Title
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Permalink
https://escholarship.org/uc/item/64k433qs

Journal
Berkeley Review of Education, 9(2)

Author
Qaiser, Zara

Publication Date
2020

DOI
10.5070/B89242103

Peer reviewed

Early Childhood Education and Care and the Use of Digital Media in Informal Environments

Zara Qaiser

University of Cambridge

Abstract

Families rely on formal and informal settings for the early childhood education and care of their young children, where they are constantly shaped by experiences and relationships with their caregivers. In a world that is increasingly reliant on digital media, parents and other caregivers play an important role in managing their children's use of digital media during the first eight years of children's lives when they spend most of their time at home or in other informal environments outside of school. This article uncovers the recent trends on the use of the most commonly used digital screen media by children from birth to 8 years of age. These trends demonstrate that parents' choices about the media environment they establish for their children depend on their knowledge about how children learn from any kind of digital media and how the use of digital media impacts their children's development. The article reviews existing literature to address concerns about the potential benefits and risks of children's use of digital media in informal environments and provides guidance to parents and other caregivers on becoming media literate.

Keywords: early childhood education and care, informal environments, digital media, parents, caregivers

Correspondence concerning this article should be addressed to Zara Qaiser. Email: zqaiser94@gmail.com

Families rely on a variety of settings for the early childhood education and care (ECEC) of their young children. Among these settings are both formal and informal environments where children learn, grow, and are influenced by experiences and shaped by their relationships with their caregivers, including parents, relatives, babysitters, teachers, or any other adult who plays an important role in their lives (Center on the Developing Child at Harvard University, 2016; Jones et al., 2018a, 2018b). Children's early experiences in these formal and informal environments lay the foundation for all cognitive, socio-emotional, physical, and behavioral development over time (Gottschalk, 2019). As these environments have integrated digital media in their everyday practices, digital media has increasingly influenced children's development (Zaranis, 2013).

Although ECEC programs are adopting and becoming better prepared to integrate digital media into their formal environments (Holloway, Green, & Livingstone, 2013), children's use of digital media in informal environments has received little attention in academia (Holloway et al., 2013). Given the ubiquity of digital media today and the importance of informal environments as pedagogical contexts for how children interact with digital media, it is essential to understand the impact of digital media use on children's development and how caregivers in informal environments—particularly parents—can factor this into their daily lives (Piotrowski, 2017).

According to the National Association for the Education of Young Children (n.d.), the first eight years of children's lives are fundamental to their development. Parents, aware of this developmental process, are pressured into exposing their children to digital media during these years to make them digitally literate. However, it is likely that the exposure and use of digital media will increase over time, and early exposure and overuse of digital media can result in a greater likelihood of overuse later in children's lives (Canadian Paediatric Society, 2017).

The rise in children's use of digital media has led to a growing concern about its impact on their cognitive and social-emotional development, which depends on the media environment that parents create at home. This media environment includes type, length of time, purpose, and how digital media is used (Bavelier, Green, & Dye, 2010; Wartella, Rideout, Lauricella, & Connell, 2014). Given that the home media environment is established more easily in early childhood than later in life, it is important for parents to understand how the media environment they create affects children's use of digital media, how children learn from digital media, and how digital media impacts children's development (Canadian Paediatric Society, 2017; Piotrowski, Jordan, Bleakley, & Hennessy, 2015; Wartella et al., 2014). Knowing how young children learn and develop from the use of digital media can inform parents about how to best support their children's interaction with digital media in informal environments in a beneficial way.

In this article, I aim to uncover the recent trends on the use of digital media by children from birth to 8 years of age and explore current research on the use of digital media in informal environments. I contend that parenting style regarding digital media use in informal environments relates to parents' knowledge about how children use, learn, and are affected by digital media.

In this article, I review the existing literature on children and digital media and discuss how children use and learn from digital media, specifically focusing on the screen time that is devoted to the most commonly used digital screen media, including

smartphones, tablets, computers, and televisions. I provide key insights on the impact of digital media use on children from birth to 8 years of age during this critical period of rapid brain development across a range of developmental outcomes and the ways in which parents can manage their children's media environment and their use of digital media (Wartella et al., 2014).

Theoretical Framework

There is a plethora of research that documents the importance of ECEC in formal environments where groups of children are provided education and care in classroom-based settings (Jones et al., 2018b). Examples of the evidence of ECEC on children's short- and long-term outcomes are the Perry Preschool Project and programs in Boston and Tennessee (Lipsey, Farran, & Durkin, 2018; Schweinhart et al., 2005; Weiland & Yoshikawa, 2013). Oftentimes, how ECEC is defined varies by state, and in the United States may include childcares, daycares, nursery schools, preschools, kindergartens, and elementary schools. In the Early Learning Study at Harvard, Jones et al. (2018a) identified formal education and care settings for children between the ages of three and four years living in Massachusetts as preschools, pre-kindergartens, Head Start centers, and other licensed center-based programs.

However, there is a dearth of research on ECEC in informal environments where many children spend most of their time. This includes care provided by parents at home or outside the home, care provided by nonparent relatives (e.g., grandparents, siblings) at home or outside the home, and care provided by nonrelatives, such as neighbors, at home or outside the home (Jones et al., 2018a). Although, the current Early Learning Study at Harvard includes ECEC in informal environments in its analysis, there are limited studies that directly address this even though there are millions of children who are not enrolled in formal early ECEC programs and are being provided ECEC in informal environments (Jones et al., 2018b). Even children who are enrolled in formal ECEC programs spend the rest of their time in informal environments, especially at home where parents are usually the primary caregivers. This article, particularly, focuses on the home as an informal environment with parents as the primary caregivers.

The role of parents is crucial in encouraging healthy early childhood development during the first eight years of children's lives when they spend most of their time at home or in other informal environments outside the school. These informal ECEC practices play a significant role in developing children's cognitive and noncognitive skills that help them succeed on personal, social, and economic levels and, hence, in defining their futures (Landers, Fuertes, & Dalais, 1996). However, ECEC in informal environments is constantly evolving in this age of digital media, and technology is becoming an integral part of it.

Today's children are born in a media-saturated environment where they are exposed to traditional as well as new forms of digital media daily (Kabali et al., 2015). Digital media refers to any kind of hard device or soft interface that promotes engagement and allows children instant access to entertainment, information, and knowledge (Chassiakos, Radesky, Christakis, Moreno, & Cross, 2016). The most common and traditional form of digital media is the television, which is still the predominant medium used by children. Over the past decade, new forms of digital media

have emerged and become increasingly popular among children. They are exposed to, and can access as well as use, various forms of interactive digital media at an increasing rate (Chassiakos et al., 2016). This article uses a broad definition of digital media. It includes digital screen devices, such as televisions, smartphones, tablets, computers, and laptops, as well as digitally mediated activities that children engage in through these devices, such as programs, videos, applications (i.e., apps), and electronic books (i.e., e-books).

