

## Article

# Views of Parents on Using Technology-Enhanced Toys in the Free Play of Children Aged One to Four Years

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**Abstract:** New technology has brought about a novel approach to play termed digital play. Digital play shares many characteristics with traditional play but also presents new possibilities (e.g., building concepts and skills about STEM, opportunities for physical, outdoor activities). Despite new toys with technological characteristics being popular, there is limited research on this specific area for children under four years old and their parents. This study explored parental perspectives and was part of a larger investigation that examined 68 (38 boys and 30 girls) very young children's (1–4 years) engagement with technology-enhanced toys (TETs) in early childhood settings. A sequential explanatory design was employed, wherein parents completed questionnaires before and after their children engaged with TETs. Statistical and thematic analysis revealed that family demographics play an important role in children's use of TETs and digital technologies (e.g., on the quality of engagement with their children during playing with TETs). Parents noted improvements in their children's skills, including fine motor skills, language, and creativity. This study underscores the importance of considering parental backgrounds in digital technology initiatives for early childhood development. Policymakers and educators may benefit from these insights to tailor digital integration and support children's digital competence effectively.

**Keywords:** early childhood; digital technology; questionnaires; technology-enhanced toys; parents' perspectives



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## 1. Introduction

Research into young children using digital technologies has been steadily growing. Many experts have delved into the use of different digital devices [1] but also into using technology-enhanced toys (TETs). The focus of these experts has been on understanding the impact of digital toys on childhood development [2], whether within family settings or organised learning environments, such as in early childhood education centres [3]. This paper reports part of the results of a larger investigation conducted with children and parents from five early childhood centres in Greece. This paper explores parents' perspectives on using TETs at home. Parents play a crucial role in children adopting digital technologies and developing digital literacy [4]. Although each social system (such as peers and educational settings) can determine whether children adopt technology-enhanced toys, family context is the key to understanding how children engage with their use [5,6].

## 2. Digital Technology and Play

Children today are immersed in a world of digital technology and devote a significant amount of time to engaging with computerised toys [7]. Research by Marsh et al. [8] revealed that today's children have growing access to a broader selection of technologies compared to children of earlier generations, including devices like tablets and smartphones.

The emergence of new technologies has had a profound effect on how children gather information, interact with others, participate in recreational activities, and construct knowledge [9]. Based on recent research, there has been a noticeable trend of children using the internet more frequently and for longer periods. This trend starts at younger ages and involves using more devices, such as tablets, mobile phones, laptops, and computers [10,11].

Together with new technologies, a new type of play, digital play, has emerged. Digital play refers to the playful engagement and exploration of digital technologies by children, similar to traditional play activities [12]. This encompasses many engaging activities that children can choose to participate in, using digital devices and toys [13]. Furthermore, digital toys may influence the nature of traditional play, particularly in dramatic and constructive play [7]. For example, during digital play, children may engage with robotic toys that become the central characters in their imaginative play [14].

Digital toys are toys equipped with computer chips that allow them to communicate or exhibit specific behaviours [7]. However, some digital toys do not rely on screens but instead offer a range of other technological features, including digital cameras, voice assistants, internet connectivity, and activity trackers. Thus, differentiating between digital toys and conventional toys is no longer straightforward solely based on the presence or absence of screens. Given the rise in popularity of toys that come with advanced technology like microprocessor chips and discreet sensors, it is becoming increasingly difficult to categorise toys as purely digital. This is especially true when the initial setup of these toys involves using a mobile device or tablet [15].

Many terms describe digital toys, such as smart toys or interactive toys, and encompass toys with internet connectivity and digital technology. These toys are often described in terms of their educational benefits and capacity for interaction and learning [16]. These toys enable children to interact with digital media and contemporary culture [13].

Another widespread term indicative of the advancement of technology is the Internet of Toys. As Wang et al. [17] discussed, the Internet of toys is a distinct category of Internet of Things devices. Through a systematic review, Ling et al. [18] pointed out that these toys can fulfil three distinct functions: establishing connections with other devices or services, enabling interaction between humans and toys, and processing data. Similarly, Heljakka and Ihamäki [19] found that these toys are also capable of acquiring knowledge from the actions of their users and modifying their responses to environments, thereby generating increasingly complex interactions and unexpected scenarios that can assist in retaining the player's attention. As such, these toys motivate participants to stay active.

Despite the popularity of these terms, this study uses technology-enhanced toys (TETs) to refer to toys that transcend physical boundaries, encourage linkages between the real and virtual worlds, and stimulate various levels of creativity and imagination beyond tangible things. These toys may not be considered part of the Internet of Toys because they may not have an internet connection, but they nonetheless stand out from more conventional toys because of their technological features (such as speakers, microphones, and microchips).

TETs use technologies to enrich the play experience for children [20,21]. A study by Bergen and colleagues [22] revealed that contemporary toys designed for young children come with a plethora of technology-enhanced features. For example, the Fisher-Price Laugh & Learn Learning Home playset offers many affordances that could stimulate infant motor and communication skills during both independent and collaborative play with parents. However, while technology-enhanced toys are increasingly popular, there remains a dearth of research on the usage patterns and potential effects of these toys on the development of very young children [23].

### 3. Digital Play and Parents' Perspectives

As highlighted by Arnott et al. [24], there is an ongoing discussion among researchers surrounding the incorporation of digital technologies into the lives of young children. Nevertheless, using digital devices has become widespread in both early childhood settings and in many children's homes [25].

Various studies have presented both theoretical and empirical evidence that underlines the importance of children's engagement with digital technologies within the home environment [26–28]. Recognising the impact of digital devices on important skills, the American Academy of Pediatrics [29] (p. 2) stated that 'digital media can be used to facilitate executive function, build self-control and problem-solving skills, and improve the ability to follow directions,' but should be moderated by parents [30].

