# Greek Parents' App Choices and Young Children's Smart Mobile Usage at Home

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**Abstract.** In the last decade, interactive touchscreen devices have become ubiquitous in young children, and toddlers first experience touchscreen technology before two. Although parents have a vital role in developing the home environment as a stimulus for development, they also have conflicting views on the appropriateness of using apps to deliver educational content for assorted reasons. The purpose of the study was to reveal various aspects of children's smart mobile use at home, such as the frequency of mobile device usage, preferred app types, and parent strategies on apps acquaintance. Three hundred twenty-five parents of kindergarten children took part in this study. The present study revealed that Greek homes are 'media rich' homes and that parents seek to support their children's learning at home via mobile devices. Furthermore, parents lack knowledge about app developmentally appropriateness and need further guidance. We expect the present study's findings to serve as a reference for researchers leading to better information for parents and creating apps with real educational value for children.

**Keywords:** Preschool children · Parents · Smart mobile devices · Apps

## 1 Introduction

In the last decade, interactive touchscreen devices are part of young children's lives [1]. Research links children's cognitive development with touchscreen devices and well-designed mobile applications (apps) [2]. As a result, self-proclaimed education apps are among the most accessed or purchased application categories in digital app stores [3]. Parents have a vital role in developing the home environment as a stimulus for development, and children's use of technology does not occur in a vacuum but within the context of family norms [4]. However, parents have conflicting views on the appropriateness of using apps to deliver educational content for assorted reasons, such as not having enough information about their children's development needs or controlling the content delivered via the apps [5]. Other factors include parenting style and socioeconomic status [6, 7].

Earlier research mainly focused on older children using interactive touchscreen technology, and thus there is not enough research focusing on young children [8]. This


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research aims to fill this knowledge gap in Greece about mobile device apps usage among preschool-aged children at home.

## 2 Literature Review

Smart mobile device usage is increasing rapidly among young children due to the novel characteristics of these devices and the rapid development of mobile applications (apps) targeting these age groups [9]. Earlier research has pointed out mobile devices as the preferred technological tool for young children [10] due to the advantages of other older technologies. Researchers constantly worried that households might be positioned along a digital divide regarding the use of technology, a growing chasm 'between media-rich and media-poor homes' [11] (p. 926). The 'digital divide' refers to the gap between those who do and those who do not have access to technology, usually falling across low-income racial and ethnic minorities [12]. [13] notes that the previous years' gap discussed in various reports does not exist due to the proliferation of smartphones and tablets. Smart mobile device usage among young children is widening fast, even for disadvantaged backgrounds [14], providing significant opportunities for children from low-income families [15]. Regarding children's use of digital technology, earlier studies have revealed several reasons behind the contradictory parents' views, such as the lack of enough information on this subject or being unable to control the multitude of parameters of device usage.

It is well known that open-ended digital activities that support exploration and experimentation while offering cooperative and collaborative interaction opportunities contribute to children's learning [16]. Furthermore, a substantial body of research shows that children's participation in learning activities at home during their early years reflects an educational development in the later years [17]. Prior research on tablet apps in preschools has proved that severe educational apps can boost preschool children's various skills. These include literacy development, geography, art, science, technology, engineering, math, computational thinking, and cognitive and social control [18]. Although the 'app gap' discussed in the previous years had decreased [13], a quality app selection gap still exists. For instance, there is a strong link between low-income parents and their belief in marketing claims about the educational value of commercially available apps that could be downloaded from the Internet [14]. On the contrary, several studies have proven that most apps in the educational category for Android and iOS operating system devices (Apple App Store and Google Play) have no educational value based on rote learning and memorization. Furthermore, most self-proclaimed educational apps lack clear evidence of efficacy and are not scientifically established, having received no feedback from developmental specialists during their development.

Furthermore, studies revealed that young children mostly experience entertainment apps [19]. On the contrary to their addictive design features, these apps do not offer any learning benefits [19]. Further research has also shown that children play dozens of the most popular apps in games and do not use apps to get extra help on their reading, writing, and math skills [20]. Further concerns about parents' choice of apps involve the commercialization embedded in almost all of the freely available apps with many popups and inappropriate ads for children, disrupting their learning [19]. The

companies make money on these free apps through advertisements, in-app purchases, or advertising paid apps on free ones.