As a result, there is a growing body of research that has studied the trends and impact of digital media use by children from birth to 8 years of age (Holloway et al., 2013). There is evidence which points toward the benefits of children's use of digital media in terms of higher cognition, academic success, and healthy development (Romer, Bagdasarov, & More, 2013; Schmidt & Anderson, 2009). For instance, there is a large body of evidence indicating that educational programming viewed on television or other digital media has a positive effect on cognitive development in children who are in their preschool years (Anderson & Subrahmanyam, 2017). However, other evidence indicates the risks of children's digital media use, particularly lower social-emotional development due to a lack of real-life interactions (Radesky, Kistin, et al., 2014). This article recognizes that the positive and negative effects of digital media use among children are multifactorial and determined by (Bavelier et al., 2010; Chassiakos et al., 2016):

- Children's age and developmental stage. For example, using digital media to watch high-quality educational content can lead to improved academic skills and performance in children who are in their preschool years but can lead to lower executive functioning and hyperactive behavior in infants (Kostyrka-Allchorne, Cooper, & Simpson, 2017).
- The type of digital media and purpose of use. For example, watching programs produced for adults using digital media may lead to no effects or negative effects on children, whereas apps that are specifically developed for the purpose of enhancing children's cognitive abilities can lead to positive learning outcomes (Barr, Lauricella, Zack, & Calvert, 2010).
- The content being viewed. For example, children's exposure to the television show "Dora the Explorer" is associated with an increase in vocabulary and expressive language skills in children at the age of 2, whereas exposure to the show "Teletubbies" is associated with a decrease in these skills (Linebarger & Walker, 2005).
- The time and extent of use. For example, excessive screen time can negatively affect learning and take away time from other important activities, like creative play, social interactions, and studying, that are essential to children's learning and development. In fact, the negative effects of excessive screen time are likely to continue through adolescence given that children's screen time tends to increase with age (Linn, Almon, & Levin, 2012).
- How it is being used—with or without a parent. For example, parents *co-viewing* and engaging with infants when watching videos can lead to infants paying more attention to the content and increase their ability to learn better than when infants are allowed to view content on their own (Barr, Zack, Garcia, & Muentener, 2008).

Despite the abundance of new digital media available to children, little is known about the role that parents can play in shaping their development through the media environment established at home (Wartella et al., 2014). Parental engagement in children's use of digital media is an important factor in fostering beneficial outcomes and controlling the negative effects of digital media (Connell, Lauricella, & Wartella, 2015; Rasmussen et al., 2016). However, parental involvement in their children's use of digital media depends on various characteristics and demographic factors that determine the media environment at home, thereby determining how much, what kind, and how they use digital media (Lauricella, Wartella, & Rideout, 2015; Wartella et al., 2014). The overwhelming access to digital media gives rise to the need for renewed discussion regarding the way families can manage their children's use of digital media.

In this article, I draw on five main bodies of literature. First, I discuss how parents determine the media environment at home (Wartella et al., 2014). Based on trends revealed in the survey conducted by the Northwestern University's Center on Media and Human Development in 2012 (Wartella et al., 2014) and in the Common Sense Survey 2017 (Rideout, 2017), I analyze the three key parenting styles identified by Wartella et al. (2014) regarding the use of digital media by children from birth to 8 years of age, including (a) a *media-centric* approach, (b) a *media-moderate* approach, and (c) a *media-light* approach. I also identify parenting styles and explore the penetration of digital media in homes, along with children's exposure to, access to, and use of it. Next, I explore the two ways in which children learn from any kind of digital screen media: *transfer of learning* and *interactivity*. I discuss the concept of transfer of learning by highlighting Lerner and Barr's (2015) research on how children apply what they learn from digital screen media to the real world and explore the factors that affect learning from digital screen media. Drawing on this concept, I look at Lovato and Waxman's (2016) research on the conditions under which young children can learn from the interactivity of digital screen media.

I then go on to examine how the use of digital media impacts children's development. In particular, I examine Anderson and Subrahmanyam's (2017) work on the impact of digital media on young children's cognitive development at different ages and development stages. In analyzing the impact of digital media on children's development, I conducted an in-depth analysis of 183 literacy-focused apps identified by Vaala, Ly, and Levine (2015) to determine whether "educational" apps actually improve children's early literacy and language skills. I also explore the work of Chiong and Shuler (2010) to assess whether these apps are designed to promote *joint media engagement*.

In the fourth section, I highlight how digital media affects social interactions due to the lack of real-life *serve and return* interactions between children and adults, as explained by the Center on the Developing Child at Harvard University (2016). By exploring Lerner and Barr's (2015) work on the parental use of digital media, and Takeuchi and Stevens' (2011) and Guernsey's (2015) work on co-viewing, I highlight that social interactions with adults are essential for children to learn effectively from digital media and provide key insights on how digital and social interactivity can be brought together. Finally, I suggest how to improve social interactions in the use of digital media through joint media engagement with adults.

I conclude by providing recommendations to parents and caregivers on how they can make the use of digital media a part of young children's lives in such a way that it enhances their learning and development as much as possible (Anderson & Subrahmanyam, 2017; Radesky & Christakis, 2016; Strasburger & Hogan, 2013).

The findings from the literature review surface important trends and questions. It addresses some of the most significant questions facing the ECEC field with regard to today's parents as it identifies links between the role of parents, characteristics of informal environments, and young children's overall development. It addresses concerns about the role that digital media plays in early experiences and, hence, in children's later outcomes. Given the importance of digital media in this age, the article provides guidance to parents and other caregivers on how to become *media literate* so that they can make informed decisions regarding their children's use of digital media and maximize children's development from its use (Lerner & Barr, 2015).

Methodology

This article is an evidence-focused literature review based on a mixed-research study. I analyze and synthesize both quantitative and qualitative information in the fields of pediatrics, psychology, child development, and media. The review is based on evidence from literature published between 2000 and 2019. This is the period when digital media started becoming accessible by young children in the West and eventually became a part of their everyday lives. However, the review also comprises literature published before 2000, as the article uses some seminal research from the field of early childhood education to support the analysis.

The search strategy for the literature review was a multipronged process. First, I used research knowledge from the course, "Education and Human Development" as part of the Master of Philosophy degree in Development Studies at the Centre of Development Studies, University of Cambridge. In particular, readings recommended by Dr. Flavio Comim in his lectures on early childhood education and education and families were the starting point for the research. Second, I used databases such as Google Scholar, JSTOR, PubMed Central, ScienceDirect, Wiley Online Library, SpringerLink, Sage Journals, and Taylor & Francis Online, to search the following keywords: early childhood education and care and formal environments; early childhood education and care and informal environments; early childhood education and care and digital media; children and digital media, parents and digital media; impact of digital media on children, young children and digital technology; families' role in early childhood education and care; and parents' role in early childhood education and care. Next, I identified relevant papers from the aforementioned databases and websites, including American Academy of Pediatrics (AAP); The London School of Economics and Political Science; Center on the Developing Child, Harvard University; Harvard Graduate School of Education, Harvard University; National Institute of Child Health and Human Development, Early Child Care Research Network; and the National Association for the Education of Young Children. Finally, I identified additional relevant papers using the references of the initial papers identified and browsed the list of papers identified.

I identified a total of 119 resources throughout the literature search including 81 journal articles, 11 books, and 27 other resources including working papers, reports,

conference papers, news articles, and websites. Out of these, I excluded 33 resources, as they were focused on irrelevant topics, fell outside the period identified for this article, targeted children outside the age range defined for the article, or focused on the kind of digital media that fell beyond the scope of this article. I included a total of 87 resources in the literature review that met the search criteria. Out of these, there were 57 journal articles, nine books, and 21 other resources including working papers, reports, conference papers, news articles, and websites. The qualitative findings of this article are based on the review and analysis of information available in these sources.