In a study by Marsh et al. [31], parents observed older children (ages 3–5) participating in a range of activities on digital devices, such as sketching, painting, storytelling, photography, gaming, and learning. Younger children (under age 1) in the same study showed a preference for simpler interactions, such as analysing magazines on a tablet. Similarly, Verenikina and Kervin [32] and Palaiologou [33] argued about the importance that parents place on the educational advantages of children's digital activities. They underlined the need for parents to acknowledge and encourage the educational potential of technology in their children's lives and the role that parental attitudes have in influencing children's access to and use of digital tools for learning.

Parents play a crucial role in determining their children's access to technology, enabling children to develop essential skills that contribute to their future academic achievements [34]. Other studies have explored parents' concerns regarding how to support their children's technological initiatives, promote learning, and balance between traditional and modern digital play [6,7,26,35].

#### *Greek ECEC Sector*

In Greece, Early Childhood Education and Care is offered through two different operating structures. Services for children under 4 years of age in Early Childhood Education and Care (ECEC) include nurseries, crèches, and kindergartens that are under the jurisdiction of municipalities, specifically the Ministry of Interior. Private Early Childhood Education and Care facilities, both for-profit and non-profit, as well as infant and/or part-time childcare facilities and integrated care nurseries are supervised by the Ministry of the Family and Social Cohesion. Children between the ages of four and five attend nursery schools, both public and private, which are overseen by the Ministry of Education and Religious Affairs [36], and their education has been compulsory since 2018. The Greek system of preschool education lacks a unified framework, resulting in segregation. The Interdisciplinary Integrated Curriculum Framework is designed for children aged 4–6, prior to their enrolment in primary school [37].

Overall, the literature presents a nuanced perspective on using digital technologies, acknowledging their potential advantages while also expressing concerns about their effects on the development of young children. The role of parental attitudes and practices is pivotal in shaping children's interactions with digital devices. However, the focus of this research has been on infants and toddlers (children under four). Initial findings suggest that play with TETs may influence language acquisition and cognitive development [22]. Thus, the aim of this study was to investigate the viewpoints of parents with children under four regarding digital technologies and TETs through pre- and post-questionnaires.

The two research questions were as follows:

1. What do parents think about using digital technologies and the use of technology-enhanced toys for children between ages one and four?
2. What advantages or disadvantages do parents report being associated with their young children (1–4-year-old) using technology-enhanced toys?

## **4. Method**

### *4.1. Participants*

Data were obtained from parents of children who attended the five centres of the larger study and agreed to their children's involvement. Parents provided written consent after being informed about the research, its purpose, potential benefits, and implications. Participation was voluntary, and the survey was conducted anonymously. We did not have

access to the parents' personal email addresses or IP addresses. The selected sample was based on convenience, as the researchers had easy access to these centres.

Before designing the questionnaires, the goals and objectives of the study were carefully considered. The research by Ahmadzadeh et al. [38] was used in developing the questionnaire, which explored parental attitudes toward play with their infants and the impact of digital media on infants, as well as Isikoglu et al. [39]. After reviewing the literature and taking into consideration the Greek context, final decisions around the formatting/content of the questions were made.

A dual-phase questionnaire was adopted. Parents completed two questionnaires—the first prior to their child's interaction with technology-enhanced toys, and the second following their child's involvement with the selected toys, both in early childhood and care settings. The study had 78 parents who consented to their children participating. The first questionnaire consisted of 10 closed-ended, multiple-choice questions. The second questionnaire had 16 closed-ended questions and 4 open-ended questions.

The ten closed-ended questions were the same in both questionnaires. These questions were about the demographic characteristics of the parents (age, gender, educational level, occupation), the number of children and their ages, the number of children participating in the study and their ages, the frequency of parental use of the internet or digital technologies at home with each child, the frequency of the child's use of the internet and digital technologies, and parent's opinions regarding the significance of the child's engagement with digital technologies. The last question was answered on a Likert scale ranging from 1 (*almost not significant*) to 5 (*extremely significant*).

The second questionnaire contained six additional closed-ended questions related to children's references to TETs at home, the frequency of their references to TETs, and parents' engagement with children's comments regarding TETs. Parents also indicated whether they bought relevant toys, played on a tablet or PC, used apps for dramatic play with children, used apps for other types of play, or used any other type of digital technology. Parents were also questioned about whether they had noticed any change or improvement, progress, or enrichment of knowledge in their child and whether they thought this change was related to playing with TETs. By answering 'yes' to this question, respondents could choose from nine different options: oral speech/vocabulary, gross motor skills, fine motor skills, social-emotional development, math skills, creativity, communication, science skills, and others. The questionnaire concluded with three open-ended questions. In the open-ended questions, parents were asked to share their insights on how their child interacted with the toys, express any worries they might have had, and provide reasons for endorsing or cautioning other parents about purchasing similar toys.

No recommendations were made to parents on which of the TETs they might use at home. Their answers were based on what they already had at home or whether the participating children made any suggestions to buy a new toy. Researchers did not make any recommendations around the use of toys or offer any kind of training to parents. Parents were free to express their views on how children engaged with their toys at home and whether children were making any references to what was happening at their EC setting. TETs were only used in the EC settings.

#### 4.2. Statistical Analysis

Due to the presence of data with non-normal distribution, non-parametric tests were employed for the analysis. Kruskal–Wallis tests were performed. This test is usually used when data do not have a normal distribution and contain independent measurements, and the relationship between different variables needs to be explored;  $p < 0.05$  was considered statistically significant. Statistical Package for Social Science, version 29.0.2.0 (IBM) was employed to analyse all data.