Parent's role is essential in their children's technology-mediated activities [21, 22] as they control their children's interactive media experiences [23]. Parents must select appropriate apps to increase children's learning and enjoy reading, writing, and mathematics despite the abundance of low-quality educational apps. Taking this into account and considering the ubiquitous use of smart technology by children younger than six years, further research is needed to investigate whether parent app choices regarding children's learning at home.

## 3 Methods

### 3.1 Study Settings, Participants, Aims, and Research Questions

The study implemented the design of a method utilizing quantitative data. Parents with preschool-aged children, all enrolled in early childhood education classrooms, took part in the research. A stratified random sampling frame was implemented to ensure that the demographic composition is representative of national patterns. Kindergarten educators actively engaged in the process to increase participants' responses to the questionnaire. Parents who did not fully complete questionnaires were excluded from the sample. A total of 325 participating parents completed paper copies of the survey, a participation rate of 91%. The study was approved by the University of Research Ethics Committee to comply with ethical considerations. Furthermore, the participants were recruited ethically, without respect to their socioeconomic background. Confidentiality was maintained throughout the study.

The study aimed to examine parents' knowledge of apps, ownership of mobile devices; app purchasing habits; children's use of apps; and app usage contexts by parents and their children. The research questions that guided this study were as follows:

- What kind of access do Greek preschool children currently have at apps at home, and how are they used?
- What are the most popular app categories that Greek parents select for their preschool children?
- What factors influence parents' decisions when it comes to choosing which apps to use?
- What support do parents need to make these mobile tools more beneficial for child development?

### 3.2 Study Instrument

When designing this study questionnaire, we started with the research questions mentioned above that motivated the study and continued with existing reports and literature on children's media use. In addition, some of the questions were updated to reflect changes in technology and research on the content or context of early screen time. In the present study questionnaire development, we utilized an iterative process

involving the research team for the item's creation, experts from the University of for the review of the items, and the research team for the revised item's creation. The questionnaire consisted of 28 questions, including dichotomous choice (yes/no), multiple-choice, and open-ended questions. The questionnaire included three parts. The first part focused on demographic information. The second part focused on the availability of technology to children at home and apps' frequency of use. The third part focused on parents' thoughts and concerns about their children's use of technology.

### 3.3 Threats to Validity

The approach in the present study was non-experimental. There was no interaction bias based on participant selection. Moreover, parents could fill out the questionnaire without spatial and time restrictions, so there were no cases of reactive arrangement. A small number of participants means that the external validity is limited, and thus the study results may not be generalizable to the overall population. To detect an effect of partial eta squared = .04 with 80% power in a one-way within-subjects ANOVA (three groups, alpha = .05, non-sphericity correction = 1), G*Power suggests we would need 119 participants [24]. Considering the final number of 325 participants, we can assume that the sample accurately represents a larger population [25].

## 4 Data Analysis

The data were analyzed using IBM SPSS statistical package version 26 (Chicago, Illinois, USA). There were no missing values. The results were determined to be statistically significant at the 5% level ($p < 0.05$). Parametric assumptions for all independent variables were examined, and they were not met. The majority of respondents (78.2%) consisted of mothers; almost all (95.1%) identified as Greeks, with a percentage of 4.0% identified as Albanians. Regarding parents' studies categorization, most parents reported being well educated, having at least a tertiary education diploma, and belonged to the 31–40 age group (67.1%) or the 41–50 age group (26.8%). However, only 24.3% had attended pedagogical studies (e.g., schoolteachers). Regarding the available family income, according to the most recent data (2019 Survey on Income and Living Conditions) [26], in this study, the risk of poverty or social exclusion was estimated at 23.1%. Children had access to several types of smart mobile devices at home. However, most important is that all children had access to at least an electronic device, while many children had access to two or more diverse types of devices.

