

Young children, digital media and smart toys: How perceptions shape adoption and domestication

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Abstract

Contemporary homes are filled with digital technologies, and children are exposed to them almost since birth, initiating their first digital experiences at very early ages (Chaudron *et al.*, 2015, *Young children (0–8)*). This trend is expected to become stronger, as our future has been envisioned around the concept of the IoT (Internet of Things), and the first smart toys are arriving at the homes of digitally savvy families. This study focuses on the digital practices of young children, looking particularly at smart toys, aiming to: a) explore how smart toys are being adopted by families, considering the perceptions of children and parents about drivers and barriers to adoption; and b) understand the domestication of smart toys. Our research is exploratory and builds on the theoretical framework, methodological protocols and ethical guidelines of the international projects “Young Children (0–8) and Digital Technologies” (Chaudron *et al.*, 2015, Chaudron *et al.*, *Young children (0–8)*; Dias and Brito, 2016, 2017, *Crianças (0 a 8 anos)*) and “Media and Social Discourses around Young Children and IoT Toys” (Mascheroni & Holloway, 2017). Our methodology is qualitative, based on visits to families including interviews with children and parents and participant observation. We selected a purposive sample of 21 medium- or high-income and digitally savvy families in Portugal. Concerning drivers and barriers for adoption, most children identify several smart toys and express interest in having them. Parents are motivated by the amount of satisfaction that the toy will afford the children and the added-value in terms of learning or developing skills. However, most parents prefer mechanical toys, sports or outdoors activities and the high price is an obstacle. Concerning domestication, smart toys are still scarce in homes and perceived as novelty, thus being in a very early stage of domestication.

Introduction

We live at a time of technological transformation, as the Internet is transitioning to a more pervasive, self-regulated and autonomous stage. One of the differentiating traits of the Internet of Things (IoT) is the embedding of technological features such as WiFi connections and sensors in a wide array of objects, thus supporting machine-to-machine communication, constant data collection and reaction to such data, auto-regulation and self-learning.

Practitioner Notes

What is already known about this topic

- Young children are exposed and using digital media from an early age.
- Toys are evolving into smart toys, due to the technological transition to the IoT.
- Smart toys are arriving at the homes of digitally-savvy families.

What this paper adds

- Children perceive smart toys as “fun” and enjoy human-like interaction.
- Parents have reservations regarding smart toys.
- The acquisition of smart toys by parents is related to their perceptions.

Implications for practice and/or policy

- Smart toys are in an early stage of domestication in Portugal.
- Parents play a key role in determining access to technology and in shaping the digital practices of children.
- Parents believe that children already use too much technology and that smart toys are too expensive.

This overarching trend reflects in all the spheres of human activity, being the Internet of Toys (IoToys) one example. Several toys with internet connection and/or automated human-like interaction have been launched in the market, targeting two particular generations. Contemporary children have been described as the touch-screen generation (Rosin, 2013) or as “digitods” (Holloway *et al.*, 2015), the first generation to be born in mediatized homes (Hepp & Krotz, 2014), to be exposed to digital media since birth and to start using them at a very young age (Marsh, 2005; Plowman & McPake, 2013). Their parents are the original digital natives (Prensky, 2001) or net generation (Tapscott, 1998), the first to come into contact with digital technologies during adolescence and often pioneers and trendsetters in their digital practices (Bennett, Maton, & Kervin, 2008). Recent research about the use of digital technologies by young children has revealed that parents are navigating uncharted territory. Being frequent users of digital media themselves, they are the first generation of parents confronted with doubts about risks and opportunities of the internet for children (Chaudron *et al.*, 2015), to feel nostalgic about their own childhood and non-digital play (Dias & Brito, 2017), to question the example they set for their children (Ponte *et al.*, 2017).

The adoption and domestication of smart toys adds to this debate, as they bring about enhanced opportunities for play and learning, but also risks. In our research, we performed a qualitative exploratory study aiming to gain deeper understanding of digital practices in homes with young children, and looking particularly into how smart toys are being perceived, adopted and domesticated (Silverstone & Haddon, 1996; Silverstone & Hirsch, 1994) by Portuguese families. We visited a purposive sample of 21 families, conducting interviews and participant observation, aiming to get a wide variety of narratives and experiences from the families, thus gaining deeper insight into the domestication of smart toys.