### Selection of the Technology-Enhanced Toys

The researchers considered several factors before selecting which TETs to use in the study. No previous study was located to provide advice on this topic. The researchers used one of the most popular online platforms, Amazon (<https://www.amazon.com>, accessed on 2 September 2022), to first explore how many and what kind of TETs were available. The selection criteria included the age group of the children participating in the research, the product rating, the number of best sellers in the category, and the price. The selected toys were as follows:

1. Fisher-Price Linkimals Owl Light Up and Learn (ages 18+ months). Toddlers engage with Owl's circle of buttons to initiate a multi-sensory experience featuring lights, sounds, and an array of educational songs and phrases. By exploring this interactive feature, users—particularly children—can trigger many stimulating responses, fostering a dynamic and engaging learning environment. The circle of buttons serves as a gateway to a diverse range of auditory and visual stimuli, enhancing the overall interactive and educational value of the owl's design (<https://www.amazon.com/Fisher-Price-Linkimals-Light-Up-Interactive-Learning/dp/B09NP97B3Q>, accessed on 2 September 2022).
2. Fisher-Price Laugh & Learn Baby to Toddler Toy Let's Connect Laptop Pretend Computer with Smart Stages (Ages 6+ Months). The Laugh & Learn Let's Connect Laptop electronic toy by Fisher-Price offers an engaging play and learning experience for babies, whether at home or on the go. Featuring pretend video chats with Puppy and friends, along with interactive elements like sliding to 'unmute', babies can explore pressing buttons on the keyboard or spinning the musical roller. These actions activate vibrant multi-colour lights, and the toy introduces over 55 songs, sounds, and phrases covering topics such as the alphabet, colours, and counting. With three Smart Stages levels, parents can adapt the learning content to suit their little one's developmental stage, ensuring a customised and evolving educational experience as the child grows (<https://www.amazon.com/Fisher-Price-Connect-Electronic-Learning-Toddlers/dp/B09BDBKXFQ>, accessed on 2 September 2022).
3. Beebot (ages 3+ years). BeeBot, with its user-friendly design, can be easily programmed using on-board buttons, allowing precise movement in space. Children can program it to move forwards or backwards or turn left or right. This simple yet effective interface serves as an excellent introduction for teaching young children concepts of control, direction, and programming language. BeeBot provides a hands-on and accessible way for kids to engage with programming principles, making it an ideal starting point for fostering early learning of these essential skills ([https://www.amazon.com/TTS-Bee-Bot-Programmable-Educational-Rechargeable/dp/B086HFXDSM/ref=sr\\_1\\_5?crid=3QMDLKHOBIVBA&keywords=bee+bot&qid=1705682423&sprefix=bee+bot,aps,218&sr=8-5](https://www.amazon.com/TTS-Bee-Bot-Programmable-Educational-Rechargeable/dp/B086HFXDSM/ref=sr_1_5?crid=3QMDLKHOBIVBA&keywords=bee+bot&qid=1705682423&sprefix=bee+bot,aps,218&sr=8-5), accessed on 2 September 2022).
4. Coko Kids Entry-Level Programmable Crocodile Robot (ages 3+ years). Coko, the adorable programmable crocodile, is thoughtfully designed to offer younger children a playful introduction to coding. Geared towards kids aged three and older, Coko provides an entertaining game where children can freely move their new friend or attempt to reach a specific goal. In either scenario, children learn fundamental programming concepts in a fun and straightforward manner. This engaging experience serves as an accessible and enjoyable way for young learners to grasp the basics of coding, fostering early interest and understanding in this important skill (<https://www.amazon.de/-/en/Programmable-Crocodile-Electronic-Educational-Clementoni/dp/B07PLD4V71>, accessed on 2 September 2022).
5. Lexibook Power Puppy: My Programmable Smart Robot Dog (ages 3+ years). Power Puppy is an advanced robot dog equipped with gesture control. This cutting-edge robotic companion offers a plethora of interactive games, featuring sound and light effects, dynamic movements, barking, animal imitations, and more. Designed not only for entertainment but also as an educational tool, Power Puppy serves as an



avenue to introduce young users to programming. Using the remote control, children can command Power Puppy, providing an engaging platform to explore fundamental programming concepts. This not only ensures a captivating play experience but also lays the groundwork for a comprehensive understanding of programming principles in an accessible manner (<https://www.amazon.com/LEXiBOOK-Power-Puppy-Programmable-Rechargeable/dp/B09DYFQP63?th=1>, accessed on 2 September 2022).

## 5. Procedure

The University Ethics Committee approved all study protocols. After ethics approval, parents were invited to an informational meeting about the study, wherein the details of the study were explained, and any questions were answered. The link to both questionnaires was given to parents through the webpage of one of the participating Early Childhood Education and Care Centres. All parents consented online before completing the questionnaires.

## 6. Results

A statistical analysis was performed with non-parametric tests, such as Kruskal–Wallis. It was impossible to draw comparisons between parents since the responses to the questionnaires were anonymous. The parents' demographics are shown in Table A1 in Appendix A.

The questionnaires were completed by female parents aged 30–40 years. The most common educational background among parents in both surveys was *Technological Educational Institutions* (25.6% and 22.0%, respectively). Most parents indicated that they were private employees in their professional category (51.3% and 57.6%, respectively). Table A1 also presents a comprehensive summary of the ages of the participants' children. Most families had two children and a participating child within the 3–4-year age range. In the initial survey, a significant number of parents with two children indicated that their second child was between ages 2 and 3 (15.4%). However, the age distribution of the parents' second child showed a significant change in the second questionnaire. There was a significant increase in the percentage of parents with a second child aged 3–4, from 14.1% to 20.3%. A very small number of parents (3.8% and 6.8%, respectively) reported having a third child.

Table 1 displays the frequency of digital technology (DT) usage among the parents' first and second children, along with the reported significance of this usage. The significance reported was only for the first child. No significance was reported for the second child.

