



Volume 36
Number 3
November 2016

Early Years

An International Research Journal



ISSN: 0957-5146 (Print) 1472-4421 (Online) Journal homepage: <https://www.tandfonline.com/loi/ceye20>

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To cite this article: Elyna Nevski & Andra Siibak (2016) The role of parents and parental mediation on 0–3-year olds' digital play with smart devices: Estonian parents' attitudes and practices, *Early Years*, 36:3, 227–241, DOI: [10.1080/09575146.2016.1161601](https://doi.org/10.1080/09575146.2016.1161601)

To link to this article: <https://doi.org/10.1080/09575146.2016.1161601>



Published online: 30 May 2016.



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The role of parents and parental mediation on 0–3-year olds' digital play with smart devices: Estonian parents' attitudes and practices

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ABSTRACT

In this manuscript, we analyse the attitudes and practices of Estonian parents ($N = 198$) who allowed their 0–3-year olds to use smart devices. We aimed to discover if there was an interaction between parental use of smart technologies, parents' attitudes and the child's age that would predict young children's usage of smart devices. We also wanted to find out what kinds of devices are made available for 0–3-year olds, how frequently parents allow the child to use them, the activities children are engaged in on smart devices and which apps they use during their digital play. Parental mediation practices were also analysed. Our results provide evidence that parent screen time, parent attitudes and the child's age are all associated with touch screen use among infants and toddlers. Parents give three main reasons when rationalising their child's touch screen use, related to education, entertainment and behaviour regulation. Although parental mediation strategies are dependent on the age and gender of the child, the majority of parents combine different mediation strategies in order to fulfil their role as mediators of young children's digital play.

ARTICLE HISTORY

Received 1 December 2015
Accepted 1 March 2016

KEYWORDS

Infants; toddlers; touch screens; parental mediation; digital play

Introduction

In recent years, digital technology and smart devices in general, and smart phones and tablets in particular, have taken an important position in young children's mediaworlds (Kucirkova et al. 2014). In fact, recent studies indicate that infants and toddlers (0–3-year olds) have also started to make use of smart devices in order to entertain themselves, to play and to learn (Cristia and Seidl 2015; Holloway, Green, and Livingstone 2013; Marsh, Plowman et al. 2015; Rideout 2013). Despite the growing popularity of smart devices among the very young, scholars studying the topic have not yet reached agreement as to whether this is a positive or negative phenomenon. On the one hand, scholars claim that touch screen technology promotes play and creativity (Marsh 2010), that apps can support learning (Michael Cohen Group LLC 2011) and thus may have a positive educational impact on young children

(Kucirkova et al. 2014). For instance, Yelland (2015, 225) has claimed that 'playful explorations that incorporate new technologies enable young children to have multimodal experiences' which promote engagement and thereby also impact their self-confidence and autonomy. On the other hand, it has been pointed out that smart technologies may pose a threat to young children's imaginative play (Levin and Rosenquest 2001) and may impact brain development, cause attention problems (Courage and Setliff 2009) and all in all lead to 'irregular sleep patterns, behavioural issues, decreased academic performance, negative impact on socialization and language development' (cited in NAEYC 2012, 3). For all the above-mentioned reasons, the American Academy of Pediatrics (AAP) discourages any media use by children under two years of age (2011).

Regardless of their stance on the topic, many scholars (e.g. Marsh, Hannon et al. 2015; Neumann 2015; Sims and Colunga 2013; Yelland 2010) agree that in order to ensure a positive impact of technology on children's development, infants' and toddlers' smart device usage needs to be a guided activity. Furthermore, in order to 'support infants' and toddlers' playful explorations with smart devices an adult should mediate this activity so that it is articulated and represented by the children in the variety of modes' (Yelland and Gilbert 2012, 2). Hence, the role of parents and their various mediation strategies in guiding young children's digital device usage cannot be overestimated.