Definition of smart toys

The concepts of IoToys and smart toys are close, but not synonyms. The term IoToys emphasizes the internet connection, through WiFi or Bluetooth, as one of the main traits of such toys (Wang, Kuo, King, & Chang, 2010) and also the embedding of sensors that allow interaction with children or other toys (Holloway & Green, 2016). Interaction is the central feature of the smart toys conceptualization, highlighting the affordance of human-like interaction with children. Toys which react to stimuli from children are not novel (ie, pushing a button thus triggering a sound),

but mechanical responses are always the same. Smart toys are the ones that give personalized responses. Even so, these can vary within an array of pre-programmed possibilities, as was the case of non-connected smart toys such as the Tamagochi (launched in 1996) and the first Furby (launched in 1997), or they can result from algorithmic registration and processing of play behavior and speech recognition and activation, thus reproducing human-like interaction based in early versions of Artificial Intelligence (AI) (FOSI & FPF, 2016).

Wider understandings of these terms include versions of digital devices such as tablets, smartphones, smartwatches, computers, cameras, drones and others specifically aimed for children, which are used mainly as toys and sources of entertainment (Dias & Brito, 2016), and also Toys-to-Life. As a summary, Mascheroni and Holloway (2017) present the IoToys as a universe of software-based toys where three circles represent features that partially overlap: (a) connectivity; (b) human-line interaction; and (c) programmability by the user.

Adoption and domestication of smart toys, what is already known?

Researching about smart toys is relevant because they are, currently, an emergent phenomenon reaching only a niche of higher income and tech-savvy families, but they are expected to become widespread in a near future, as we transition into IoT (Chaudron *et al.*, 2017). Although it is relatively scarce, the literature on smart toys highlights the new risks that these may pose to young children, and the need to understand in more depth how they are being adopted and domesticated by families (Mascheroni & Holloway, 2017).

The domestication theory is a relevant framework for understanding how families are adopting smart toys and integrating them in their daily practices. Initially proposed in the 90s (Silverstone & Haddon, 1996; Silverstone & Hirsch, 1994), it has developed and been applied to several digital media (eg, Haddon, 2006; Katz & Aakhus, 2002; Reuver, Nikou, & Bouwman, 2016). The concept of domestication conceives the adoption and appropriation of technology as an interactive and dynamic process, which includes the materiality of technology itself but also the social and cultural dimensions of individuals and their relationships in a household, and the symbolic meanings they afford to technologies and use practices.

These symbolic meanings are ascribed even before the smart toys enter the homes, and are shaped by mixed and polarized media discourses, which bear some weight in shaping the parents' perceptions, and subsequently the adoption of smart toys (Mascheroni & Holloway, 2017). Journalistic pieces from news media outlets are mostly negative in tone and highlight risks associated with smart toys, such as privacy invasion, data collection, commercial exploitation and health dangers, feeding a debate about the datafication of childhood and the need for ethical guidelines for the IoToys industry (Chaudron *et al.*, 2017; Holloway & Green, 2016). On "user-generated" media pieces, such as blogs and social media (including a wide variety of productions, as opinion articles from experts posted on blogs, parental tips and reviews on blogs and social media, and even reviews made by children on YouTube videos), the tone is usually positive, and opportunities for learning and entertaining are highlighted. This is corroborated by the advertising discourse, in which companies target mostly children with the association between smart toys and "fun," and also appeal to parents by publicizing the educational features of smart toys. This contradicts media discourses.

Therefore, the adoption of smart toys is determined by two contradictory perspectives on "good parenting" (O'Connor & Fotakopoulou, 2016). On the one hand, the IoToys are appealing for both children and parents because of their edutainment potential. But the potential of enhancing learning opportunities in a fun way for children raises other issues, such as the blurring of boundaries between formal and informal learning (Montgomery, 2015) and the impact of an increased individualization and personalization of learning (Gordon, 2014).

On the other hand, smart toys also have a “dark side” related to the risks of being connected. Privacy risks stand out, not only regarding strangers (eg, the potential hacking of embedded cameras and data collection) but also the parents, who may surveille children using smart toys (although this is often perceived as positive by parents) (Holloway & Green, 2016; van Dijck, 2014).