**Table 1.** Frequency of DT use among children and significance of first child's DT use.

Frequency of Use (Hours per Week)	Percentage in Pre-Questionnaire ( <i>n</i> = 78)	Percentage in Post-Questionnaire ( <i>n</i> = 59)
First Child		
Not at all	5.1	6.8
Little (1–2)	5.1	37.3
Enough (2–3)	43.6	30.5
Much (5–6)	26.9	15.3
Very much (8–10)	19.2	10.2
Second Child		
Not at all	1.3	5.1
Little (1–2)	2.6	8.5
Enough (2–3)	2.6	10.2
Much (5–6)	1.3	-
Very much (8–10)	-	5.1
Significance of First Child's Use of DT		
Almost not significant	5.1	3.4
Slightly significant	20.5	10.2

Table 1. *Cont.*

Frequency of Use (Hours per Week)	Percentage in Pre-Questionnaire ( <i>n</i> = 78)	Percentage in Post-Questionnaire ( <i>n</i> = 59)
Neutral	24.4	33.9
Very significant	29.5	27.1
Extremely significant	20.5	25.4

In the pre-questionnaire, most respondents (43.6%) indicated that they used DT enough with their first child, while a smaller percentage (26.9%) reported using it much. In the post-questionnaire, there was a significant rise in the proportion of participants indicating little usage (37.3%), whereas the percentages for enough and much usage declined to 30.5% and 15.3%, respectively. For the second child, most parents indicated that they used DT for a sufficient amount of time, averaging 2–3 h per week. In the post-questionnaire, there was a slight increase in usage reported as enough (10.2%).

The percentages for the importance of using DT varied between the pre- and post-questionnaires. In the initial survey, 25.6% of parents expressed their belief that the use of DT holds minimal or no significance. However, in the subsequent survey, this percentage dropped to 13.6%. There was a slight increase in the significance of using DT, rising from 50% to 52.5%, among parents who deemed it highly or extremely important.

#### 6.1. Association between Variables: First Questionnaire

When examining the data from the pre-questionnaire, the researchers focused on the importance of children's use of digital technology in relation to various demographic factors, including occupation and the number of children in the family.

A Kruskal–Wallis test was performed on the score of the four groups (municipal/public employees [A], private employees [B], freelancers [C], and unemployed [D]). The differences between the rank totals of 35.50 (A), 43.89 (B), 24.71 (C), and 47.28 (D) were significant:  $H(3, n = 78) = 8.701, p = 0.034$ . The findings indicated that unemployed parents identified the significance of children's engagement with digital technologies. (Appendix A—Table A2). A Kruskal–Wallis test was also performed on the scores of the three groups (families with one child [A], families with two children [B], and families with three children [C]). The differences between the rank totals of 31.25 (A), 45.77 (B), and 37.67 (C) were significant:  $H(2, n = 78) = 8.010, p = 0.018$  (Appendix A—Table A2).

#### 6.2. Association between Variables: Second Questionnaire

The statistical test results of the connections between different variables and aspects of children's use of digital technology are displayed in the Appendix A—Table A3.

A Kruskal–Wallis test was conducted to analyse the relationship between parents' level of education and the importance of digital technology use by the child ( $H(7, n = 59) = 18.112, p = 0.011$ ), the frequency of reporting toys by the child ( $H(7, n = 59) = 15.137, p = 0.034$ ), and using children's references to toys at home ( $H(7, n = 59) = 15.317, p = 0.032$ ). The findings indicated a significant link between the educational background of parents and the extent to which children engage with digital technology and toys at home.

A Kruskal–Wallis's test was conducted to examine the relationship between the number of children in the family and the children's use of digital technology. The results showed a significant finding ( $H(2, n = 59) = 6.366, p = 0.041$ ) related to the first child's usage. This finding suggests a possible link between family size and the frequency of digital technology use by the family's eldest child.

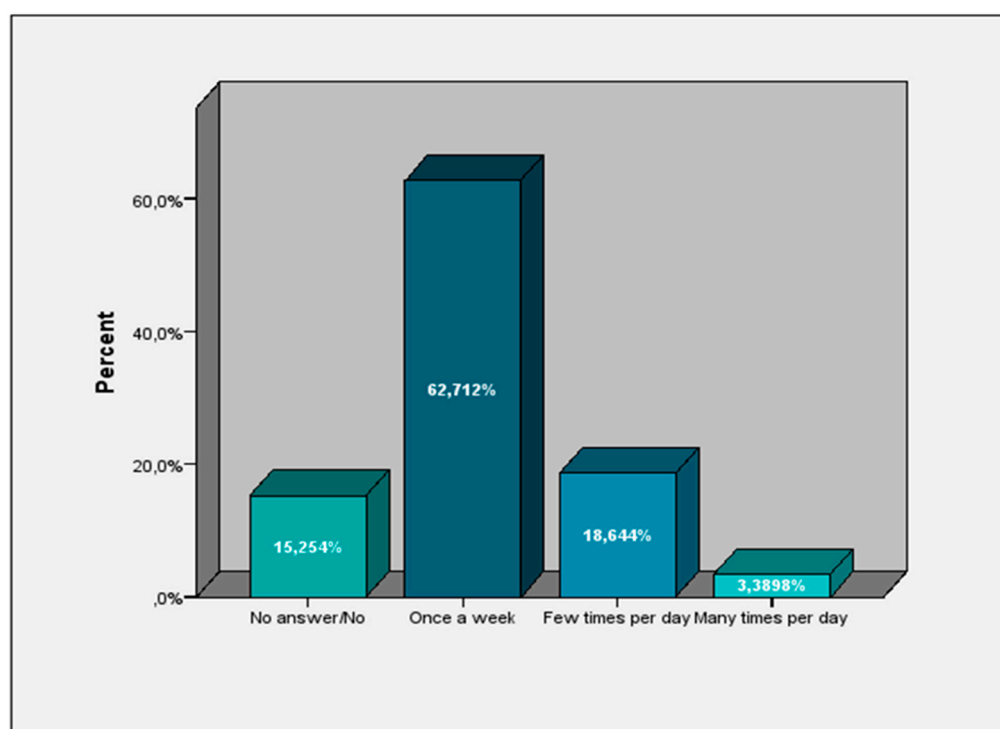
A Kruskal–Wallis's test was also conducted to examine the relationship between the variable number of children in the family and the second child's use of digital technology. The results indicated a statistically significant difference ( $H(3, n = 59) = 9.508, p = 0.023$ ), suggesting a correlation between the number of children in the family and the increased frequency of digital-technology use by the second child.