As the majority of studies so far have studied older children's usage of smart devices as well as parents' mediation strategies, there is still a lack of studies which analyse the digital play activities of 0–3-year olds. Although this age group has been part of the sample in several recent studies which have explored parental mediation strategies and young children's practices either on smart phones (Baek, Lee, and Kim 2013; Roy and Paradis 2015), tablets (Michael Cohen Group LLC 2011; Yelland, Gilbert, and Nicole 2014) or both (Kabali et al. 2015; Marsh, Hannon et al. 2015; Neumann 2015; Nikken and Schols 2015; Lauricella, Wartella, and Rideout 2015), infants' and toddlers' practices as well as their parents' mediation strategies have not been the main focus of these studies. Although some qualitative studies (Marsh, Hannon et al. 2015; Neumann 2015; Schlembach and Johnson 2014) have specifically explored 0–3-year olds' engagement with smart technologies and the guiding role of their parents in the process, there is still a gap in the literature. Furthermore, the majority of studies so far have been carried out in the English-speaking world, either in the USA (Kabali et al. 2015), in the UK (Crescenzi, Carey, and Price 2014; Marsh, Plowman et al. 2015) or Australia (Neumann 2015), and the topic has only rarely been explored in other countries (Cristia and Seidl 2015). To the knowledge of the authors, no relevant studies have been carried out in eastern European countries.

The present article investigates practices of Estonian 0–3-year olds on smart devices and parental mediation strategies ($N = 198$) used for guiding digital play. We aimed to study if there was an interaction between parental use of smart technologies, parents' attitudes and the child's age that would predict 0–3-year olds' use of smart devices. We set out to explore parents' own usage of smart technology as well as their justifications for making these devices available to infants and toddlers. We also wanted to find out what kind of digital devices are made available to 0–3-year olds; how frequently parents allow the child to use them; which activities children engage in on these devices; and the apps they use during their digital play. Furthermore, we analysed the mediation practices used by parents and how these were linked with young children's digital device usage.

We believe Estonia offers an interesting setting for exploring this topic for several reasons. Firstly, the term ‘e-Estonia’ is often used (Kotka, Vargas, and Korjus 2015) to describe Estonia’s emergence as one of the most advanced e-societies in the world, a constantly switched-on and tech-savvy nation. Secondly, the above-mentioned traits have also been documented in academic studies which suggest that Estonia belongs to the group of countries which could be classified as ‘higher use, higher risk’, i.e. where higher levels of Internet usage go hand in hand with a higher likelihood of encountering online risks (Livingstone et al. 2011).

Since no previous systematic studies have been carried out in Estonia to investigate toddlers’ use of touch screen technology and parental mediation on 0–3-year olds’ digital play, this study can be viewed as a pilot study to provide the first insight on the topic.

Theoretical framework

Important others as role models

Two different theoretical perspectives can be used for explaining infants’ and toddlers’ use of smart devices. First of all, according to Bandura’s (1977) social cognitive theory, learning and behaviour occur through observational learning. In other words, important others, i.e. parents, siblings and peers, can be viewed as role models for the young child. Therefore, when parents or siblings are using smart devices at home, infants and toddlers may start to mimic their activities and later also try these out on their own.

In addition to mimicking their parents’ smart device use, parents’ own attitudes regarding new technologies and their possible impact as well as parents’ own usage practices may also ‘set the stage for how the home media environment is created’ (Lauricella, Wartella, and Rideout 2015, 11). The importance of different experiences, activities, roles and interactions of a developing person with their important others, i.e. an immediate microsystem, is also stressed in Bronfenbrenner’s (1977) bio-ecological framework which characterises human development as a process of reciprocal interaction between a developing person and their environment. Thus, when following this approach, it can be argued that ‘the family habitus (practices and culture)’ has an impact on the young child’s engagement with new technologies (McPake, Plowman, and Berch-Heyman 2008, 24).

In fact, empirical studies (Lauricella, Wartella, and Rideout 2015; Roy and Paradis 2015; Vinter 2013) also reveal that families shape young children’s habits in their use of smart technologies through personal example. For instance, findings of Lauricella, Wartella, and Rideout (2015, 15) suggest that the child’s age, parent attitudes and parent screen time ‘play a dynamic and complex role in children’s screen time with these technologies’. According to their findings, children of parents who are active tablet and smart phone users spend significantly more time using tablets and smart phones, compared to the children whose parents use these devices less often (ibid., 14).