Almost all children had access to a smart device daily or some days during the week. Three hundred nine parents (95.1%) declared that they use a restriction policy on their child's time with the mobile device. On the contrary, only 16 parents (4.9%) answered that they did not use any rule. In the question of whether the children play educational games (apps with a game-like format and an educational goal) on the smart mobile device, the parents in their majority (303, 93.2%) answered positively. The parents answered that their children play different mobile games during their engagement with smart mobile devices. As expected in their majority, children play with math

apps (153, 47.1%) and read/writing apps (153, 47.1%). Surprisingly enough, the parents answered that children mostly play with apps that promote spatial reasoning skills (224, 68.9%) and coloring recognition apps (168, 51.7%). A small number of children play with coding and STEM apps (43, 13.2%). In an open question, on the other types of games that children play and not already mentioned in the questionnaire, the parents answered that their children play apps that help them learn the English language (23, 7.07%).

What is significant is that the parents in their majority answered that they download educational apps/games for their children (297, 91.4%). Only 28 parents (8.6%) answered that they do not download educational apps for their children. These numbers may follow the parents' answers; those 21 children play with smart mobile devices without an adult supervisor. Almost all parents (294, 90.5%) answered that they download and use only free apps. Only 31 parents (9.5%) said that they use both free and paid apps. None of the participants answered that they prefer to use only paid apps. Twenty-eight parents answered that they download apps for their children weekly, either two-three times per week (19, 5.8%) or one time per week (9, 2.8%). One hundred fourteen parents said they download monthly, either one app (50, 15.4%) or two-three apps (64, 19.7%). Thus, the parents in the majority (162) do not download apps for their children often. Similarly, 21 parents (6.5%) declared that they do not download apps. These numbers comply with the parents' previous answers that 21 children play with mobile devices without an adult supervisor. We can also suppose that in these families, children alone download apps.

When parents asked what motivates them to download apps for their children, they gave various answers. The most popular answers were 'as a reward for an achievement or a good behavior' (124, 38.2%), 'to support the child's learning (117, 36.0%), 'to satisfy the child's desire' (118, 36.3%), 'to encourage the child's play and creativity (82, 25.2%), 'as a gift' (36, 11.1%) and 'just because my child only needs a new app' (26, 8.0%). A question is how their child knows about a specific app. In the multiple questions the source's parents use to download an app, surprisingly enough, 139 parents (42.8%) answered that their child asks for the particular app. We suppose that they meant that they are looking together with their child for apps and might download apps that their child finds attractive due to colors, known heroes, etc. 136 parents (41.8%) answered that they download apps after a personal search in app stores. Sixty parents (18.5%) answered that they download apps recommended by the older member of the family or their husband or partner, their child educators (74, 22.8%), friends, colleagues (82, 25.2%), through social networks posts (49, 15.1%) and advertisements (22, 6.8%). These two last answers must problematize the researchers as other studies have found that user comments are primarily subjective and do not correlate with the actual educational value, while ads promote specific apps. We can also conclude that parents are informed mainly by their colleagues or friends and not by their children's teachers. However, in Greece, this can be explained by the low degree of penetration of mobile technology in schools and the lack of familiarity and knowledge of teachers about this new educational reality.

Parents seem to follow the same strategy regarding the criteria they use to download an app. Instead of following recommendations on specialized sites or blogs (89, 27.4%), they prefer to base their decision on friends or relatives' recommendations

(166, 51.1%), on comments and reviews on app stores (151, 46.5%), comments and reviews on social media (67, 20.6%) and apps downloads (92, 28.3%). Surprisingly, they do not base their strategies on app stars (18, 5.5%) and app prices (18, 5.5%). Their low-interest in-app price may be explained since they mostly download free apps (n = 294). There are no specific websites and blogs for app reviews in Greece, such as the Commonsense Media in the United States, so only 89 parents said they based their specialized apps criteria. Now another question emerges. Due to these apps' inexistence in Greece, what are these sites and blogs they refer to?

To further investigate parents' belief in digital technology, they answered questions on a 5 Likert scale. From the parents' answers, we can conclude that parents are positive about using mobile technology for their children's education in formal and informal settings (M = 3.55), although they feel unsure about their knowledge about this technology's utilization. They express their need for information from experts on how to find apps with real educational value to help their children learn (M = 3.86), on how to balance the time between apps usage and other activities for their children (M = 3.81), and the correct age that they will introduce mobile technology to their children (M = 3.85).