Important connections between educational level and different aspects of children's use of digital technology were found. The number of children in a family was associated with the frequency of digital technology use for both the first and second children.

The findings indicate a significant link between the educational background of parents and various aspects of children's engagement with digital technology. This study discovered a correlation between parents' level of education and the importance they place on their children's utilization of digital technology. In addition, there is a connection between the educational backgrounds of parents and how often their children mention and play with toys at home. This has been thoroughly examined in the Section 7.

### 6.3. Children's References to Their Experiences with the TETs

A question posed to parents in the second questionnaire inquired whether their children communicated with them about their experiences with technology-enhanced toys in early childhood settings. The data showed that a significant percentage of parents (84.75%) reported that their children communicated using TETs. Further, most parents reported that their children referred to using TETs at least once a week (62.71%). Figure 1 illustrates all the frequencies.

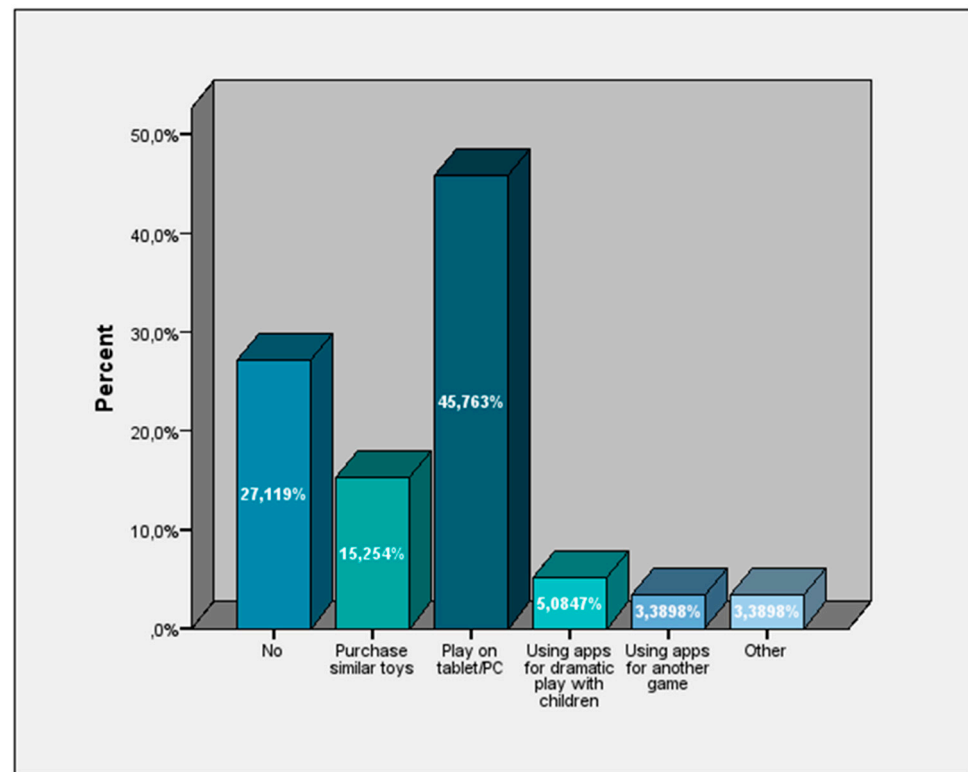


**Figure 1.** Frequency of children's references to TETs.

### 6.4. Parents' Use of Children's References to Technologically Enhanced Toys

A large percentage of parents (69.5%) answered that they used the references their children made to TETs at home. A positive response to this question followed the description of how they used their children's references to TETs. A significant portion of the parents (45.8%) indicated that electronic devices, like tablets or computers, were used to enhance children's references. Furthermore, 15.3% of the parents reported that they ended up purchasing similar toys. Additional approaches involved using applications for engaging in imaginative play with children (5.1%), using applications for different types of games (3.4%) and using other ways, such as playing with other children, playing with Gameboys, and digital painting (3.4%). However, 27.1% of the parents mentioned that their children's references to TETs were not used. This category encompasses a substantial portion of the responses, showcasing a wide array of methods for using children's references (Figure 2).





**Figure 2.** Method for using children's references.

Parents were asked about any changes they had observed in their children's development and learning (Table 2). The exact question and the possible answers were as follows: *"Have you noticed any improvement/progress/enrichment of knowledge in your child that you think is related to playing with this toy?"* By answering "yes", parents were called to answer the following closed-ended question: *"If yes, in which developmental area?"* The areas were as follows:

- a. Speech/Vocabulary;
- b. Gross motor activity (Gross motor activity refers to a child's ability to control large muscles of the body or muscle groups to move each limb individually (e.g., arm, leg movement) or in a coordinated manner (e.g., walking, running);
- c. Fine manipulation (the child's ability to manipulate small muscles correctly—using the muscles in the hands, fingers, and wrists in any action, e.g., holding a pencil);
- d. Social-emotional development (development of the child's personality, understanding of his/her feelings and the feelings of others, expression and management of his/her needs and desires);
- e. Mathematical concepts;
- f. Creativity;
- g. Communication;
- h. Science concepts (developing manual and scientific skills);
- i. Other—they could write their own answer.