About the domestication of smart toys, Marsh (2017) changes in play practices have been observed, subsequently reconceptualizing them as “connected play,” observing that instead of distinguishing between online and offline, as adults often do, young children engage in ongoing fluxes of transmedia and phygital play, thus combining digital devices and other objects (ie, using a tablet to play a song while playing with physical dolls). However, Chaudron *et al.* (2017) stress that the automation and robotization of smart toys may challenge the agency of children, who may become more reactive in play and also affect their social skills.

With our work, we intend to explore in more detail how perceptions of both parents and children are acting as drivers and barriers to the adoption of smart toys, and how they are being domesticated.

Are perceptions shaping the domestication of smart toys?

The domestication process has four general stages: (1) appropriation, when a technology is first brought into a home as a novelty; (2) objectification, when the technology is integrated into the space and aesthetics of the home and also in particular use practices and routines (thus being defined by its functionality but also gaining meaning); (3) incorporation, when users and the domestic context change due to the inclusion of the new technology, and this technology starts blurring into the background as it becomes familiar and taken for granted; and (4) conversion, when particular use practices that emerge become market trends, thus influencing the subsequent technological development and innovation (Berker, Hartmann, Punie, & Ward, 2006). Within this framework, our article sets out to explore to which extent the perceptions of parents towards IoToys and digital media in general play a role in the different stages of domestication of smart toys.

Previous research on parental mediation of digital technologies has revealed that parents with positive perceptions and attitudes toward digital media are more likely to adopt participating and instructional parental mediation styles, acting as scaffolders for the development of digital (and other) skills in children, while parents with negative perceptions and views about digital media are more likely to monitor, restrict and limit the digital practices of children (Nikken & Jansz, 2014; Valcke, Bonte, Wener, & Rots, 2010). Also, research shows that perceptions and attitudes are intricate in experiences, as parents who have higher education, higher income, and who are intense and skilled users of digital media themselves are more likely to have positive views on children using digital technologies (Brito *et al.*, 2017; Dias *et al.*, 2016). In our research, we intend to explore to which extent the perceptions and attitudes of parents act as drivers or barriers to the adoption of smart toys.

Previous findings about the domestication of mobile phones and smartphones state that these devices are affective technologies due to their personal nature and also because they mediate affective relationships (Vincent, 2006). We also aim to probe the perceptions of children, exploring if the potential of smart toys, with their human-like interaction, to become objects of affective connection and to foster learning (Chen, Liao, Chien, & Chan, 2011) are drivers for adoption, and are reflected in the domestication process.

Methods

In our empirical work, we aim to answer the following question: how are smart toys being adopted (what are the drivers and barriers to adoption) and domesticated by families with young children, in Portugal?

Following the work of Chaudron *et al.* (2015), our methodological protocol is based on visits to families that include interviews and participant observation. The interviews were semi-structured, of exploratory nature (Denscombe, 2007).

Sampling and sample

For our study, we adopted a purposive sample, which aims to be representative of the adoption and domestication of smart toys, instead of the population it refers to (Charmaz, 2004). This sampling technique was used in the “Young Children (0-8) and Digital Technologies” project (Chaudron *et al.*, 2015; Dias & Brito, 2016, 2017) and we adapted the main criteria used for selecting families, targeting:

- Families with at least one child under 8 years old (later, we decided focusing on children with 6, 7 and 8 years old, as they were more likely to own smart toys);
- Child gender parity;
- Diversity of family composition (including divorced parents, older and younger siblings, no siblings);
- Geographical diversity;
- Digitally savvy families, that is, with access to several digital devices in the home and who use at least one digital device at least once a day (both parents and children), as these were more likely to own smart toys;
- Medium- and high-income families (We used the same categories that the Portuguese National Institute of Statistics uses in our *Census*) after not finding any smart toys in a few homes of families with low income (The literature on parental mediation of digital media corroborates that the digital practices of parents, and also their levels of education and income are important in shaping their perceptions towards digital media, and consequently their parental mediation style [e.g. Valcke *et al.*, 2010; Nikken & Jansz, 2014]).

The families were recruited within the contact networks of the researchers and with the help of institutions such as schools, kindergartens and Parishes when necessary. The families were first approached by email or phone. The goals of the study were explained, as well as what the participation entailed and that anonymity and confidentiality of the data were ensured. We proceeded to a follow-up contact and scheduled visits with those willing to participate. At the beginning of the visit, we walked all members of the family through an informed consent form and asked them to sign it. We provided a simplified version of the informed consent form to children, which helped make them feel important and valued, as well as predisposed to engage in our research. We visited 21 families between November 2016 and March 2017. On Table 1 we present a detailed description of our sample.