## 5 Study Limitations

On limitations, firstly, given that this study was a survey design, the causal direction between the dependent and the independent factors could not be ascertained. Furthermore, due to the correlational approach, extraneous variables such as individual differences (parents' personality, cultural values) might also influence the study outcomes. In addition, the data on this study were reported by parents. Thus, there might be a discrepancy between mobile media use reported by parents and the child's actual usage.

## 6 Discussion - Conclusion

The present study results suggest that all children at home have access to at least an electronic device, while many children have access to two or more diverse types of devices. Smartphones are the most popular device for children. Although still not widely available in kindergartens, smart mobile device adoption is increasing fast, and children at a younger age begin to use them early in Greek homes. Other studies have revealed that television had been the "go-to" device for parents of young children but noted that touchscreen and multi-use devices are gaining popularity [27, 28]. Compared to the results with another study in Greece, we can see the same trends [29]. These results are confirmed in other studies [30]. In [30] study, the researchers analyzed 0- to 3-year-olds children's use of touchscreen devices at home in three different countries, Japan, Norway, and Portugal. The study results revealed that touchscreen technologies dominate in these three different countries. Based on our study, we can conclude that most children in western countries, including Greece, live in homes that are "digitally fluent" environments [31]. Especially European children grow up in technology-rich

homes [23], and printed books and educational television programs rapidly give way to digital content, shifting the learning environment at home for very young children [32]. In general, smartphones followed by tablets are popular in this age group due to their simplicity, portability, size of the screen, and ease of use [23], illustrating how deeply this technology has integrated into the daily parenting routines [6].

In Greece, young children use touchscreen devices (smartphones or tablets) daily or a few days per week, following [33] study. In her study, [33] investigated the digital technologies children under five use at home in four European countries: England, Greece, Malta, and Luxemburg. She found that many 3- to 5-year-olds use digital technologies (computer-based, internet-based) more than 30 min during the week and longer during the weekend. Based on the participants' responses, our results are in contradiction with previous studies. It seems that children in Greece use mobile devices less compared to other children around the globe. In Japan, almost half the two-year-old children watched videos or played games through their parents' smartphones for 60–80 min per day on average [30]. Similarly, in the United States, children as young as four years of age spend an average of an hour per day on an interactive screen device [13].

Regarding the impact of socioeconomic status, age, gender, and ethnicity on digital technology access and use, the previous year's studies found that socioeconomic background can influence how families incorporate digital media [11]. Socioeconomic status (SES) is a multidimensional vector that refers to a cluster of variables, such as lack of material resources, low parental education, or family financial pressures [34]. The present study found that even lower-income parents provide their children with versions of Apple and Android devices. These results followed other international study results. For instance, in a study in Canada with families from different socioeconomic backgrounds, social class did not seem to be a key indicator of technology practice or use [15]. In general, we can consider that in Greece, there is no digital divide in lower-income and ethnic minority children due to the overall increase in mobile device availability. While earlier studies have shown that children from low-income families have limited access to educational opportunities in digital content [35], in this study, children from both low and high SES have equal access to mobile content within the family environment. Several studies have also highlighted the parents' crucial role in guiding young children to use touchscreen mobile devices to gain educational benefits in informal educational settings [36]. This is considered important as mobile game-based learning in developmentally appropriate apps with educational value can help young children quickly develop their math, language, coding, and STEM skills [37, 38]. We also found that there is also no difference in apps usage and digital device access between boys and girls. This is important as the mobile ecosystem can create a supportive environment that can help children create positive attitudes and set clear learning goals [39]. Furthermore, gender equality in device and apps access can help females overcome technology phobias which can, in theory, impact the acquisition of CT skills and compromise their academic and professional future [40, 41]. Thus, the gap in which children of lower-income homeowners had substantially less access to smartphones, tablets, or educational apps described in older studies [42], does not exist.

Research suggests that children learn educational concepts from well-designed multimedia resources such as mobile applications (apps) [22]. An abundance of apps designated as educational (without evidence for this claim) are available in digital stores [7], and parents play an essential role in supporting their children in their learning with educational media [43] by choosing developmentally appropriate apps. However, reports indicate that children entertain themselves at home mostly with tablets [20]. In this study, we also found that children mostly use apps for entertainment purposes. Studies have also found that young children widely use three types of educational apps [19]: interactive gaming apps that have goals that progressively increase in difficulty, thereby piquing children's interest; applications that have tools for drawing or building to encourage children to join a constructive activity with may possible outputs; and electronic books with colorful, animated, and interactive features [18].