Furthermore, empirical studies indicate that parents’ attitudes about smart devices also influence how much time their young children spend with them. For instance, parents who believe it is important for their toddlers to be familiar with technology are also more likely to allow their child to use their smart phones (Roy and Paradis 2015) or 0–2-year olds of parents with more positive attitudes towards smartphones and tablets also spend more time with smart devices (Lauricella, Wartella, and Rideout 2015). However, parents are not aware (in most cases) of their children mirroring their behaviour and underestimate the risks of the use of technologies by their children (Chaudron 2015).

Digital play practices of infants and toddlers

According to research findings, young children are spending more time using digital media than ever before (Chaudron 2015; Holloway, Green, and Livingstone 2013; Kotilainen 2011; Marsh, Hannon et al. 2015; Marsh, Plowman et al. 2015; Rideout 2013; Suoninen 2013). However, the time spent on using smart devices is dependent on the age of the child. For instance, studies in the USA reveal that children under two spend on average close to an hour a day with screen media, whereas in the case of the 2–4-year olds, this time has already doubled. The findings of a more recent study from the UK (Marsh, Plowman et al. 2015, 42) report that 25% of children under three years of age who live in a household which has tablets have extensive access to these devices.

On the one hand, the growing popularity of smart devices in this age group is often explained by effective marketing strategies which emphasise the educational power of these technologies and provide the children with ‘a good start for learning’ (Yelland 2007, 53). On the other hand, several authors (Else 2009; Michael Cohen Group LLC 2011) consider that the fun interaction these new technologies provide is one of the key factors for their success.

According to Yelland (2015, 225) ‘new technologies have an important role to play in reconceptualising play in the twenty-first century’, creating additional opportunities for young children’s play by allowing them to play in multiple modes. Furthermore, it is argued that smart devices can influence young children’s play in several ways, enabling children to ‘make connections with many areas of learning and experience’ (Broadhead, Howard, and Wood 2010, 12). For instance, Plowman and Stephen (2005) argue that touchable screens may help promote free play and rule play, but also stimulate young children’s imaginative play and role-play (Plowman et al. 2012). In addition, virtual play may also include fantasy, socio-dramatic and ritualised play (Marsh 2010). However, as it is very difficult to isolate play from the wider repertoire of activities 0–3-year olds engage in on smart devices, we will refer to all the activities undertaken by infants and toddlers on touch screens as ‘digital play’.

Baek, Lee, and Kim (2013) reveal that the educational aspect is often the main explanation parents offer to justify their toddlers’ smart device usage. At the same time, analysis of the activities infants and toddlers engage in on smart devices indicates that young children mainly use these devices for entertainment, i.e. watching cartoons and videos, whereas use of educational content has been found to be relatively low (Baek, Lee, and Kim 2013).

Many parents make use of different applications to provide their children with additional educational opportunities. According to Goodwin and Highfield (2013), it is possible to classify these apps into three broad categories: instructive, manipulable and constructive. The former has elements of ‘drill-and-practise’ design as a homogenous response is required from the user; ‘manipulable apps allow the user to manipulate elements enabling guided discovery and experimentation within a predetermined context or framework, whereas the latter allows users to create content and digital artefacts’ (Goodwin and Highfield 2013, 380–381). Goodwin and Highfield (2013) emphasise that parents and educators need guidance in selecting the apps, and thereby also support in their role of mediators for their infants and toddlers because many of the apps have spurious content in spite of being classified as ‘educational’.

Parental mediation during their child's digital play

Parental mediation is a broad term that includes both media usage restrictions (time spent with media and content restrictions) and strategies to prevent the potential negative effect of the media. It is generally linked with increasing positive effect of the media, helping children become critical media consumers and citizens (Linder and Werner 2012; Livingstone and Helsper 2008; Vinter citation 2013).

Livingstone et al. (2011) differentiate between four main parental mediation categories: (1) restrictive mediation, i.e. posting restrictions on time and content used; (2) active mediation, i.e. discussing the content, giving explanations or instructions; being present or nearby when the child is using the device; (3) technical mediation, i.e. using software of parental controls so as to regulate or block, filter or monitor child's activities; and (4) monitoring, i.e. checking the browser history after the child has used the device.