The quantitative findings stem from the results of two nationally representative surveys conducted by Growth from Knowledge—a national survey conducted for Northwestern University's Center on Media and Human Development in 2012 (Wartella et al., 2014)—and the Common Sense Survey conducted for Common Sense and VJR Consulting in 2017 (Rideout, 2017). The results of these surveys were used for this article given their relevance to the topic; they offered opportunities to gauge family media environment and the patterns in children's use of digital media including old and new forms of digital media. The surveys are based on nationally representative samples, were conducted within the last 10 years, and are in line with the target group of this study (i.e., children from birth to 8 years old).

The national survey conducted for Northwestern University's Center on Media and Human Development in 2012 was based on a nationally representative sample of 2,326 parents of children from birth to 8 years of age in the United States that explores how parents incorporate digital media into their family lives and parenting practices (Wartella et al., 2014). The survey was conducted by Growth from Knowledge using its Knowledge Panel, a probability-based web panel that is representative of the U.S. population. Households were selected using probability-based methods, including address-based sampling and random-digit-dial telephone calls. The survey measures the family media landscape based on parents' responses to questions about the home environment, parental and children's use of digital media, family activities, use of digital media as a parenting tool, parents' attitudes about digital media, and parents' views about the impact of digital media. The survey does not include data on digital media such as cable or satellite television, video games, or iPods, etc.

The Common Sense Survey 2017 is the third in a series of nationally representative, probability-based surveys that document patterns of media use among children from birth to 8 years of age in America. The survey was based on a representative sample of 1,454 parents of children from birth to 8 years of age from all regions of the country with different demographic characteristics including low- and high-income families, low- and high-educated parents, and diverse racial and ethnic backgrounds. However, this article does not analyze the relationship between racial and ethnic backgrounds and parents' choices about digital media use.

Parenting Styles Regarding Digital Media Use by Children up to 8 Years of Age

With the rapid influx and use of digital media in the recent past, these are becoming an important part of young children's lives. In the Common Sense Survey 2017 that documents media use patterns among children in America, 98% of the children from birth to 8 years of age lived in homes with some kind of mobile device (e.g., smartphone

or tablet) and television (Rideout, 2017). Based on the results of the nationally representative survey conducted for the Northwestern University's Center on Media and Human Development in 2012 (Wartella et al., 2014), parents of children from birth to 8 years tended to establish a media environment at home based on the choices they make regarding digital media, including the (a) time spent by parents using digital media; (b) time spent by children using digital media; (c) presence of digital media in their homes; (d) presence of digital media in children's bedrooms; (e) use of digital media as a family activity; (f) use of digital media as a parenting tool; and (g) use of digital media as an educational tool.

These individual choices about the home media environment come together as parenting styles adopted by parents of children from birth to 8 years of age, which govern the *family media ecology* and set the tone for children's use of digital media (Wartella et al., 2014). This results in different family media ecologies for children where there are different amounts and kinds of digital media devices in the home, different locations for these devices in the home, different views about using digital media as a family activity, and different attitudes in using digital media as parenting and educational tools (Wartella et al., 2014). Particularly, these characteristics determine the number and kind of digital media that children have access to and the amount of time that children spend using digital media.

Wartella et al. (2014) identified three different parenting styles regarding digital media: (a) a media-centric approach, (b) a media-moderate approach, and (c) a media-light approach. In the survey conducted in 2012, about 27% of the parents adopted a media-centric approach, 47% of the parents adopted a media-moderate approach, and around 26% of the parents adopted a media-light approach (Wartella et al., 2014). In addition to the characteristics regarding digital media mentioned above, these parenting styles are also marked by a variety of demographic characteristics that affect parents' individual choices about digital media use including family income, parents' education, and family structure (i.e., single- or dual-parent families; Wartella et al., 2014). There were substantial differences in digital media use between low- and high-income families, low- and high-educated families, and single- and dual-parent families that are highlighted in the following subsections.

Media-Centric Approach

According to the survey conducted in 2012, parents adopting a media-centric approach tended to spend a great deal of time using digital media themselves, at an average of 11 hours of screen time per day, and their children tended to spend an average of four and a half hours per day using digital screen media (Wartella et al., 2014). Media-centric parents also tended to have positive views about the effects of digital media on children—around 9% of the parents surveyed in the Common Sense Survey 2017 whose children used screen media believed that their children benefitted from the screen media that they used, as shown in Figure 1 (Rideout, 2017). These parents weare also far more likely to use digital media as an educational tool, as they often believe that digital media improves rather than hurts their children's learning, creativity, social skills, ability to focus, behavior, and physical activity, as shown in Figure 1 (Rideout, 2017).
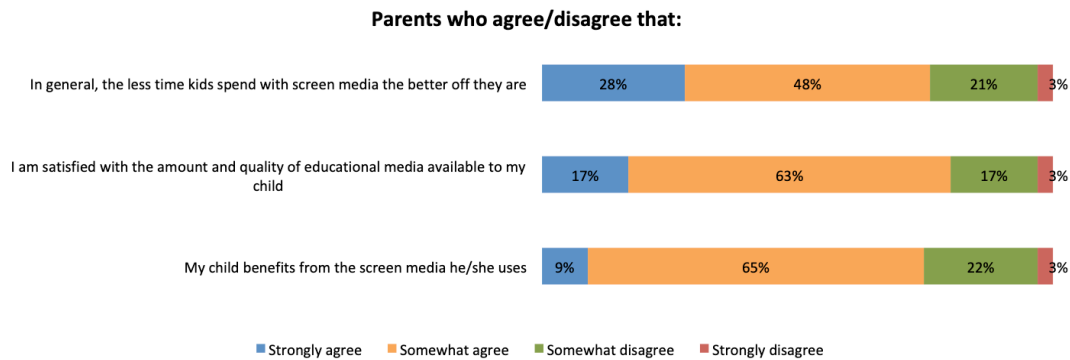
Parents who agree/disagree that:

In general, the less time kids spend with screen media the better off they are	28%	48%	21%	3%
I am satisfied with the amount and quality of educational media available to my child	17%	63%	17%	3%
My child benefits from the screen media he/she uses	9%	65%	22%	3%

■ Strongly agree   ■ Somewhat agree   ■ Somewhat disagree   ■ Strongly disagree

Figure 1. With permission "The Common Sense Census: Media use by Kids Age Zero to Eight," by V. Rideout, 2017, San Francisco, CA: Common Sense Media, p. 39. Copyright 2017 by Common Sense Media.

Parents' positive views about the benefits of digital media use increased the likelihood of their children using more digital media on a daily basis (Wartella et al., 2014), including watching television or videos in the hour before bedtime and leaving the television on nearly all the time even when no one is watching (Rideout, 2017). Despite the AAP's recommendations that children refrain from using screen media an hour before bedtime and that televisions be turned off when nobody is watching due to the negative impact of background exposure to digital media (Radesky & Christakis, 2016), around 49% of the children from birth to 8 years of age watched television or videos before bedtime, and 42% of parents said that television was on *always* or *most of the time* at home, even if no one was watching (Rideout, 2017). Background exposure of digital media tends to reduce the quantity and quality of parent-child interactions and has been found to be negatively associated with cognitive development, attention, and executive functioning skills in children (Pempek, Kirkorian, & Anderson, 2014). Using digital media before bedtime is also known to disturb children's sleep patterns. The presence of digital media in children's bedrooms is likely to lead to an increase in the amount of time children spend using digital media before bedtime and, by extension, affect the quality and quantity of children's sleep at night (Nathanson & Fries, 2014).