**Table 2.** Improvement in developmental areas after using TETs.

	No Answer	Speech/ Vocabulary	Fine-Motor Skills	Social-Emotional Development	Creativity	Communication
Frequency	10	15	16	5	10	2
Percent	16.9	25.4	27.1	8.5	16.9	3.4

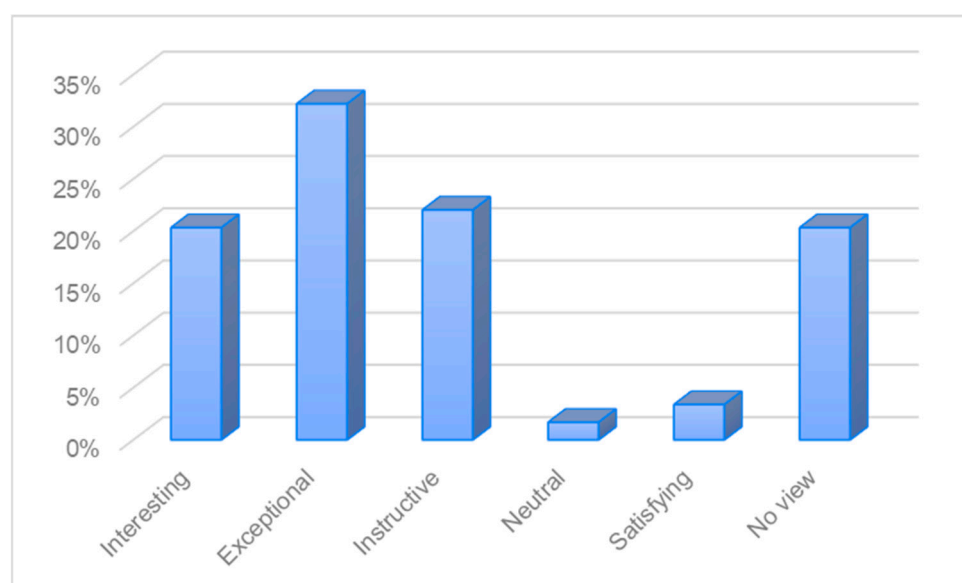
Of those surveyed, 81% gave a positive response, and 19% gave a negative response. The fine-motor skills of their children had improved, according to a sizable portion of parents (27.1%). Additionally, speech/vocabulary (25.4%) and creativity (16.9%) improved.

### 6.5. Open-Ended Questions

In the post-questionnaire, three open-ended questions were included. Using thematic analysis [40], the researchers recorded all answers, created 11 codes and 6 themes, and then calculated the percentages of each. The findings from each of the three questions were as follows:

*Open-Ended Question 1:* Overall, what did you think of the child's whole experience with digital technologies?

The whole experience was rated 'interesting' by 20% of parents. However, the same percentage of parents did not explain their view (Figure 3). Overall, parents had an exceptional view ('excellent', 'very good', 'good', 'positive') of their children's experiences. Additionally, they evaluated it as instructive ('educational', 'beneficial', and 'creative'). Very few of them reported their children's experience with TETs as neutral.



**Figure 3.** Parents' thoughts about child's experience with TETs.

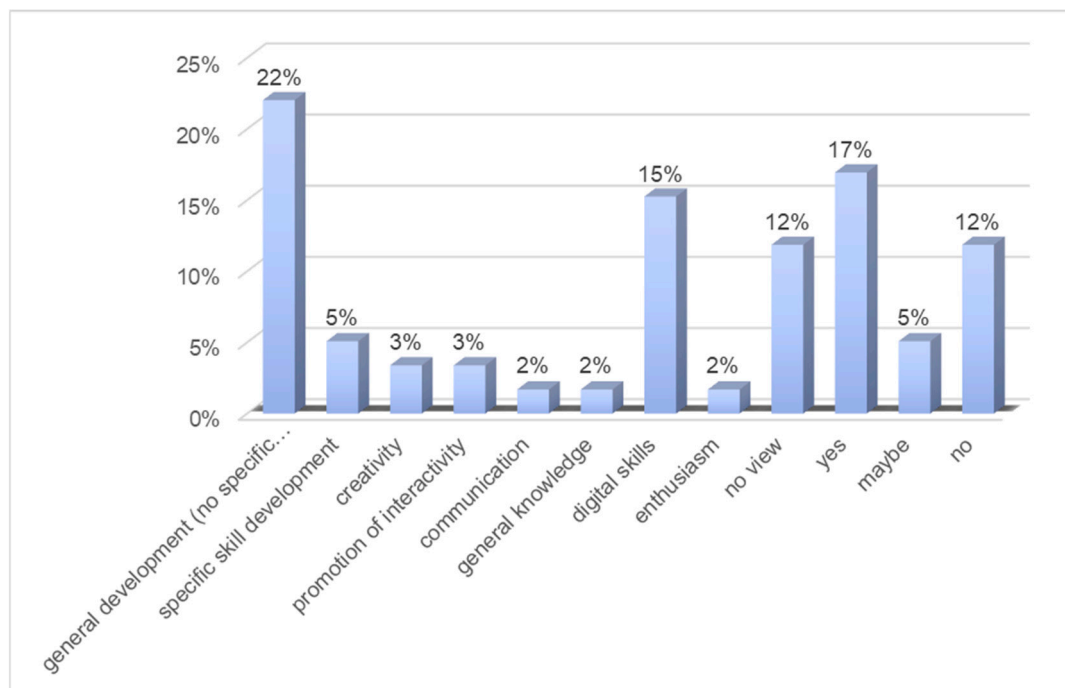
*Open-Ended Question 2:* Were you troubled by something?