Previous studies have demonstrated that parents' use of mediation activities is dependent on the age and gender of the child (Nikken and Jansz 2014), as well as on parental attitudes and their own usage practices. For instance, parents who are concerned about the possible negative effects of using smart devices tend to apply time and content restrictions, whereas parents who believe in the positive effects tend to co-use the mediums or use active mediation strategies (ibid.)

Methods and data

Data collection

As young children's digital technology use has not been studied before in Estonia, we decided to use a quantitative approach and carry out an online survey in order to gain the first input about Estonian parents' attitudes and practices related to 0–3-year olds' smart devices usage.

We recruited the respondents through contacts with preschools as well as by launching a call on Facebook. First of all, we sent out an email about the study and its aims, together with a request to forward the link of the survey to potential respondents to all the preschool directors in Estonia. Preschools were asked to share the survey link among the families of 0–3-year olds. Then, the main author of the paper also shared the link on her own Facebook profile and in preschool communities and groups on Facebook.

A survey was compiled on Google Forms and distributed online in December 2014 (4 December 2014–31 December 2014). We decided to carry out an online survey in order to reach potential respondents who might not have been so easy to target by other means. For example, since it is possible in Estonia to take parental leave until a child reaches the age of three and many mothers make use of this opportunity (Biin et al. 2013), reaching these families through preschools' means only might not have been possible. Our analysis shows that 73% of the respondents came through a call forwarded by preschool directors and 27% through a call posted on a Facebook page.

Making use of an online survey does have its limitations. For instance, we were only able to potentially reach those parents who were able to access the Internet, but since almost 89% of Estonian households with children are connected to the Internet (Estonian Competition Authority 2013), we do not believe that Internet access was a major problem. Furthermore, as we set out to explore parental attitudes and practices related to digital technology use, we needed a sample that had access to the Internet.

A second possible disadvantage of an online study is potential unreliability of respondents because, unlike a face-to-face interview or a phone interview, we cannot be sure of the respondents' identity (Mukherji and Albon 2010). In addition, as we were able to study only the self-proclaimed views and practices of parents about their child's smart device usage, it is possible that respondents' self-presentations were inaccurate or were socially desirable responses (Paulhus and Vazire 2007).

Our online survey consisted of five parts. Following the questions from the 'Technobabies' study (O'Connor 2014), our first set of questions in the survey was related to young children's touch screen use. A total of 10 questions used 6-point Likert scales to ascertain what touch screen devices are available in homes (e.g. a smart phone, a tablet, an e-reader, a touchable mp3 player or some other), how often they are used by infants (1 – several times a day to 6 – never) and what kind of applications children use most often. Open-ended questions allowed respondents to add explanations.

The second part of the survey, relying on the study 'Zero to eight' (Rideout 2013), included 14 multiple-choice and open-ended questions about the parents' awareness, where and how often their children used touch screen devices, what restrictions they apply and what kind of content children are accessing. Questions focused on whether and under what conditions parents implement time and content restrictions, and whether the parents have received support and guidance for child touch screen use.

In the third part of the survey, eight questions (four multiple-choice and four open-ended) were used to determine the parents' attitudes concerning how touch screen use can affect child development. This part of the survey, however, is not part of the present paper.

The fourth part of the survey focused on parental mediation strategies and included questions about active and restrictive mediation and co-using. The respondents were asked to answer each question on a four-point scale, ranging from 1 – *always* to 4 – *never*. The active mediation scale consisted of four questions to measure parents' tendency to talk about media content while the child is engaging with the medium; the restrictive mediation scale consisted of seven questions to measure parents' tendency to set rules that restrict the use of the medium (restrictions on location, content and time spent); and the co-using scale consisted of three questions to measure parents' tendency to remain present while the child is engaged with the medium and share the experience without commenting on the content or its effects (Livingstone and Helsper 2008; Nikken and Jansz 2014, 2006).

We first tested the survey questions during a pilot study ($N = 7$) which helped us work out some procedural mistakes and eliminate misunderstandings in the wording of some of the questions. The pilot study was carried out in the course of one week and the participants were selected on a convenience sample basis.