Protocol for the visits to families

Our visits to the homes were structured in four moments:

1. *Introduction and presentation of the study* (5–10 min): This first stage usually took place in the living room, where the families gathered to welcome us. We presented the main goals of the study, our protocol and procedures and the informed consent forms to the parents and children.
2. *Ice-breaker activity* (25–30 min): At this point, one of the researchers stayed with the parents and the other followed the children to another room. We used different activities to get to know the parents and the children and make them feel comfortable to engage with us and at the same time collect some data about their digital practices, so that the interviews wouldn't be too long. With the children, we used two sets of images,

Table 1: Socio-demographic information about the families which participated in the study

Families	Members	Income	Age	Smart toys owned
F1	Joana	High	40	Toys-to-Life Drone
	António		40	
	Edgar		8	
	Maria		6	
F2	Telmo	Medium	43	
	Francisca		40	
	José		8	
F3	Vasco	Low	41	
	Cristina		40	
	Madalena		6	
F4	Luís	High	39	Smart watch Drone Emilio (interactive stuffed animal)
	Mariana		38	
	Armanda		8	
F5	Isabel	High	41	
	Adriana		38	
	Mónica		8	
	Bárbara		6	
	Marco		3	
F6	Mateus	Low	38	Toys-to-Life
	Sónia		36	
	Afonso		8	
	Xavier		3	
F7	Daniel	Medium	40	
	Rosa		39	
	Joaquim		8	
	Bernardo		5	
F8	Vasco	High	45	
	Sandra		42	
	Pedro		11	
	Manuel		5	
F9	Bruno	Medium	45	
	Nádia		43	
	Rodrigo		10	
	Teresa		6	
F10	Oscar	Medium	40	Programmable car
	Patrícia		39	
	André		8	
	Diogo		5	
F11	Gonçalo	High	43	
	Carmo		42	
	Tiago		8	
F12	Soraia	Medium	37	
	César		7	
	Paulo		4	
F13	Guilherme	Low	35	
	Lara		33	
F14	Alice	Low	6	
	Emília		36	
F15	Fernando	Medium	8	
	David		36	
F16	Matilde	Medium	40	
	Fátima		8	
	Ricardo		40	
	Inês		40	
	Marcelo		8	

(Continued)

Table 1: (Continued)

<i>Families</i>	<i>Members</i>	<i>Income</i>	<i>Age</i>	<i>Smart toys owned</i>
F17	Nuno	Low	4	
	Joaquim		39	
	Sofia		29	
	Margarida		10	
	Adriano		8	
	Sebastião		7	
	Benjamim		3	
	Jorge		1	
	Bianca		1	
F18	Bárbara	Low	42	
	Renato		8	
F19	Inês	Medium	43	
	Ricardo		39	
	Vicente		7	
	Tomás		2	
F20	Camila	Medium	36	
	Mafalda		8	
F21	José	High	60	
	Luciana		43	
	Alda		8	

Notes. The children that were the focus of our research are signaled in bold; all the information included on this table was given by the families.

app icons and emojis and we ask them to pair the apps that they had already used with how they made them feel (Figure 1). With the parents, we gave them a set of keywords (The keywords were the following: boring, anti-social, risky, family fun, with mom, with dad, curious, challenge, difficult, discussion, distraction, fun, educational, explore together, easy, informative, interesting, annoying, necessary, need skills, social, solitude, tension, useful and addictive) and asked them to choose the ones that they associated with digital technologies, along with a brief explanation.

3. *Semi-structured interviews* (25–45 min): We interviewed the parents and the children separately. Our goal was to validate the data collected using the triangulation of methods and preventing parents from influencing the spontaneous participation of children. In order to explore which smart toys the children owned, knew and would like to have, we provided a cardboard with images of the most popular smart toys on the Portuguese market (We conducted our research during the Christmas period, so there was more advertising about smart toys than usual. We included in our games the smart toys that were advertised on TV channels for children and on catalogues of department stores, between November 15th 2016 and January 6th 2017, in Portugal.) and asked the children to mark them with colored post-its according to these categories—green for “I own one”; pink for “I know it and I would like to have one”; yellow for “I know it but I wouldn’t like to have one”; blue for “I don’t know it” (Figure 2). We asked the parents about their view on smart toys, exploring their perceptions of opportunities and risks; about their reasons for buying them for their children or not; and about their children’s play practices and if they were involved.
4. *Finalization* (10–15 min): At the end, we thanked the families for their availability and said our goodbyes.