Although [13] discussed an "app gap" that mentioned the difference in the percent of parents who have downloaded apps for their children to use in this study, we can speak of an "app quality gap." In other words, the app's visual design, sound effects, and interface can distract children from the actual educational content. A balance between these characteristics is necessary to ease children's learning [7]. International statistics highlight ongoing concerns about the science education achievement gap that exists between kindergarten students. Girls worldwide are at higher risk for their STEM skill development than boys. Furthermore, studies highlight that early STEM engagement is crucial for young children of both genders to prepare for future STEM challenges [44, 45]. The present study found that parents do not download apps for their children's STEM skill development.

It is not expected that children can choose digital devices and apps with appropriate educational content. Research recognizes that parents play a critical role in children's technology introductory activities. Furthermore, the joint parent and child engagement with technology can improve children learning outcomes [3, 46]. Nevertheless, most parents worldwide do not know where to find appropriate tools and high-quality educational apps. For instance, it has been found that children play games instead of educational apps [3]. In the light of the research findings from the study in Turkey, the same researchers found that all the digital games were in the 'negative category,' characterized by inadequacy of their design and the education content [3]. In this study, similar to other studies [23], parents select and download apps and games that they consider educational and appropriate for their children.

Nevertheless, parents often perceive what is being taught as educational value, similar to early childhood curricula (quizzes, puzzles, and games) dismiss other aspects of context and skills [31]. Furthermore, in this study, the inadequate and often misleading information that parents receive from the media and other unofficial sources such as peers about digital content appears to be a significant factor in their decisions on children's touchscreen use [30]. In this study, parents mainly download and use free apps. Researchers have proven that the quality of an app may be reduced by features such as ads and popups that can divert children's attention away from the educational content [47].

Furthermore, these distracting features increase the cognitive burden, especially for younger children [48]. Additionally, researchers state that several free early literacy

apps targeted at younger children imitate worksheets or flashcards promoting rote learning [19]. Fortunately, early childhood organizations (e.g., Resources for Early Learning or Zero to Three) provide parents with ideas and strategies for developmentally appropriate activities with smart screen technologies [7]. Unfortunately, Greece has no similar resources, although this lack has been already mentioned in the earlier studies [29].

Although digital learning can be used in diverse ways to enhance learning, parents still voiced uncertainty about adopting and implementing these digital resources [49]. In the present study, participants have mixed views about the potential of screen media for their children's development. Like other studies, most parents simultaneously recognize the potential benefits of using touchscreen technologies for their children, but they also expressed concern about potential risks, such as exposure to inappropriate content [13, 30]. Although the participants in this study, in their responses, did not mention the unfamiliarity and the high cost of monitoring software and parental control functions [50], almost all of them express their concerns regarding their lack of knowledge on selecting appropriate mobile educational content in the form of apps. However, regarding their concerns, in contrast to the study results of [31], parents do not get informed from scientific sources like doctors, educational reports, or experts. On the contrary, the participants answered that they mostly get recommendations from family and friends.

Like other studies in the present study, most parents, despite their willingness, mentioned a lack of scientific literacy to find educational apps in the digital stores [3, 51]. In addition, they are also being unaware of classifying young children learning needs and how they can use apps to scaffold children learning, such as encouraging engagement in meaningful activities [52] or higher-order skills such as problem-solving [31].

## 7 Conclusion

Parents are the primary mediators of children's home digital media, deciding children's digital presence, content, and activities [31, 46], especially in crises such as COVID-19 lockdown [53]. Providing parents with support services and strategies for coping with mobile media usage challenges can enhance learning and both learner and parent satisfaction with mobile technology. Educational organizations, stakeholders, and researchers should recommend or even better provide age-appropriate and developmentally appropriate content in apps. Unfortunately, there are no such digital resources in Greece and other countries in the parents' native language. Early childhood organizations must provide parents with advice for mobile developmentally appropriate activities to pursue their children's education.

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