Respondents

Our final sample consisted of 400 parents of 0–3-year olds, who expressed their attitudes regarding young children's usage of smart devices and their own mediation practices. We later divided the sample into two subsamples: parents who 'allow' their children to use smart devices – 49.5% from the initial sample – and parents who 'do not allow' their 0–3-year olds to use smart devices – 50.5% from the initial sample. In the context of this paper, we only study the responses of parents who allow their infants and toddlers to use smart technologies ($N = 198$).

The majority of respondents (88.9%) to our survey were mothers or female guardians of children and only 11.1% were fathers or male guardians of children. The greater number of responses from mothers is explained by the fact that, in Estonia, fathers tend to take parental leave less often in comparison to mothers and thus tend to spend less time with very young children (Biin et al. 2013). Furthermore, the domination of mothers as respondents to our survey can also be explained by the fact that, similar to other post-socialist countries, Estonian fathers are quite inactive (18%) among the parents most involved in children's Internet use (Talves and Kalmus 2015).

We obtained data about 198 children, of whom 53% were girls and 47% boys. Most of the data (29.8%) were collected on children aged 31–36 months.

The average age of parents responding to our survey was 32 years (respondents' age 20 to 50). The majority (63.6%) lived in the three largest counties of Estonia (Harju, Pärnu and Tartu), all of which also have the greatest number of preschools. The majority of respondents have higher education (68%), which refers to the fact that surveyed parents are mostly highly educated, live in urban areas and are rather young, with 68.5% of them under age 35. Our findings also revealed that parents' sex, age and educational level had no effect on parental mediation strategies, or time and content limits set for children's smart device usage.

Data analysis

Data were analysed with SPSS 22.0 using frequencies and t-tests for comparison of mean differences. Summary characteristics were created on the basis of individual questions' arithmetic mean. A total of three summary characteristics were formed: 'parent's activity with device (frequency)', 'child's access to device' (frequency) and 'child's activity with device'. The summary characteristics were formed by compounding questions in the first part of the questionnaire (six-point Likert scale) and dividing the sum by five.

Based on parents' answers to an open-ended question, we used Goodwin and Highfields' (2013) classification of apps into three categories of pedagogical design with an aim to study what type of apps young children used. Following the specified age of the target users provided in the app description, we identified all named apps ($N = 26$) also by age.

Results

Smart device usage among 0–3-year olds

The findings of our study suggest that almost all our respondents (98%) have a smartphone and the majority (65.7%) also own a tablet, both of which are used either once a day (40.9%) or several times a day (19.2%), mainly for reading the news and e-books (40.9%). Smart devices were also often used weekly for work-related reasons (54%), but also for entertainment and fun, e.g. for watching movies or TV programmes (20.7%) or for playing games (19.7%).

The correlation analysis results indicate that there is a positive link between parent and child activity with the smart device ($r = 0.29$, $p < 0.05$). In other words, the more frequently a parent uses a smart device, the more frequently it is also used by the child.

The most commonly used smart devices among infants and toddlers are smartphones and tablets, both of which are used every day by 39.4 and 25.2% of the 0–3-year olds, respectively. However, children very rarely (30.8%) or never (46.5%) use more than one type of

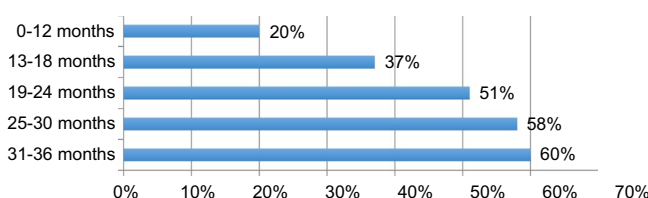


Figure 1. The age distribution of children (children who are allowed to use touch screens).

media at a time (e.g. play a handheld game while watching TV). Most often, young children use smart devices at home (96.5%) or in a car (28.8%).

The frequency of touch screen use among children increases with age (see Figure 1). The correlation analysis of touch screen guidance refers to the same tendency where the link between children's age and touch screen mediation is statistically significant ($r = 0.28$, $p < 0.05$), which shows that using parental mediation increases with children's age.