Only four parents (8%) expressed the following concerns:

- 'I'm unsure if I am using it correctly.'
- 'Limited discussion of digital play within the household.'
- 'My concern stems from the child's complete absence of any mention or discussion of digital play, as if it was never a part of their experience.'
- 'I prefer not to introduce digital games at such a young age.'

*Open-Ended Question 3:* Would you suggest that other parents purchase similar toys for their children? If so, what are your reasons?

Most parents (71%) agreed that they would recommend similar toys to other parents. The reasons were general development without specific examples (22%); digital skills (15%); specific skill development, such as speech and fine motor skills (5%); creativity (3%); encouraging interactivity (3%); communication (2%); general knowledge (2%); enthusiasm (2%); no view (12%); yes (17%); maybe (5%); and no reason (12%; Figure 4). A large percentage of parents (46%) did not give a clear justification for their recommendation.



**Figure 4.** Reasons for recommending that other parents should buy similar toys.

## 7. Discussion

The aim of this study was to investigate parental perspectives regarding the use of technology-enhanced toys for children between 1 and 4 years of age. Furthermore, this study examined the potential benefits of using these toys in Early Childhood Education and Care facilities on children's playtime at home.

Similarly, the results of the pre-questionnaire revealed that unemployed parents might view digital technologies as useful resources for enhancing their children's education and development. This positive view of unemployed parents could be also attributed to having more time available for supervision and involvement in their children's activities. In addition, it might be suggested that unemployed parents are acknowledging the significance of digital literacy in equipping children with the necessary skills for the future. The finding highlighted the intricate relationship between socioeconomic factors and parental attitudes towards technology in influencing children's developmental experiences, and more research is imperative in this area.

Likewise, the results of the post-questionnaire survey showed that parental education level was a significant factor in how parents perceived the importance of digital technology for their children; parents with higher levels of education were more likely to recognise the importance of digital technology. This finding is consistent with an analysis by Livingstone et al. [41], who found that more educated families supported their children's engagement in digital media activities, possibly due to their confidence in managing digital media themselves [42]. Furthermore, the survey revealed that a higher level of parental education was a crucial factor in influencing the frequency of children's references to their experiences with TETs. This finding partly contradicts previous findings by Jabbar et al. [43], who reported that parents with children under the age of 8 years were supportive of children's access to and use of technological devices, regardless of their educational background. However, Jabbar et al.'s study was before the COVID-19 pandemic, and this may be one reason why parents in the current study had different views.

Furthermore, this study suggested that the level of parental education influenced both the frequency and the use of references to children's toy reports. Consistent with prior research by Martinez et al. [44], parents' advanced educational level increases the effectiveness of parenting techniques and children's academic performance. Parents with a strong

educational background can more easily help their children engage with digital technology and digital play at home, as also supported by previous research [45,46]. According to Apdillah et al. [47], parents who possess advanced digital skills and maintain a favourable outlook on media generally report better experiences and views on technology-based learning.

Family demographics were important in this study. Larger families (e.g., families with two or more children) prioritised using digital technology over families with one child, possibly due to the influence of family members serving as companions and playmates [48]. Larger family sizes may facilitate more frequent interaction with technology among younger siblings. These findings are in line with the proposition by Radesky and Christakis [49] that families with young children (ages 0 to 8) tend to use more new digital technologies, including mobile and interactive media, and parents often have more relaxed rules for the second child in the family when it comes to using digital devices [50]. These results are consistent with the scoping review of Lafton et al. [51] that age and gender are factors that influence how children and young individuals engage with digital technology in the family setting. In line with these results, Dore and Zimmermann [52] argued that children who use digital technology under supervision can enhance their relationships with their parents, siblings, and peers by engaging in shared digital activities.

Additionally, the age of the family's first child affected the usage patterns of digital technology for subsequent children. This finding implies that older siblings may positively influence the familiarity and engagement of younger siblings with DT. A possible explanation for this effect is that older siblings serve as role models and mentors for their younger siblings and may introduce them to new technologies or applications [53].

These findings underscore the complex interplay of family, education, and demographic factors in shaping children's attitudes and behaviours towards digital technology. These insights can enable a better understanding of the role of digital technology in family dynamics and child development and can guide parents towards creating more effective and beneficial strategies for its use.

In answering the first research question of this study, parents demonstrated favourable attitudes and readiness to endorse TETs and digital technologies for their children's development and digital skills, in line with previous studies [8]. However, the findings also highlighted challenges and concerns parents expressed with the selection (e.g., as 'interesting'), use (e.g., 'not sure if using it properly'), and impact (e.g., 'general development', without specific examples) of TETs and digital technologies on their children, in line with previous studies (see [9,54–56]). More recently, Lewis et al. [57] postulated that parents experienced a shift in their perceptions of digital technologies, leading to greater consideration of quality in their choices for their children. Nikken and de Haan [58] also discovered that most parents did not find digital environments safe and expressed concerns about negative effects on children, such as addiction, health problems, and a decline in academic success. A recent study by Kucirkova and Radesky [56] showed that the overuse (using digital devices like tablets, TVs, and electronic toys excessively and inappropriately) can lead to delays in cognitive, language, and social-emotional development in infants. Understanding how to evaluate the quality and impact of digital toys appears to be a fruitful area of future research.

When addressing the second research question, most parents permitted their children to use tablets or PCs to document their encounters with TETs [43]. Parents primarily reported advantages in children's fine motor skills, language/vocabulary, and creativity after their experiences with TETs similar to previous studies (e.g., [8]) [59]. The results also highlighted parental concerns about the appropriate use of TETs. However, previous studies mostly focused on parental mediation styles within families with children aged 9 years and older [60]. To the researchers' knowledge, this study is the first to explore parents' views regarding using TETs with children under four years old, a pivotal developmental stage with crucial ramifications for children's overall growth and well-being.

