24	23%
Altered visual acuity	21	20%
Impaired emotional regulation	15	15%
Limited acquisition of new skills	10	10%
Sedentary lifestyle	10	10%
Altered sleep patterns	7	7%
Violent behavior	7	7%

Note. n = number of answers; % = Percentage of answers.

Technology dependence associated with increased screen time and the difficulty in disengaging from it: "Controlling screen time, sometimes it is difficult to accept that you can't access it whenever you want" (sic).
Children also detach themselves from their environment by becoming involved and focused on technology: "These are additive methods, and they don't pay attention to anything else at that moment! (They don't listen to us when we call them or ask them to do something, etc.)" (sic).
Prolonged use of technology limits the acquisition of

new skills through other activities: "Creating habits like these too early can lead to changes in a child's normal development" (sic).
Emotional regulation, such as controlling frustration, behavior, and irritability, was also reported: "Less resistance to frustration, less interpersonal relationship skills" (sic).
They also mentioned a sedentary lifestyle and childhood obesity: "Increased sedentarism" (sic) and "Less availability for physical activity" (sic).
Changes in visual acuity caused by excessive use of technology were also reported: "Exposing children to screens for too long can damage their eyesight" (sic).
Changes in sleep patterns were also identified, including difficulty falling asleep and more night-time awakenings: "…sleeps more restlessly and has more night-time awakenings on the days [the child] watches TV" (sic).
Age-inappropriate content is stimulating and encourages violent behavior: "If we don't control it, he'll be watching content that is terribly inappropriate for his age" (sic).

Discussion

The results reveal that 94% of preschool children in this sample use technology. As mentioned in the literature, the prevalence of technology use among preschool children is 80-100% (Fink et al., 2019; Guedes et al., 2020). Children started using technology between the ages of 1 and 2. In addition, children use technological devices, such as touchscreen devices, from the age of 11 months (Adams et al., 2022). Children are introduced to technology at an early age. Most parents report that their children use it daily, with an average screen time of 1 to 2 hours per day. Other studies have found that, on average, preschool children use technology between 1.6 and 3.8 hours per day (Fink et al., 2019; Madigan et al., 2019). Parents' level of education is associated with the early introduction of technology into preschool children's daily routines, since parents with higher levels of literacy tend to expose their children to technology at a later time and for shorter periods of time (Adams et al., 2022). The majority of parents in the study had a bachelor's degree, and most introduced their children to technology when they were 1 or 2 years old, suggesting a connection.
As for the main technological devices used, the content viewed and the times when children use technology, the results of this study are consistent with those found in the literature (Madigan et al., 2019), with television being the most used technological medium and cartoons being the most viewed content. Children watch television shows, movies, videos, or stories (Madigan et al., 2019).
The parents in this study use technology to distract their children, manage their behavior, carry out tasks, and enjoy moments of leisure. The literature shows that children use technology with parental supervision and that parents find this approach valuable because it has benefits for their children's cognitive, emotional, behavioral, and social development (Adams et al., 2022).
During the COVID-19 pandemic, technologies enabled remote work and virtual schools, allowing people to continue working and learning (Ricci et al., 2023). The use of computers in schools promotes learning and knowledge acquisition. In this way, it has become necessary to use technologies in all aspects of society, namely in daily routines. Parents did not report an increase in children's use of technology during the COVID-19 pandemic, which leads to disagreement, as social isolation and virtual learning have forced children to adapt to a new reality where technology is part of their routines (Ricci et al., 2023). As a large percentage of the children in this study were born in the year of the pandemic or were between the ages of 1 and 3, some had not yet used technology, and others had not even started kindergarten/school. Therefore, parents believe that there was no increase in use. However, for children who were already using technology, parents did not see an increase.
The parents reported positive aspects associated with knowledge, language, creativity, imagination, memory, concentration, and fine motor skills. On the other hand, these negative aspects are associated with technology dependence, the increase in utilization time, the detachment from the surroundings, the prolonged use of technology and the limitations in the acquisition of new skills. In addition, overuse of technology can affect emotional regulation, promote sedentary lifestyles and childhood obesity, and affect visual acuity and sleep patterns. Parents do not address issues related to the impact on mental health. However, studies show that excessive use of technology causes symptoms of separation anxiety, which can lead to anxiety, panic, depression, social isolation and mood swings (Ricci et al., 2023).
The analysis of the results showed that parents' perspectives on the positive and negative aspects of technology use in their children's development are consistent with the literature.

Conclusion

This study contributed to the understanding of the technology habits of preschool children, how technology fits into family dynamics and influences family routines, and parents' perceptions of the positive and negative aspects of technology use and its influence on the development of preschool children. Parents' perceptions of technology use vary. Therefore, nurses' interventions are important to train parents and guide practices that allow for the integration of technology into the daily lives of preschool children to promote their development.
This study highlights the importance of addressing this issue in every interaction with the child and their family to foster growth and development. Future studies should explore this topic in the context of school health to raise awareness among children, teachers, and parents about the risks of excessive technology use. They should also study the impact of technology on child development by following children with different technological habits throughout their childhood.

Author contributions

Conceptualization: Melo, F., Mota, M., Santos, M. R., Branco, M. C.
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Writing – review and editing: Melo, F., Mota, M., Santos, M. R., Branco, M. C.

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