Many of the parents in our sample justified their young children's touch screen usage by emphasising the advantages and positive impact these technologies provide. First of all, the majority believed that children not only learn new skills (67.7%) but also acquire new knowledge (53%) while using touch screens. Secondly, many parents (55.1%) stressed the fun aspect of touch screens as they provide infants and toddlers with entertainment. Both of these justifications can be considered child-centred as parents had their child's best interests and development at heart. However, one parent-centred reason also dominated in these justifications: 67.2% of parents in our sample reported that they allow their child to use smart devices because these technologies helped occupy children while parents need to do something else, e.g. engage in household duties. Although, only 21.2% of the respondents claimed that they allow children to use touch screens because these devices also stimulate parent-child time together, the findings suggest that touch screen usage can be initiated by both sides, i.e. smart devices are used either upon the request of the child (44.4%) or when suggested by the parent (47%).

Digital play activities of infants and toddlers

The findings suggest that when using smart devices, infants and toddlers mainly (31.8%) watch videos, cartoons or TV programmes from YouTube, 'Masha and the Bear' being named as the main favourite of the children in the 0–3 age group. Parents' answers to the open-ended questions, however, revealed that with the help of parents, young children were also using smart devices to look at photos or communicate via Skype or Facetime.

More than half of the respondents (56%) had installed 5–9 applications in their smartphones, or tablet (28.8%), almost 40% from these applications were claimed to be installed with their young children in mind. The main reason (31.3%) for installing these applications according to the parents was the proclaimed educational benefits of these apps. Nevertheless, only 20% of the parents in our survey were able to name specific applications ($N = 26$) their toddlers actually used.

For instance, the parents in our sample named 'Talking Tom', which aims to shape empathy and compassion among young children, as one of the most popular applications among infants and toddlers. Yet, even in the case of 'Talking Tom', active parental mediation is advised

as this application includes actions which can incite violence and may shape biased values (you can hurt the cat by pushing or striking his stomach). Several parents in our sample also mentioned the general apps of Toca Boca which are also included in the POSCON (Positive Online Content and Services for Children in Europe) repository. The popularity of Toca Boca is probably explained by the fact that the apps by this provider aim to stimulate young children's imagination and support their creativity in a non-competitive digital environment, coupled with a child-friendly usability. The analysis of the applications parents named as the apps used by their 0–3-year olds, however, suggests that the majority are not age-appropriate. Although many of the apps are not age specified by designers, only a few (Animal Numbers for Kids, Duckie Deck) were designed for toddlers, whereas the majority were designed for children who are over four years of age. Furthermore, our analysis of apps according to the pedagogic design used (see Table 1) reveals that the greatest number of applications can be categorised as manipulable (14) and instructional (11). The least

Table 1. Classification of apps following Goodwin and Highfields' (2013) classification.

Nr	Name of the app	Pedagogical design classification			
		Imposed representations; high cognitive offload	Imposed representations which can be manipulated; medium cognitive offload	Student-generated representations; low cognitive offload	Specified age of the target user from the App description
		Instructive	Manipulable	Constructive	Age
1	ABC Turtle	*			4+, Made for Ages 5 and Under
2	Animal Numbers for Kids	*			Appropriate to toddlers 1–3
3	Animal Sounds for toddlers and Kids	*			4+, Made for Ages 5 and Under
4	Animal Memory	*			4+
5	Baby Piano	*			4+
6	Big Forest Puzzle	*			4+
7	Turtle Math	*			Made for Ages 5 and Under
8	Sound Touch Lite	*			4+
9	Busy Shapes	*			Kids 5 and under
10	Öpi värve	*			4+
11	Toddler Coloring Book	*			For toddler
12	Angry Birds		*		4+
13	Toca Boca general apps		*		4+, Made for Ages 5 and Under
14	Duckie Deck		*		2–5 years for toddlers
15	My Zoo		*		4+
16	Pou		*		4+
17	Zoo Sounds		*		4+
18	My Baby		*		4+
19	Subway Surf		*		9+
20	Talking Tom		*		4+
21	Talking Bird		*		4+
22	Tony the Truck		*		1 between 4 years
23	Pettson's Inventions 2		*		4+
24	Lego Duplo		*		4+, Made for Ages 5 and Under
25	Minions		*		4+
26	Kids Doodle			*	4+

*apps placed in the category.

represented were constructive apps, from which only 'KidsDoodle' could be named as one example where users can create content and digital artefacts.