Parents adopting a media-centric approach are also more likely to use digital media as a parenting tool to help keep their children occupied while they get things done, such as making dinner or other household chores. Similarly, they are more likely to use televisions as electronic babysitters to engage their children when they are getting ready for bed (Thompson, Adair, & Bentley, 2013; Wartella et al., 2014). Parents adopting a media-centric approach are more likely to be from single-parent families who do not have a large family support system and must turn to digital media to get things done around the house. Financial constraints and their inability to pay for a babysitter could possibly contribute to their dependence on using digital media as a parenting tool, as they may single-handedly juggle work, childcare, and housework (Russo & Clark, 2003). The limitations derived from time and financial constraints could also be responsible for single-parent families using digital media as a family activity, like watching television, rather than spending time with their children on recreational activities outside the home

(Coyne et al., 2017; Russo & Clark, 2003). This suggests that the overall family structure and roles affect parents' everyday practices regarding the way digital media are utilized and, thus, influence the parenting style adopted.

Digital media is also used as a parent coping strategy, as various studies have suggested that child characteristics are linked to parents' tendencies in terms of their children using digital media (Jago et al., 2012; Radesky, Silverstein, Zuckerman, & Christakis, 2014). Media-centric parents tend to allow more screen time for children who have certain characteristics. Difficult behavior and self-regulation problems contribute to parent's decisions regarding digital media use by their children (Radesky, Silverstein, et al., 2014). For example, parents who think their infants and toddlers are fussy or are more intense criers are more likely to allow increased media exposure for their children (Thompson et al., 2013). Furthermore, children who exhibit poor self-regulation including emotional regulation, attention, self-soothing, and sleep difficulties are more likely to consume more media at the age of 2 and, hence, exceed the media recommendations given by the AAP (Radesky, Silverstein, et al., 2014). This is again particularly more common among single-parent families who do not have the support of partners. Potentially, single parents may also be more likely to use digital media to reward or punish a child's behaviors (Wartella et al., 2014). The excessive use of digital media by single parents could also have implications on how children relate to each parent, as there can be differences between the media environments of each household. If one parent adopts a media-centric approach and the other parent adopts a media-moderate or media-light approach, this could be a source of conflict between the parents of different households (Russo & Clark, 2003).

Furthermore, parents of low-income families who have toddlers with social-emotional delays are also more likely to encourage their children to use mobile devices when they need to be calmed down than parents from high-income or high-educated families (Radesky, Peacock-Chambers, Zuckerman, & Silverstein, 2016). Children from low-income families may exhibit more characteristics like being emotionally negative and having a difficult temperament than children from high-income families. This may be because children from low-income families have less access to resources that give them the opportunity to experience the kind of environments that foster the development of these skills. This causes parents from low-income families to adopt a more media-centric parenting style in using digital media as a coping strategy, making children susceptible to the negative impact of digital media use. These results indicate that parents could be given alternative coping strategies that could provide the behavioral *scaffolding* required to improve children's executive functioning skills like working memory, inhibitory control, and cognitive or mental flexibility, which are important characteristics for children's overall development (Center on the Developing Child at Harvard University, 2011; Radesky, Silverstein, et al., 2014).

Recent research indicates that children's self-regulation outcomes and executive functioning can be improved over time through responsive and sensitive parenting (Blair, Raver, & Berry, 2014). This requires parents to develop a media environment that fosters parent-child relationships and social interactions. Adopting a more media-moderate or media-light approach would mean that parents from media-centric families could encourage their children to engage in other activities that are free of cost when children

are being fussy or are facing sleeping or feeding difficulties. In this case, however, parents would need to make more time for children to practice their executive functioning skills through individualized teaching and scaffolding (Center on the Developing Child at Harvard University, 2011).

Although parents of high-income families are more likely to own digital media devices like mobile phones and tablets, parents of low-income families tend to adopt a media-centric approach because they are more likely to view digital media, like television and computers, as having a positive influence on children's reading, speaking, and mathematics skills (Wartella et al., 2014). They may feel that they have less control over their children's educational outcomes due to being less educated themselves (Nikken, 2019). This challenge—coupled with the fact that they may not have many options to support their children's development due to low economic resources—could contribute to them being more likely to use digital media for educational purposes.

Media-Moderate Approach

Media-moderate parents tended to spend a moderate amount of time using digital screen media compared to media-centric and media-light parents (Wartella et al., 2014). Based on the survey conducted in 2012, parents who adopt a media-moderate approach spent an average of five hours a day using digital screen media themselves, and their children spent an average of about three hours a day using digital screen media (Wartella et al., 2014). The Common Sense Survey 2017 revealed that media-moderate parents were split in terms of their views about the benefits of screen media. Sixty-five percent of parents whose children used screen media somewhat often believed that their children benefited from it, whereas 22% of parents did not believe their children benefited from using screen media, as shown in Figure 1 (Rideout, 2017). These parents were also more likely to think that their children's use of screen media makes no difference to their learning, creativity, social skills, ability to focus, behavior, or physical activity, as shown in Figure 2 (Rideout, 2017).

However, hardly any media-moderate parents had negative views about the use of digital media or believed that their children were better off without using digital media. One reason for this low perceived benefit may be that most media-moderate parents encourage their children to use digital media in moderation, and they try to benefit from the use of digital media while giving importance to other activities that encourage social interactions, like outdoor play. This is in line with Wartella et al.'s (2014) findings that parents adopting a media-moderate approach were a little less likely to use digital media as a family activity. Instead, they were a little more likely to do activities inside the house, like eating meals together and cooking, or activities outside the house, like playing, walking, and going to the park (Wartella et al., 2014).

However, according to Wartella et al. (2014), parents who adopted a media-moderate approach were fairly evenly split between those who were low-, moderate-, or high-educated, and they fell into the income group that was neither high nor low compared to the income groups identified for parents who adopted a media-centric and media-light approach. This suggests that there is a certain population of parents whose family income, level of education, and family structure may not be the only determinants of the parenting style they adopt. There could be other variables that contribute to their

parenting styles regarding digital media use, including, but not limited to, parents' proficiency in digital media use and children's personal attributes like gender, age, and cognitive ability, which are beyond the scope of this article (Nikken, 2017).

Media-Light Approach

Media-light parents tended to spend the least amount of time using digital screen media. These parents tended to spend an average of less than two hours a day using digital screen media, and their children spent an average of around one and a half hours a day (Wartella et al., 2014). Three percent of the parents surveyed in the Common Sense Survey 2017 whose children used screen media strongly disagreed that their children benefited from it, as shown in Figure 1 (Rideout, 2017). In fact, these parents were far more likely to believe that the use of digital media hurts rather than helps their children's learning, creativity, social skills, ability to focus, behavior, and physical activity, as shown in Figure 2 (Rideout, 2017). With an environment that is less oriented toward the use of digital screen media, media-light parents were less likely to use them as a parenting tool, like when they needed to run errands inside the home or when they were getting their children ready for bed (Wartella et al., 2014). In fact, media-light parents were more likely to use tools like books, toys, or activities to keep their children engaged during their parenting practices (Wartella et al., 2014). Similarly, these parents were less likely to enjoy using digital media as a family activity like watching movies together (Wartella et al., 2014).

