Play in a Digital World
How Interactive Digital Games Shape the Lives of Children

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The authors discuss the impact of interactive digital games on the lives and the play of young children in terms of *Sesame Street*'s express mission to help children become smarter, stronger, and kinder. They conclude that such games have much the same effect as other types of play and call for more research to help use it. **Key words**: digital play; electronic games and child development; play and digital devices; *Sesame Street*; smarter, stronger, kinder

With the invention of interactive telephones and other devices, new opportunities for play have become ubiquitous in the lives of even very young children. A national survey by Common Sense Media reported that nearly all American children under age eight live in a home with a tablet or smartphone (Rideout 2017). In a study of children's use of different media and technologies, Rideout found that viewing television shows and movies remain the primary media for children younger than age six, although their playing of digital games on mobile devices has increased since earlier surveys conducted in 2011 and 2013. Children between the ages of two and four play digital games for about twenty minutes each day, sixteen of these minutes on mobile devices. Similarly, children between five and eight years of age play digital games for about forty-two minutes each day, twenty-four of these minutes on mobile devices (Common Sense Media 2017). Recent research by Griffith and Arnold (2019) found that a sampling of four-year-olds using mobile media considered playing games—both educational and noneducational—a favorite activity. Now that digital games are ubiquitous in children's homes, schools, and play spaces, we believe it critical to consider whether the nature of digital play benefits or harms children's development.

American Journal of Play, volume 12, number 1 © The Strong
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Since the introduction of the first commercial video games in the 1970s (Green and Bavelier 2007), the format and affordances of interactive games have been constantly evolving with technological advancements. Today, digital play includes playing video games on televisions with video game consoles, computer games, games on phones and tablets, hand-held video games, and augmented reality and virtual reality games found on different platforms. In this article, we consider how our understanding of children's traditional play without technology applies to digital game play. We focus on young children before they reach formal schooling in first grade. Digital games are a culturally relevant part of young children's everyday lives, so we examine the nature of play afforded in interactive games for its contribution to children's healthy development as defined by *Sesame Street's* curriculum and summarized by its stated mission to raise children who are smarter, stronger, and kinder. We apply a taxonomy of how to think about digital games based on this *Sesame Street* mission: In helping children become *smarter*, how does interactivity relate to cognitive development? In helping them become *stronger,* how does interactivity relate to health? And in helping them become *kinder*, how does interactivity relate to social and emotional development?

Nature and Principles of Play

Although most scholars argue that children can learn cognitive and social skills through play (Bodrova and Leong 2015; Vygotsky 1967), the difficulty of defining which activities are play and which are not has plagued psychologists interested in the role of play in development (see Zosh et al. 2018 for a review). Zosh et al. (2018) recently presented a model of nondigital traditional play theorizing it to be a spectrum of activities that range from free play to playful instruction, which vary based on who initiates the activity (child or adult), who directs the activity (child or adult), and whether or not the activity has an explicit learning goal. More specifically, they argue that children both initiate and direct free play, that adults initiate and guide but children direct play and games, that children initiate but adults direct co-opted play, and that adults both initiate and direct playful instruction (Zosh et al. 2018).

Although recent reviews have challenged whether child-initiated and child-directed pretend play causally supports positive cognitive, social, and emotional developments (Lillard et al. 2013), some studies have indicated that

playful activities can support learning when these activities leverage elements known to be generally supportive of children's learning. More specifically, play can support learning if children are actively involved, cognitively engaged, make meaning out of the experience, have social partners, iteratively expand the play, and experience joy (Zosh et al. 2018). This model of nondigital play has particular utility for unpacking the nature and affordances of digital play. For example, Hirsh-Pasek et al. (2015) noted that not every educational digital app contains all of the elements most likely to lead to learning, but that apps with all these supportive features (i.e., actively involved, cognitively engaged, etc.) can lead to learning. We expand this approach to consider how different affordances of digital play may support or hinder children's development toward becoming smarter, stronger, and kinder.

Nature of Digital Play

Applying Zosh et al.'s (2018) framework of nondigital play to digital play highlights the increased complexity in delineating the ways in which digital play differs from nondigital play, and affects development differently than nondigital play. Although researchers have argued that noninteractive screen media (e.g., television shows) can serve as social partners, scaffolding children's learning if children respond socially to that particular media (Richert, Robb, and Smith 2011), it remains unclear whether we should categorize a digital game as a social partner. For example, does the digital game take the place of the adult in Zosh et al.'s (2018) framework (i.e., operating as a "digital adult") or is the game a space constrained by a set of rules in which children and adults can play together? For the purpose of this essay, we consider the digital game akin to a social partner (Richert, Robb, and Smith 2011) and as capable of inhabiting the role and characteristics of the "adult" in Zosh et al.'s (2018) play spectrum. We refer to this role as a "digital adult."

Marsh et al. (2016) revised Hughes' (2002) sixteen-type play taxonomy to be applicable for digital tablet apps. Marsh and colleagues filmed twelve preschool children playing popular touch screen apps and transcribed them multimodally (i.e., facial expressions, gestures, and vocal comments), resulting in three common types of play—mastery play, imaginative play, and deep play. In mastery play, children build with blocks (e.g., houses and buildings) in the app and attempt to gain control of their virtual environment similar to gaining

control of a physical environment by building with blocks. In imaginative play, children pretended the game differed from reality: While playing an augmented reality game, children extended the reality or limitations of the app by pretending an animal ran off the screen. In deep play, children experienced risks or a fight for survival: While playing a game called *Temple Run*, children immersed themselves with an avatar who steals an ancient relic and runs from demon monkeys. According to Zosh and her colleagues (2018), these three types of interactive play would correspond with children's initiation of the play activity but may or may not correspond with whether the children or a "digital adult" directs the activity.