Parental mediation of young children's digital play

The majority of the parents in our sample combine different elements from various mediation strategies for guiding their infants and toddlers' smart device usage.

One of the most often used strategies among our respondents was supervision, with 58.1% of the parents always staying close during the child's digital play on a touch screen, and 52% always monitoring their child's gaming behaviour.

Another strategy that the majority of parents used was restrictive mediation. For instance, 56.6% of the respondents claimed to have implemented both time and content restrictions during child's digital play; and a smaller group restrict either the time (22.5%) or the content (6.6%). Many parents (59.6%) implementing restrictive mediation check the game's/application's appropriateness or read content descriptions (45.5%) to ensure that these are age-appropriate and suitable. The frequency analysis indicates that in comparison to boys, parents tend to limit both the viewing time as well as the allowed content more in case of girls: 79.3% vs. 20.7% and 63.1 and 36%, respectively.

Categorisation of respondents' open answers showed that content restrictions are implemented mainly for violent videos, cartoons and games, e.g. shooting games, which are not considered age-appropriate for very young children. However, parents also restrict children's use of documents, and limit certain activities like sending messages, making phone calls or pressing random buttons. Respondents' open answers about time limits showed that parents implement precise time limits ranging from 10 min to a few hours a day. Based on these open-ended responses, we can assume that in many instances, technical mediation is implied to set limits to both time and content 0–3-year olds can use. For instance, parents claimed to use different parental controls, e.g. requiring a password, restricting Internet access and disabling built-in apps, on the smart devices.

Nevertheless, some parents (14.1%) did not implement any restrictions on infants' and toddlers' digital play. Furthermore, 28.3% of the parents in our sample never checked a game's appropriateness and 21.2% never read content descriptions. Based on the open-ended answers, infants and toddlers were considered to be smart enough to find enjoyable content themselves.

The findings show that infants' and toddlers' smart device usage is more frequent in those families where parents limit the media content and viewing time, compared to children in families where no restrictions are imposed. The result of t-test showed that there was a significant difference between parents who limit the media content ($M = 4.82$; $SD = 0.71$) with parents who do not ($M = 4.58$; $SD = 0.82$). Children use smart devices more frequently in those families where parents limit media content, $t(196) = 2.1$; $p < 0.05$. T-test showed similar significant differences between parents who limit viewing time ($M = 4.78$; $SD = 0.69$) with parents who do not ($M = 4.52$; $SD = 0.95$), indicating that in the families where parents set viewing limits, children use smart devices more frequently, $t(196) = 2.1$; $p < 0.05$. Smaller mean value indicates a higher frequency of smart device.

Parents also used active mediation: 44.4% of parents always ask questions and talk to a child during the child's digital play, whereas 44.9% of the respondents often point child's attention to what the child does on the screen. Giving feedback or specific instructions to a

child during digital play, however, is less common: 36.4 and 32.3%, respectively. Co-using the device with a child was also practised, with 39.9% of respondents claiming that a child often, though not always, sits on their lap during their digital play.

Discussion

The findings of our study support Bandura's (1977) social cognitive model and Bronfenbrenner's (1979) bio-ecological framework in suggesting that infants' and toddlers' touch screen usage is influenced by the practices of important others, especially parents. Hence, similar to the findings of Lauricella, Wartella, and Rideout (2015), our results also indicate that parents' smart device usage is associated with child time with touch screens: the more frequently parents use these devices, the more frequently they are also used by the child. The majority of respondents use smart phones and tablets daily and their active engagement with these technologies at home is reflected in the infants' and toddlers' practices: 39.4% of 0–3-year olds use smart phones and 25.2% tablets every day. Considering the above, raising the awareness of parents on the topic is crucial.