Parents adopting a media-light approach were more likely to be more educated and less likely to think that television has a positive effect on children's reading, speaking, and mathematics skills and, hence, were less likely to use it as an educational tool. These parents were also more likely to be from dual-parent and high-income families and are less likely to be bound by time and financial constraints (Wartella et al., 2014). This could mean that they were more able to co-view and engage with their children when using digital media, as parents have each other's support and can take turns engaging with their children (Canadian Paediatric Society, 2017). Parents could have reaped more benefits from the use of digital media in the little time that they spent using them compared to parents who spent relatively more time using digital media. Hence, socioeconomic factors can shape the media approach adopted by parents, and this has implications for children's use of digital media and how they balance the positive and negative effects of digital media.

These different parenting styles result in different media ecologies that children are exposed to and access in different households. More research is required to better understand how parenting styles are linked to parental mediation of digital media for their children at different ages and development stages. Focusing on parenting styles and its characteristics can help parents understand the quantity of digital media that their children use; exploring how children learn from digital media and how the use of digital media impacts children's development can help parents understand the quality of digital media that their children use and experience. This will help them make more informed choices about their children's use of digital media in terms of the time spent and the content viewed, bringing a more balanced use of digital media to their children's lives while maximizing the benefits and minimizing the risks of digital media.
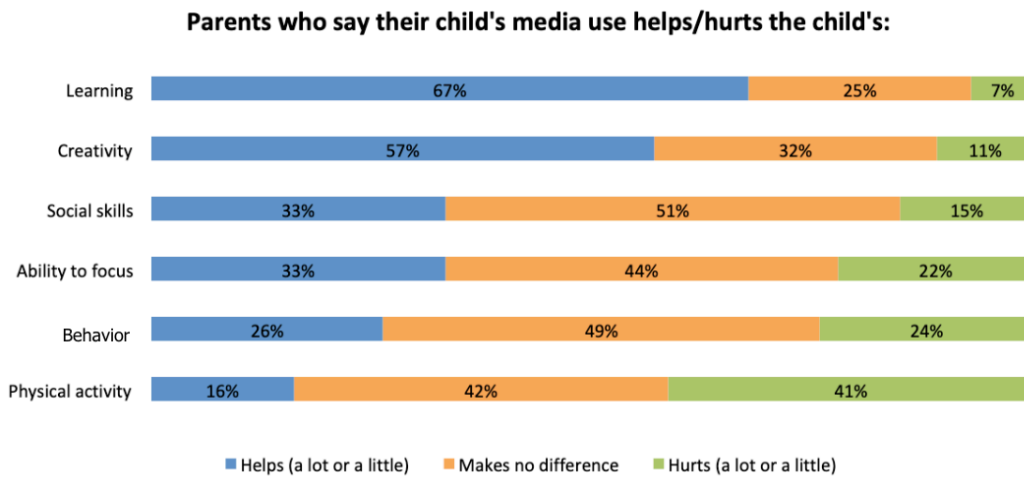
Figure 2. With permission Parents' views of media effects, 2017. Adapted from "The Common Sense Census: Media use by Kids age Zero to Eight," by V. Rideout, 2017, San Francisco, CA: Common Sense Media, p. 39. Copyright 2017 by Common Sense Media.

How Children Learn from Digital Media

Whether children come from families adopting a media-centric, media-moderate, or media-light parenting style, digital media is here to stay. Hence, it is necessary to understand the quality of digital media that children use and experience. How exactly do children learn from digital media?

The Common Sense Survey 2017 showed that children from birth to 8 years of age spent an average of 2 hours 19 minutes a day using screen media (Rideout, 2017). Table 1 shows that television remains the predominant medium used by all children from birth to 8 years of age. However, a lot of the television or television-like video content is also viewed on alternative platforms, like smartphones, tablets, and computers (Anderson & Subrahmanyam, 2017). Hence, although some recent evidence about children's comprehension of the content viewed on digital screen devices exists, much more evidence exists from research on television's impact on children's development.

On the one hand, many companies claim that their devices and educational programs teach young children a variety of skills, though some evidence is not in line with this claim (DeLoache et al., 2010; Neuman, Kaefer, Pinkham, & Strouse, 2014). On the other hand, there is considerable research indicating that children do learn from digital screen devices under certain conditions (Arunachalam & Waxman, 2010). Thus, researchers have been exploring the conditions that support young children in learning from interactions with digital screen devices (Hirsh-Pasek et al., 2015; Richert, Robb, Fender, & Wartella, 2010). A review of existing research on children's use of digital media highlights two ways in which children learn from any kind of digital screen media: transfer of learning and interactivity (Lovato & Waxman, 2016).

Pioneered by DeLoache (1987, 1989, 1995) and extended by DeLoache, Miller, and Rosengren (1997), the concept of transfer of learning was designed to measure how well children apply what they learn from one medium, like pictures or three-dimensional

(3-D) models, to the real world. More recently, however, researchers have adapted this concept to determine how children apply what they learn from digital screen media to the real world (Chassaikos et al., 2016; Lerner & Barr, 2015). Various experiments (Dayanim & Namy, 2015; Troseth, Saylor, & Archer, 2006) have complemented the adaptation of this concept to this age of digital media. Taking this concept further, Troseth et al. (2006) examined the effect of interactivity on the abilities of children at the age of 2 years to transfer information learned from a video to the real world. Similar to the results of Lauricella, Pempek, Barr, and Calvert's (2010) and Kirkorian, Choi, and Pempek's (2016) experiments, Troseth et al.'s (2006) findings suggest that children transfer information to the real world more readily when information is presented to them in a *contingent interactive* manner (Lovato & Waxman, 2016).

Table 1.
Time Spent with Digital Screen Media by Device and Age, 2017

Average time spent per day using:	Child's age (years)		
	<2	2 to 4	5 to 8
Television	29 mins	1 hour 9 mins	1 hour 4 mins
DVD/videotape player	6 mins	23 mins	18 mins
Mobile device	7 mins	58 mins	1 hour 2 mins
Computer	<1 min	5 mins	20 mins
Video game device	<1 min	4 mins	12 mins
Total screen media time	42 mins	2 hours 39 mins	2 hours 56 mins

Note. Adapted with permission from "The Common Sense Census: Media use by Kids Age Zero to Eight," by Rideout, 2017.