Registering and analysis of data

The interviews were later coded according to thematic analysis (The analysis was performed using QSR NVivo 11 Plus software for Windows), a qualitative data categorization strategy, using



Figure 1: Set of images provided to the children, for them to group the apps according to the emotions they caused [Colour figure can be viewed at wileyonlinelibrary.com]

categories that emerged from a preliminary reading of the interviews and also based on the theoretical framework presented and our research questions. We present the categories on Table 2. Thus, we started with a broad reading of the data in order to discover patterns and the development of themes (Boyatzis, 1998). We used pseudonyms to identify the participants and ensure their anonymity.

Results

Digital media in the homes, digital practices and parental mediation

In order to set a context to the domestication of smart toys, we briefly describe in this section the overall presence of digital media and digital practices that we found in the homes we visited.

We have found diverse digital media in all of the homes: smartphones, laptops, consoles, tablets. More than half of the children owned personal devices, mostly tablets.

Concerning digital practices, our observations are consistent with previous studies (eg, Chaudron *et al.*, 2015; Dias & Brito, 2016, 2017; Ponte *et al.*, 2017): the device that children use the most is the tablet, mainly for playing games and watching videos on YouTube. Children explore portable devices mostly alone, while parents are occupied with work or house chores.

Despite the fact that our sample had features that favored positive perceptions and attitudes towards digital media—eg, tech-savvy, high-income parents (Nikken & Jansz, 2014; Valcke *et al.*, 2010)—parental mediation was based on restrictive rules and supervising instead of co-using or scaffolding. The most common rule is limiting time of use. Although this rule seems not to consider content, several parents reported that if children are using the tablet or laptop for educational purposes, they extend the limits.

Camila (F20m36): I have always put very clear rules. She [Mafalda, F20g8] can use for the time allowed and weekdays is less time, half an hour, no more. Over the weekend, a little more, but I never give her much time. If it's for school work I'll let her stay longer.

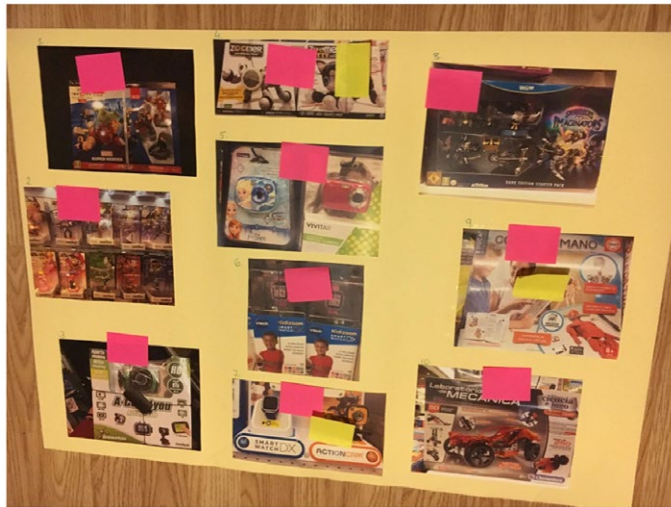


Figure 2: Cardboard with pictures of smart toys [Colour figure can be viewed at wileyonlinelibrary.com]

Table 2: Categories for the thematic analysis

Categories	Subcategories	Values
Socio-demographic	Gender of child	Boy, girl
	Age of child	0–2; 3–5; 6–10
	Family composition	Both/single parent, single child/siblings
Digital practices	Income	High, medium, low
	Usage of digital media	High, medium, low
	Devices in the home	Smartphone, tablet, computer, console, other
	Digital practices of children	Entertainment, educational
	Digital practices of parents	Work, leisure
	Perceptions of children	Positive, negative, neutral
	Perceptions of parents	Positive, negative, neutral
Smart toys	Parental mediation	Instructional, restrictive
	Smart toys in the home	Own, would like to have, know
	Perceptions of children	Positive, negative, neutral
	Perceptions of parents	Positive, negative, neutral
	Play practices	Description, observation
	Parental mediation	Instructional, restrictive

Notes. Categories and subcategories were based on research questions and literature review; values emerged from a preliminary reading of the data.