Our findings also showed that the age of the child influences children's smart device use: whereas only 20% of children under one year of age had been in touch with smart technologies, this percentage rose to 60 for children aged 31–36 months. Furthermore, parents' attitudes about touch screens also have an impact on infants' and toddlers' smart device usage. The majority of respondents believed that by making smart devices available to infants and toddlers, they enable their children to learn new skills (67.7%) and acquire new knowledge (53%), and also provide the child with opportunities for entertainment (55.1%). Hence, similar to the findings of several previous studies (Baek, Lee, and Kim 2013; Broadhead, Howard, and Wood 2010; Marsh, Plowman et al. 2015; Yelland 2007), our respondents emphasised the positive impact and educational power smart devices may have on young children, but stressed also the importance of the fun aspect these technologies provide (Else 2009; Michael Cohen Group LLC 2011).

The main activities infants and toddlers engage in on smart devices are associated with the fun aspect touch screens provide since touch screens are mainly used by infants and toddlers to watch cartoons and videos. Using smart devices for educational content, however, has been found to be relatively low (Baek, Lee, and Kim 2013). Our findings are no exception here. Although a number of parents had installed 'educational' applications on their smart phones and tablets, our analysis of the apps named by parents revealed not only that their educational potential was questionable (e.g. Talking Tom and Toca Boca general apps), but that in the majority of cases, these apps were actually designed for children over four years of age. In other words, their content may not be age-appropriate for young children and does not carry the functionality and full potential needed to be effective for this age group (Aziz 2013). According to Goodwin's and Highfield's (2013, 380–381) categories of pedagogical design, the apps named by the parents can be classified into three groups: instructive, manipulable and constructive. The unpopularity of constructive apps was expected and could be explained by the relative lack of skills and knowledge of infants and toddlers. The greatest number of apps installed by our respondents could be classified as instructional apps where children are able to master new knowledge through 'drill-and-practice'. Such a practice however cannot be considered educational and thus may indicate parents' lack of

knowledge on what could be considered educational and age-appropriate for their 0–3-year olds.

At the same time, our findings suggest that many parents of 0–3-year olds take their role as mediators of child's digital play seriously as they tend to combine different mediation strategies. Although many respondents were engaged in different mediation activities during their child's digital play, the analysis of open-ended answers also revealed an alarming trend – there were parents in our sample who believed that 0–3-year olds are themselves smart enough to find enjoyable content from the apps installed on the smart device.

All of the above indicates that there are parents in Estonia who are themselves in need of guidance and information so as to be able to fulfil their roles as mediators of young children's digital play properly

Furthermore, similar to previous studies, our results also reveal that parental mediation is dependent on the age and gender of the child. For instance, our findings coincide with Nikken and Schols (2015) and suggest that parental mediation strategies are rather used by toddlers (2–3-year olds) than in case of infants (0–1-year olds). However, in contrast to the findings of Nikken and Jansz (2014), who have found that parents tend to set significantly more general rules for boys than for girls, our findings suggest that Estonian parents set time and content restrictions more often for girls than for boys. As findings about gendered parental mediation practices of older children's Internet use in Estonia reflect just the opposite stance (Talves and Kalmus 2015), additional studies are needed to gain more input on the topic. At the same time, considering that Estonia is known for low gender equality and high Internet use, it is evident that parental mediation strategies of Estonian parents do not depend purely on a child's gender but on a more complex interrelation of gender and children's and parent's socio-demographic characteristics and parent–child interactions (*ibid*).

Although we believe our findings provide interesting and novel input on the topic of smart device usage among 0–3-year olds, we acknowledge that the study has some limitations. First of all, one of the weaknesses of the study is its non-representative sample which does not allow us to make any generalisations about the findings. Secondly, our sample was rather small and homogenous and thus the findings may not correspond with the attitudes and practices of other parents of 0–3-year olds. Additionally, it is also possible that other variables that were not included in our study may influence touch screen use among infants and toddlers. Furthermore, we were only able to analyse parents' self-proclaimed views and practices which may not reflect their real-life practices.

Due to the fact that smart device usage among infants and toddlers is a relatively new phenomenon, additional studies on the topic are needed. In addition to using quantitative methods, future studies should also make more active use of qualitative methodology. For instance, in addition to conducting interviews with parents, it would also be important to carry out observations in order to analyse how the 0–3-year olds actually engage in digital play on smart devices.

Disclosure statement

No potential conflict of interest was reported by the authors.

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