Transfer of Learning
        Children learn and gain skills from screen devices through transfer of learning, where they receive information and then apply that knowledge to real-life experiences in their everyday routines (Lerner & Barr, 2015). An example of this is when a child sees a giraffe in a YouTube video and then recognizes a real-life giraffe at a zoo a few days later (Lerner & Barr, 2015). In this way, information from two-dimensional (2-D) platforms is applied to the 3-D world (Lerner & Barr, 2015). Research has demonstrated that babies as young as 6 months old can imitate the movements they observe on television, which means that they can pick up information from 2-D platforms and can understand it enough to incorporate it into their own behavior in the 3-D world (Lerner & Barr, 2015).
        However, evidence has shown that it is much easier for children to retain information delivered through real-life experiences and interactions rather than through screen devices. In an experiment carried out by Troseth et al. (2006), an experimenter showed children where a toy was hidden in a room in two ways. Half of the children learned the location of the toy through watching a video, whereas the other half learned the location of the toy through a live condition where they saw the experimenter hiding the toy in the 3-D room. Children from the former condition found the toy 27% of the

time, whereas children from the latter condition found the toy 77% of the time. This phenomenon is called the *transfer deficit*, where it is more difficult for children less than 2 years of age to transfer information presented to them on a video screen than from a real-life interaction (Lerner & Barr, 2015). Research attributes the transfer deficit to the lack of memory flexibility, attention controls, and symbolic thinking among infants and toddlers that is required to effectively transfer information from 2-D platforms to the 3-D world (Barr, 2013; Chassiakos et al., 2016).

Repetition of experiences on 2-D platforms can reduce this transfer deficit as repeated exposure to a particular action or object results in repeated imitation by children. This results in better abilities to apply the information to real-life experiences leading to greater learning among children between 1 and 5 years of age (Lerner & Barr, 2015). Dayanim and Namy (2015) showed that children at the age of 15 months can learn sign language symbols after repeated viewings of video demonstrations without any adult help. However, a comparison study showed that children retained more information for a longer period when their parents taught them sign language symbols using a book (Dayanim & Namy, 2015). Children under the age of 2 years are at a developmental stage when their cognitive, language, sensorimotor, and social-emotional skills are being developed, and this requires real-life exploration and social interactions with adults (Chassiakos et al., 2016). Therefore, social interactions with adults are essential for children to learn effectively from digital media.

Interactivity of Digital Media Devices

Following the first experiment, Troseth et al. (2006) conducted another experiment, which suggests that the transfer deficit does not arise from the screen itself but from the children's opportunity to engage with screens contingently (Lovato & Waxman, 2016). In this experiment, all children learned the location of a toy from a video, but what varied was whether the videos were shown in an interactive or noninteractive manner (Troseth et al., 2006). In the interactive video, the experimenter engaged with the child watching the video by playing with him or her for 5 minutes and then hid the toy (Troseth et al., 2006). In the noninteractive video, the child viewed the experimenter playing with another child and then hiding the toy. Children who watched the interactive video were able to successfully find the toy 65% of the time, whereas the children who watched the noninteractive video were able to find the toy successfully only 35% of the time. This indicates that children can transfer information presented to them on a video screen, but they learn better when they are engaged with the characters through interactivity (Lovato & Waxman, 2016).

The interactivity of new digital screen media is a feature that allows children to touch the screen or move content around (Calvert, 2015). Interactive digital media requires behavioral action (e.g., voice or touch) from children to identify whether children are responding to the content accurately, and then it responds to the children's inputs accordingly (Anderson & Subrahmanyam, 2017). In theory, this means that the interactivity of digital media can provide scaffolding to help build children's skills and learning based on their levels of competence (Chassiakos et al., 2016).

As screen devices become more interactive, one can draw a distinction between educational tools that are noninteractive, such as watching videos, and those that are

interactive, such as participatory games. Studies have concluded that the more children engage with screen devices, the greater the learning (Lerner & Barr, 2015). This was exemplified by one study where three groups of toddlers between 30 and 36 months were shown three different scenarios in which hidden puppets were revealed: (a) a live enactment, (b) a video, and (c) an interactive game (Lerner & Barr, 2015). The groups of children who watched the live demonstration and who played the interactive game were more likely to know exactly where the puppets were hidden as opposed to the group of children who watched the video (Lerner & Barr, 2015). Similarly, programs in which characters speak directly to children tend to improve their language expression and vocabulary. Thus, educational tools on screen devices that require children's participation are more likely to improve children's learning (Lerner & Barr, 2015).

However, excessive interactivity can be detrimental to the development of children's cognitive skills (Lerner & Barr, 2015). Studies have shown that children tend to click around the screen when reading e-books. In fact, parents who read e-books with their children also tend to focus more on the various audio and animation features rather than on the story (Lerner & Barr, 2015). This distracts children from the storyline, impeding their ability to keep track of what is being read, thereby reducing their story comprehension skills (Lerner & Barr, 2015). E-books, therefore, can have a positive effect on children's cognitive skills as long as parents guide their children to focus on the story by capitalizing on features of screen devices and not letting them distract children instead (Lerner & Barr, 2015).

How the Use of Digital Media Impacts Children's Development

Given the increasing presence of technology in our everyday lives, it is important for children to use digital media to remain relevant in today's world. On the one hand, some researchers claim that the use of digital media helps children's cognitive development and is necessary for their success in school and future careers (McCarrick & Xiaoming, 2007). Digital media serve as important sources of education in informal environments, and they also have the potential to support learning in formal environments (Subrahmanyam & Renukarya, 2015). On the other hand, some researchers argue that technology harms the growth of children as it hinders the development of cognitive skills (Anderson & Subrahmanyam, 2017). Parents' lack of understanding influences their decisions to adopt media-centric or media-light parenting styles and approaches regarding their children's use of digital media. It is therefore important to understand how digital media impacts children's cognitive development at different ages and development stages.

Digital Media and Cognitive Development

The impact of digital media use on children's cognitive development is linked to the amount of time spent, the content, and the social context of viewing them (Anderson & Subrahmanyam, 2017). For children less than 2 years of age, digital media use is negatively associated with cognitive development, particularly in terms of language and executive functioning (Zimmerman & Christakis, 2005). This is because much of the content that children are exposed to are programs directed at adults, and children have little comprehension of this kind of content (Anderson & Subrahmanyam, 2017). In fact,

such programs act as background exposure for children at this developmental stage, diminishing the quantity and quality of parent-child interactions that play a vital role in children's cognitive development (Kirkorian, Pempek, Murphy, Schmidt, & Anderson, 2009). There is mixed evidence regarding the impact of content directed toward children, depending on whether the content is educational or not (Zimmerman & Christakis, 2005). Although parents interact less with children less than 2 years of age during co-viewing of such content, they are more likely to use better vocabulary during and after viewing the content (Lavigne, Hanson, & Anderson, 2015).

By the age of 2.5 years, children are able to understand and learn from age-appropriate digital media content (Anderson & Hanson, 2010). For example, evidence shows that educational television programs, like "Sesame Street," have a positive impact on children's literacy, vocabulary, and social behavior skills (Fisch, 2004). Generally, educational television programs seem to have a positive impact on children's cognitive skills, as they lead to increased school readiness and improved academic performance (Anderson, Huston, Schmitt, Linebarger, & Wright, 2001). An experiment carried out by Roseberry, Hirsh-Pasek, and Golinkoff (2014) showed that toddlers between 24 and 30 months of age learned the meaning of new words better through interactive digital media (i.e., the contingent condition) rather than passively viewing television or videos (i.e., the noncontingent condition). Another experiment conducted by Kirkorian et al. (2016) showed that toddlers between 30 and 36 months of age learned words in contingent and noncontingent conditions, but toddlers between 24 and 30 months of age learned words from tablet screens more successfully when they are engaged in specific contingent interactions.