Also, all members of the family assign meaning to the digital devices: for instance, Mafalda (F20g8) considers the tablet as her “friend,” while Inês (F16m40) describes it as a “babysitter.” This is an indicative of advanced stages of domestication, such as objectification or incorporation.

Parents' perceptions about digital media and smart toys

As previous research also shows, parents revealed mixed perceptions about digital technologies (eg, Chaudron *et al.*, 2015; Mascheroni & Holloway, 2017). Regarding positive views, they highlight that digital devices are educationally beneficial. They are useful for researching for school and some families get together to carry out school projects, exploring educational content and technologies together. Apps are an asset to learning English and programming.

In addition, parents recognize that we live in a digital society and that children are naturally immersed in technology.

Sandra (F8m42): (...) We know that in the world, as it is today, we cannot survive without technologies and without these networks, so now we are trying to adapt the best we can, minimize negative aspects and potentiate the positive ones.

Parents report that apps stimulate children cognitively. In games, children have to use several senses and motor coordination. They also stimulate logical and strategic thinking.

Another positive aspect is that digital devices can help parents in entertaining children, especially in restaurants when parents have dinner with friends. Also, they are important for the family to be in contact with distant relatives and also with each other.

For some parents, the use of digital media is an impediment for children to engage in other activities, such as playing outdoors or socializing with family and friends and may also replace physical activity. Most parents believe in a balance of all activities—watching TV, playing digital games (of various types), running outdoors or playing with physical toys—as negative outcomes may result from excesses.

The negative perceptions mainly focus on addiction and anti-socialization, in which children, when playing, alienate themselves from family members, not paying attention to them and these situations are sometimes the subject of family discussions.

Matilde (F15m36): We had a conversation this week and I told her that the cell phone would have to stop because I'm home and sometimes I feel alone.

Inês (F16m40): Once they connect with new technologies, the outside world ends.

Parents also have fears, such as children having access to inappropriate content (eg, violent and explicit language videos on YouTube) and contacts with strangers.

These mixed feelings somewhat reflect on smart toys, as although most parents admit not being informed on the subject, they neither find them appealing nor are inclined to buying them for their children. They have the opinion that children already use technology long enough and do not intend to further stimulate such use.

I: Do you ever think of offering him something like this?

Camila (F20m36): No, let her be happy and ignorant about it.

I: In the near future do you think on investing in this type of toys?

Sónia (F6m36): Only if he asks because we strongly encourage the physical contact, the reality and not so much the virtual world. In fact, this Christmas he asked for a PlayStation 3 but we still gave him the Monopoly because in the previous year he had

asked for the PlayStation vita, then PlayStation 3 and I started to think I should take it easy. I opted for a game where everyone could play, more didactic.

A few parents assume that their children have already asked for smart toys (eg, Zoomer Kitty, Furby, Hatchimals). A barrier mentioned by some parents is the high price of the smart toys. Some elaborate that they need to consider if the child is going to play with the toy for a long time, if the toy is going to bring the child satisfaction and entertainment and also if the toy is educational, or if they are going to spend a lot of money in a toy that the child will be bored with after a short time.

Even before adopting (or not) smart toys, parents are assigning them meaning. For most parents, they are “expensive.” About half the parents acknowledged the educational potential of smart toys as a relevant driver for adoption, admitting being willing to consider buying them. Thus, they are perceiving smart toys as more than a toy whose sole function is play or entertainment, adding an educational purpose.

Parents were not aware of the risks most mentioned in media discourses, such as privacy invasion and commercial exploitation (Mascheroni & Holloway, 2017). They do not associate smart toys with these concrete risks, but consider them less “natural” (Cristina, F3m40) or less “healthy” (Isabel, F5m41) than other forms of play.