## 8. Recommendations for Future Research

The results of this study establish a foundation for subsequent investigations that seek to broaden comprehension of the intricate interplay among DT, families, and very young children. Numerous potential directions for further investigation arise from this study and are as follows:

*Sibling interaction:* Further investigation is warranted to examine how sibling interactions influence the development of digital competencies in children. An investigation into the function of siblings as intermediaries between socialisation and digital learning can yield significant knowledge regarding the processes by which children acquire digital competencies within the framework of their families.

*Parental Mediation:* It is necessary to conduct additional research regarding the impact of parental mediation on the DT experiences of children. Gaining insight into how parents mediate and navigate their children's engagements with DT can provide valuable knowledge regarding efficacious approaches to encouraging ethical and constructive use of DT across age groups. According to the report, future research should focus on insights connected to parent demographics. Specifically, research demonstrates that unemployed parents place a higher value on digital technology (47.28%) than parents engaged in specialised professions. This conclusion opens up possibilities for further research into the association between parental work status and attitudes toward digital technology.

*Evaluate the Long-Term Effects on Family Dynamics:* To ascertain the long-term consequences of DT on family dynamics, longitudinal studies are required. An investigation into the transformation of digital usage patterns within families and the subsequent impact of these changes on familial relationships and interactions can yield significant knowledge regarding the enduring consequences of adopting digital technologies as a family.

Through these prospective avenues of research, researchers can augment their overall comprehension of the role that digital technologies play at home. This comprehension, in turn, can provide valuable insights for formulating policies and interventions in the digital age that are grounded in empirical evidence.

## 9. Limitations

This study had limitations. For example, the sample size was limited, preventing generalisations. Although all parents participated in the pre-questionnaire, the sample was smaller in the post-questionnaire, which is a typical occurrence in the research process [61]. Further, no comparisons between the two questionnaires were conducted due to the anonymity of the data and the primary aim of the study, which was to examine parents' views (and not to make pre-post analyses). It would be useful for future studies to aim at a larger sample, employ a wider range of methods, and attempt comparisons.

## 10. Implications

The results of this study have practical implications for policymakers, educators, and other stakeholders in early childhood development and digital technology initiatives. It is important for policymakers to recognise that unemployment and a lower educational level among parents influence children's digital engagement. Consideration must be given to the specific challenges and difficulties that unemployed parents have when professional programmes that improve digital literacy and access are provided. With targeted support and resources, policymakers can help unemployed parents make the most of DT for their children's development. By educating parents about technology and providing them with efficient strategies for assisting their young children to meaningfully use technology, the 'family technology milieu' [62] will be significantly improved by increasing digital literacy, balancing technology use, promoting positive digital parenting practices, enhancing communication and connection, and creating safe and secure online environments.

Educators also play a critical role in promoting digital literacy among children. This study has useful insights for educators, informing them about the importance of family size, parents' educational backgrounds, and positive views on digital technologies. Educators



know that families come from different socioeconomic backgrounds and have different levels of experience with technology. Therefore, educators can develop tailored interventions to meet the individual needs of each family. Realising children’s diverse starting points will help educators effectively support children’s digital competence and minimise digital divides.

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## Appendix A

**Table A1.** Parents’ demographics.

	Percentage in Pre-Questionnaire ( <i>n</i> = 78)	Percentage in Post-Questionnaire ( <i>n</i> = 59)
Age		
20–30	7.7	8.5
30–40	59	66.1
40–50	33.3	25.4
Sex		
Male	19.2	13.6
Female	80.8	86.4
Education		
LEA/VAS <sup>1</sup>	2.6	5.1
General High School	20.5	16.9
Vocational High School	10.3	5.1
Technological educational institution	25.6	22.0
University	16.7	22.0
MSc	23.1	20.3
PhD	1.3	1.7
Other	0.0	6.8
Occupation		
Public/municipal employee	21.8	11.9
Private employee	51.3	57.6
Freelancer	15.4	18.6
Unemployed	11.5	11.9
Number of Children		
1	41	40.7
2	55.1	52.5
3	3.8	6.8

**Table A1.** *Cont.*

	Percentage in Pre-Questionnaire ( <i>n</i> = 78)	Percentage in Post-Questionnaire ( <i>n</i> = 59)
Age of Family's First Child (Years)		
0–1	1.3	-
1–2	17.9	6.8
2–3	11.5	13.6
3–4	32.1	35.6
4–6	19.2	27.1
6 or more	17.9	16.9
Age of Family's Second Child (Years)		
0–1	6.4	11.9
1–2	5.1	8.5
2–3	15.4	13.6
3–4	14.1	20.3
4–6	1.3	1.7
6 or more	1.3	1.7
Age of Family's Third Child (Years)		
0–1	-	1.7
1–2	2.6	3.4
4–6	-	1.7
Number of Children Participating		
1	98.7	94.9
2	1.3	5.1
Age of First Child Participating (Years)		
0–1	1.3	-
1–2	20.5	8.5
2–3	29.5	23.7
3–4	47.4	55.9
4–5	1.3	11.9
Age of Second Child Participating (Years)		
1–2	1.3	3.4
2–3	-	1.7

<sup>1</sup> LEA: Lea Employment Agency, VAS: Vocational School.

**Table A2.** Statistically significant associations in pre-questionnaire (Kruskal–Wallis Test).

Parent Demographic	Importance of Child's Use of DT
Occupation	0.034
Number of Children	0.018

**Table A3.** Statistically significant associations post-questionnaire (Kruskal–Wallis Test).

	First Child's Digital Technology Use	Second Child's Digital Technology Use	Importance of Digital Technology Use by the Child	Child's Report on Toy Use Frequency	Using Children's References to Toys at Home
Parents' Educational level	-	-	0.011	0.034	0.032
Number of children in the family	0.041	-	-	-	-
First child's age	-	0.023	-	-	-

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