Beyond the preschool years, children usually watch television programs that are directed toward adults and may not be suitable for cognitive development (Anderson & Subrahmanyam, 2017). Furthermore, watching too much television can negatively impact children's executive functioning skills, especially the ability to concentrate for a longer period of time (Anderson & Subrahmanyam, 2017). Children at this age are learning to read, whereas viewing such content for longer periods can displace time spent doing other valuable activities that could improve cognitive skills (Ennemoser & Schneider, 2007). With thousands of educational apps now available on screen devices, parents are increasingly encouraging their children to use digital media to develop their early literacy and language skills in a fun and engaging way, but are apps educational enough?

Are Apps Educational Enough?
According to the Common Sense Survey 2017, 71% of parents had downloaded apps for their children to use (Rideout, 2017). Out of these parents, 24% had downloaded apps for children under the age of 2 years, 80% had downloaded apps for children between 2 and 4 years of age, and 88% had downloaded apps for children between 5 and 8 years of age (Rideout, 2017). It is interesting to examine to what extent these apps labeled as educational improve children's early literacy and language skills.

Studies suggest that apps can be effective in promoting children's literacy skills. For example, a mobile app named "Martha Speaks: Dog Party" can help children between the ages of 4 and 7 years learn vocabulary (Chiong & Shuler, 2010). Similarly, the "Super Why" app helps increase literacy skills of children between 3 and 6 years of

age through mini games. The app particularly helps children in (a) identifying letters, letter sounds, and rhyming words; (b) spelling and writing words; and (c) completing sentences by filling in blanks with appropriate words (Chiong & Shuler, 2010).

However, these two research-based apps were developed by public broadcasting services—PBS Kids and WGBH—that produce high-quality apps to support ECEC across millions of households (Chiong & Shuler, 2010). Unfortunately, there are very few of these apps that are commercially available (Chassiakos et al., 2016). Most of the educational apps are not developed based on any established curricula, knowledge of ECEC, or input from education or development specialists (Vaala et al., 2015). In fact, commercially available apps demonstrate low learning effectiveness and tend to only target rote academic skills, like learning colors and the alphabet (Vaala et al., 2015). App descriptions tend to give exaggerated and misleading claims about their effectiveness in enhancing learning (Guernsey & Levine, 2015). In fact, around 40% of the app descriptions in an analysis of apps[1] provided little or no information on the age or developmental stage targeted by the apps, yet age-appropriate content is vital to children's development (Vaala et al., 2015).

Apps reviewed and awarded by expert review sites (e.g., Common Sense Media, Parents' Choice Awards, and Children's Technology Review) based on certain criteria tend to cost $1 to $2 more than the "Top 50" educational apps in app stores, indicating that families who pay more end up with apps of higher quality (Vaala et al., 2015). Given that most parents download free apps for their children, most children end up using low quality apps leading to poor cognitive development (Rideout, 2017). Another concern regarding apps is their interactive features that are designed to engage children, but these features may actually distract children and decrease their comprehension (Bus, Takacs, & Kege, 2015). An analysis of apps showed that 45% of the apps had interactive hotspots (e.g., noise, animation, narration) that were not central to the content and could be distracting for children (Vaala et al., 2015).

Furthermore, currently there are very few apps explicitly designed to promote joint media engagement. Vaala et al.'s (2015) analysis showed that only two out of 183 apps had co-use features, such as competitive or collaborative play with other players, whereas studies suggest that parents play an important role in helping children maximize their learning from apps (Chiong & Shuler, 2010). Adults provide scaffolding and help children comprehend the content better (Chiong & Shuler, 2010). They can help their children get started with the app, explain information to children, and also help reinforce the material learned outside the app (Chiong & Shuler, 2010). For example, app developers can include automatic pauses in the design, allowing parents to switch from the 2-D to the real, 3-D world. Hence, apps need to be designed in such a way—engaging

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[1] An in-depth analysis of 183 literacy-focused apps from "Top 50" lists of educational apps in app stores and apps awarded by expert review sites (Common Sense Media, Parents' Choice Awards, and Children's Technology Review) for children from birth to 8 years of age provides important insights on apps and numerous dimensions including their descriptions, features, and prices (Vaala et al., 2015).

yet not distracting—so that they can be used by both parents and children, encouraging joint media engagement and effective learning for children (Vaala et al., 2015).

The Power of Social Interactions

As interactive as these apps and other digital screen media may be, they cannot create the type of experiences that face-to-face interactions do (Guernsey, 2015). A child playing with "Talking Tom," an app in which a cartoon cat talks back to a child by copying whatever the child says, is an interactive and engaging experience (Guernsey, 2015). However, this interaction cannot replace the value of real-life social interactions and conversations.

Serve-and-Return Interactions

Real-life interactions and conversations involve reciprocal serve-and-return interactions between children and adults that the use of digital media does not (Center on the Developing Child at Harvard University, 2016). Children reach out to adults through babbles, words, gestures, facial expressions, and actions, and responsive adults react to these serves through similar words, voices, expressions, and gestures (Center on the Developing Child at Harvard University, 2016). These reciprocal serve-and-return interactions create dialogue between parents and children where one question or idea builds on and leads to another, building and strengthening neural connections in children's brains that contribute to the development of communication and social-emotional skills (Shonkoff & Phillips, 2000).

If adults are not responsive toward children's serves, this may affect the children's brain architecture, thereby leading to disparities in their cognition, behavior, and social-emotional skills (Center on the Developing Child at Harvard University, 2016). For example, children's oral language acquisition is determined not only by their abilities to hear adequately, differentiate between sounds, and connect meanings to particular words, but also by the presence of serve-and-return interactions with adults (Center on the Developing Child at Harvard University, 2016). Babies will suffer from poor language development if parents do not respond to their babbles or other attempts to communicate (Center on the Developing Child at Harvard University, 2016). Each interaction is a unique experience that contributes to children's future growth and development (Center on the Developing Child at Harvard University, 2016). Hence, these reciprocal interactions, which digital media devices cannot seem to provide, are essential for children's development.

Parental Use of Digital Media

Not only is children's own use of digital media void of real-life interactions necessary for their growth and development, but parental use of digital media also has the potential to disrupt interactions between children and adults. For example, evidence suggests that leaving the television on as foreground or background exposure can lead to a decrease in verbal and nonverbal interactions between parents and children as well as a decrease in interactive play (Kirkorian et al., 2009; Nathanson & Rasmussen, 2011). More recent evidence has shown that increased use of mobile devices by parents also tends to lead to more conflicts between parents and children (Radesky, Kistin, et al.,

2014).

Parental use of screen devices affects children in numerous other ways. An observational study carried out by the Boston Medical Center on 55 parents and their young children showed that more than 70% of parents used mobile phones while having meals (Lerner & Barr, 2015). The more time parents spent using mobile phones, the more likely their children were to misbehave to try and get their attention (Lerner & Barr, 2015). This invoked aggressive reactions from parents including shouting at their children and, in more extreme cases, hitting them (Lerner & Barr, 2015). This can affect not only the time children spend using digital media but also their emotional development. Although the sample for this study was small, its findings suggest that parental use of screen devices affects parent-child interactions that are vital to early childhood development.

Parents should not only limit the usage of these devices around their children but also use activities like family meals as opportunities to bond by having real conversations (Lerner & Barr, 2015). A media environment that encourages parent-child interactions during family routines can play an important role in early childhood development of cognitive, social-emotional, and language skills (Wartella et al., 2014).