Domestication of smart toys

Our exploratory fieldwork revealed that, in Portugal, the smart toys market is still in an early stage. We found some early adopters of smart toys, but they were scarce, even in homes with high penetration of digital devices and in families with high income. However, most children know several smart toys and expressed that they would like to have them or at least try them, relating strategies for convincing the parents: “behaving well” (Fernando, F14b8), “having good grades” (Armanda, F4g8), “nagging them” (Vicente, F17b7). Children ascribe meaning to smart toys, even before adoption, and it is “fun.”

I: Do you know any of these? [showing the toys on the cardboard]

André (F10b8): This connects to the tablet, doesn't it?

G: Yes, do you know it?

André (F10b8): I know it but I have never played with it.

Teresa (F9g6): I know! The tablet car!

I: How does it work?

Teresa (F9g6): The car connects underneath and controls with the tablet.

Kids know smart toys from seeing them in stores, magazines or TV commercials, and their description of the smart toys and arguments for wanting to try them out or own them is consistent with the way they are portrayed in advertising.

[The child recognizes all smart toys presented on the cardboard]

I: Ah! You know them all. And do you have any of these?

Fátima (F15g8): No, no, no, no, no and no.

I: You do not have any. So how do you know these toys?

Fátima (F15g8): They are in stores.

I: No friend of yours has them? You never played with them?

[Shake her head saying no.]

I: Would you like to?

Fatima (F15g8): I would love to have one.

Some children highlighted the human-like interaction afforded by smart toys as one important motivation for adoption.

Alda (F21g8): "My father says I can't have a real kitten, so I asked him for the Zoomer Kitty."

Armanda (F4g8): "I like Emilio because he is like I friend I can play with."

In our sample, only four families owned smart toys: Toys-to-Life that connect to the PlayStation or apps, a drone, a programmable car and the teddy "Emilio," a toy that interacts with children through voice and image recognition. The children in these families were familiar with such toys and able to show us diversified uses, such as interacting with content, producing their own content (photos and videos) and integrating the smart toys in play (eg, playing music on a smart watch as "soundtrack" for playing with dolls). We observed that these toys are integrated in the play practices of the children, although retaining the *status* of "novelty," consistent with the first stage of domestication, appropriation (Berker et al., 2006).

In the case of Toys-to-Life, they are associated to the console, so they fit in the objectification stage: in both homes where we found Toys-to-Life, the consoles have been integrated in the living room, and they were kept in a nearby drawer and basket. Both children were boys, and had rules about when and how long they were allowed to play, for about an hour after finishing their homework, more freely during weekends. Toys-to-Life are part of individual play practices, and do not have much impact on the family dynamics.

Concerning the other toys, the families reported initial instructional parental mediation and co-use, as the toys were new in the home and the children asked the parents for help in learning how to use them. However, as children appropriated them, parents became less involved.

Discussion

Our exploratory study revealed that, although smart toys are present in the market and in media discourses (Mascheroni & Holloway, 2017), they still have not arrived to most of the homes in our sample.

Young children are aware of their existence, eager to try them and own them. They perceive them as appealing, mainly because of the human-like interaction they afford. However, parents do not share this enthusiasm. They mentioned two main barriers to adoption: (a) their perception of the presence of digital media in the lives of children as already excessive, addictive and prejudicial of other aspects such as social skills and physical activity; (b) not finding worth the investment in high-priced toys without being sure that children would play with them for a long time and benefit from developmental and educational stimulation from them.

These perceptions are aligned with overall mixed perceptions of digital media in general explored in the literature (eg, Chaudron *et al.*, 2017; Dias & Brito, 2016, 2017), in which parents identify benefits and opportunities, but also downsides and risks. However, parents are not informed about the risks of smart toys, although they have been discussed in journalistic media discourses (Mascheroni & Holloway, 2017).

Concerning the domestication of smart toys, our research reveals that it is still in a very early phase. In the few homes where we have found smart toys, they are regarded as a novelty, although the children reveal expertise in their use. Their appropriation is mostly individual, engaging only

the children and not revealing much impact in family dynamics. Also, we observed that assigning meaning occurs even before the first stage of domestication, as bears weight on the whole process, beginning with the decision to adopt or not.

As smart toys become more common in the homes, further research is needed to fully understand their domestication and the implications of this process for play practices and family dynamics.

Statements on open data, ethics and conflict of interest

Our project follows all recommended ethical guidelines for qualitative research with children. Our data are not open to public and there are no conflicts of interest. The research protocol was approved by CECC's Ethics Committee.

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