Joint Media Engagement

There is no doubt that children learn better from real-life interactions with their parents or other caregivers, but there is also growing evidence that children tend to learn more from digital media when adults actively engage with them (Takeuchi & Stevens, 2011). This is called joint media engagement, and the increasing presence of digital media in everyday life requires adults to practice this whenever children use digital media (Takeuchi & Stevens, 2011). During joint media engagement, adults make children's use of screen devices a shared, social, and interactive experience by (a) co-viewing with them, (b) observing what their children do, (c) asking them questions, and (d) responding to their actions on the screen (Lerner & Barr, 2015).

Research suggests that toddlers between 12 and 24 months can learn new words from word-learning videos that are commercially available online, but only if parents co-view and reteach the words to them while using such videos as scaffolds to build children's language skills (Richert et al., 2010). In fact, a study showed that 14-month-olds experienced better language development when their mothers interacted with them while watching educational television programs as opposed to children whose mothers did not interact with them during digital media use (Mendelsohn et al., 2010).

Joint media engagement enhances children's learning and enriches their experiences. Although many parents use media technology with their children when they are under the age of 5 years, the practice of joint media engagement tends to decrease as children grow older. Families should continue to carry out this practice, as it augments social processes in learning (Lesk et al., n.d.). They should also make the effort to extend screen content to real-life experiences for their children (Lerner & Barr, 2015). For example, if an app involves counting, parents can incorporate this into their children's daily routines by counting steps or the number of cups on the dinner table. Joint media engagement and actively facilitating children's usage of screen devices as educational

tools before, during, and after any activity can mitigate the potential negative effects of screen devices and enhance the benefits of using them (Linn et al., 2012).

Limitations

There are some important limitations to this article. First, there is limited evidence-backed research exploring young children's use of digital media in informal environments, the role of parents in their children's use of digital media, and the impact of digital media on young children, which does not match the substantial increase in the use of digital media by young children. The majority of research that does exist is small-scale in nature, making it difficult to deduce concrete results and make national or cross-national generalizations and comparisons. The lack of research focusing on young children from birth to 8 years of age in informal environments may be due to the difficulties associated with involving this age group in surveys and studies. Timely research on children's use of digital media in their everyday lives that is backed by evidence could help better understand the role that parents can play in maximizing the benefits of their children's use of digital media and building a more applied evidence base to benefit parents and practitioners.

Second, this article does not explore the implications of digital media use on children's neural and physical health and developmental outcomes, such as sleep and musculoskeletal concerns (Gottschalk, 2019). It does not include research from biological sciences that could be useful in getting a more holistic picture. Furthermore, the article does not explore the use of the internet by children from birth to 8 years of age, though there is an emerging trend of young children using digital media that are connected to the internet including smartphones and tablets. This is likely to result in young children accessing the internet and potentially being exposed to violent and harmful content, contact with strangers, and invasion of privacy (Livingstone & Bober, 2006). Much of the evidence used for this article stems from the impact of television use and parental mediation of children's television use due to the vast evidence available on television and limited evidence available on relatively newer forms of digital media, like smartphones and tablets. Although many of the programs viewed on television are now viewed on smartphones or tablets, these newer forms of digital media have other features and uses that could impact children differently than television use does. Hence, there are a few gaps in the review and analysis presented in this article.

Third, given that this article examines the media patterns among parents and children at home, it is possible that the survey responses given by parents are more socially desirable and context-dependent than accurate and truly representative of their daily lives in a private space. Moreover, although the surveys are based on nationally representative samples, they are not inclusive, as they do not include parents of children with developmental delays or disabilities. It would be valuable to have nationally representative data that documents the uptake of digital media among these children, especially because parents often use digital media as electronic babysitters for young children with challenging behaviors, and the use of digital media can affect children with development delays or disabilities in different ways compared to peers without disabilities (Thompson et al., 2013).

Conclusion

In a world that is increasingly reliant on digital media, it is important for children to use such media more carefully during the first few years of life. During this period of rapid brain development, parents and other caregivers play an important role in managing their children's use of digital media in informal environments. Whether parents choose to adopt a media-centric, media-moderate, or media-light parenting style determines the number and kind of digital media devices that children have access to, the time and extent of digital media use, and the manner in which digital media are used at home. These choices heavily depend on what parents know about the ways in which children learn from any kind of digital media, and how the use of digital media impacts children's development at different ages and developmental stages.

The use of digital media can help children learn and grow by increasing their cognitive, literacy, and social-emotional skills, provided parents regulate their own and their children's use of digital media in a number of ways (Anderson & Subrahmanyam, 2017). Parents should discourage the use of digital media for children younger than 18 to 24 months, as it is negatively associated with their cognitive development (Zimmerman & Christakis, 2005). For children who are older than 24 months, parents should choose high-quality programs and apps that contain age-appropriate content, as children are better able to understand and learn from digital media this way. Ensuring that content being viewed by children on screen devices is especially designed for their age group and is interactive—but not too interactive—can help children learn better (Lerner & Barr, 2015).

Parents must choose high-quality apps that are engaging but not too interactive. More than 80,000 apps are labeled educational, but these are not necessarily educational. Platforms such as Common Sense Media and PBS Kids can be used to learn about and identify age-appropriate and high-quality apps (Radesky & Christakis, 2016). Parents should adopt a general practice of joint media engagement, as it not only promotes enhanced learning for children but also encourages social interactions. This means co-viewing, co-playing, and co-engaging with children while using digital media devices to make children's use of screen devices a shared, social, and interactive experience (Guernsey, 2012; Guernsey & Levine, 2015; Lerner & Barr, 2015). There is a need to limit the amount of time spent using digital media, as excessive screen time for children interferes with activities that are essential for early childhood development (Linn et al., 2012). Spending too much time using digital media takes time away from real-life exploration and playful activities, time with nature, and parent-child interactions that include back-and-forth conversations and other activities, such as reading and playing together (Lerner & Barr, 2015).

The use of digital media as a parenting tool should be limited, as it is unsupervised. When parents give their children digital media devices to calm or distract them, children become dependent on these devices, denying their internal mechanisms the chance to self-regulate (Walters, 2015). Instead, parents should use other strategies that do not interfere with children's social-emotional development. To enhance parent-child interactions that promote early childhood development, parents should also avoid using digital media during family activities like meals (Radesky & Christakis, 2016; Strasburger & Hogan, 2013). Parents should also control their own use of digital media,

as it shapes the media environment of households. It not only takes away time from interactive family activities but also influences how much time children spend using digital media (Wartella et al., 2014).

Digital media are an integral part of our lives, but parents should not feel pressured to introduce the use of digital media to their children too early in their lives. The use of digital media has its potential benefits in terms of higher cognition, language, and literacy skills, but it has its potential risks in terms of lower executive functioning and social-emotional skills due to a lack of social interactions. This article argues that families must get past the extreme two-sided debate—the digital media-free mentality versus the overuse of digital media mind-set. It advocates for an approach whereby families play a positive role by considering how children learn from digital media, and how the use of digital media impacts children's development at different ages and developmental stages, while making decisions regarding early childhood education in informal environments. Families can help establish a media environment where children benefit from the opportunities that digital media present and make sure children experience real-life interactions that are vital to their overall development (Wartella et al., 2014).

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