To understand the diversity of ways in which digital games can operate as a "digital adult" with children in play, we further consider differences in various kinds of interactivity. The nature of interactive media involves a dialogue between the device and the user—there must be a level of response, feedback, or collaborative problem solving for a digital game to be considered interactive (O'Keefe and Zehnder 2004). Thus, to unpack how digital games may (or may not) make children smarter, stronger, and kinder, we need to understand the affordances that different kinds of interactivity provide for children's play.

Framework of Digital Games Interactivity

Williams (2000) defined interaction as the possibility of action between the user and the information, and he believed the benefits of interactive platforms include a level of openness that offers choices and a range of consequences. We propose that digital games provide four levels of engagement for children's play—receptive interactivity, manipulative interactivity, embodied interactivity, and contingent interactivity. Conceptualizing these levels of interactivity in digital games provides a framework for how interactive game play may be distinct from play with traditional toys or more passive screen media (i.e. watching videos). In addition, these varying levels of interactivity can guide our understanding of how interactive game play can impact children in a wide range of content areas.

Receptive interactivity happens when a child receives information by watching or listening to a source of information in a digital game. Receptive interactivity is associated with a level of cognitive engagement that includes processing and encoding information. Normally, in receptive interactivity, children do not demonstrate behavioral actions such as tapping or dragging objects on

the screen. Receptive interactivity is a form of interactivity similar to watching television and using other devices that transmit information but do not accept information back from the user. Different apps in touch screen devices have borrowed this functionality and work in a mode that allows only for receptive interactivity, such as an e-book story that simply provides audio translation of a text. Receptive interactivity would fall into the playful instruction aspect of Zosh et al.'s (2018) spectrum because the digital adult both initiates the play and directs it.

Manipulative interactivity is associated with physical and explicit behavioral engagement used in devices that primarily rely on touch to manipulate on-screen objects. For example, a puzzle app played on an iPhone might require a child to click, drag, and rotate pieces to complete a game. This is different from embodied interactivity, which represents a higher level of using the body (or parts of the body) to depict and facilitate cognition. Virtual Reality (VR) games or Exergames (i.e., video games that require full-body movements) represent embodied interactivity, because the games are a fully immersive sensorimotor experience. Manipulative and embodied interactivity most often move from free play at the beginning (child initiated, child directed) to either guided play (digital adult initiates specific activities, but child still directs the play) or co-opted play (digital adult takes over direction of play). However, these kinds of interactivity remain fundamentally different because manipulative interactivity requires children to use only their hands or fingers to play the game whereas embodied interactivity requires them to use more of their bodies and often to move their bodies through space.

Contingent interactivity involves reciprocity between the user and a system. An example of contingent interactivity is the kind of experience that a child has when exchanging a meaningful dialogue with an intelligent agent or receiving feedback about learning performance. Contingent interactivity can involve dialogue, exchanged messages, or feedback dependent on previous actions or messages. As with manipulative and embodied interactivity, contingent interactivity likely moves from free play at the beginning (child initiated, child directed) to either guided play (digital adult initiates specific activities, but child still directs the play) or co-opted play (digital adult takes over direction of play).

Gaming and Interactivity in Digital Play

Digital games can vary in their educational or entertainment level, their degree

and nature of interactivity, and their spectrum of play. Two different tablet games that both have manipulative interactivity may support spatial skills for preschoolers using different play approaches. For example, *Toca Blocks,* by Toca Boca allows children to build worlds using interactive blocks but provides little structure creating an open-ended individualized experience. But *Busy Shapes,* by Edoki Academy, helps children develop an awareness of objects as players move through various levels of structured play. Both these digital games fall into the category of "education" in Apple's app store and require mental-rotation and spatial-relationships skills to play. However, *Busy Shapes* comes under the category of guided play with clear goals and objectives, and *Toca Blocks* falls under the category of open-ended explorative play. Although they are different in form, both apps create a play experience that may lead children to learn about shapes.

How can we apply this taxonomy of digital games and types of interactivity to an analysis of the contributions of digital games for preschool children alongside *Sesame Street's* taxonomy in its curriculum and its classifications of goals related to helping children grow smarter, stronger, and kinder? In short, are there digital games today that can contribute to these preschool goals? Before considering how variations in digital games influence child development, we briefly describe the guiding developmental framework outlined by *Sesame Street*'s curriculum goals.

Sesame Street's Curriculum Goals

From inception, *Sesame Street*'s programming and curriculum, guided by educational experts and researchers, focused on young children's development (see Lovato, Lauricella, and Wartella 2017; Fisch and Truglio 2000; Kotler, Truglio, and Betancourt 2016). More than forty years of research conducted on *Sesame Street* has shown which features engage children and lead to greater attention as well as what children learn from the programs (Fisch and Truglio 2000). *Sesame Street* teaches children their letters and numbers, but it also teaches social and life skills, such as how to make healthy choices concerning food and fitness or how to get along with others.

As we have reiterated, the curriculum focuses on the themes of helping preschool children be smarter, stronger, and kinder (Kotler, Truglio, and Betancourt 2016). Decades of research demonstrate how children learn academic

content, such as vocabulary, from the television show *Sesame Street* (See for example Wright et al. 2001). *Sesame Street* also teaches self-regulation and executive functioning skills (e.g. attention, working memory, cognitive flexibility) as part of their smarter curriculum because these skills are also important for school readiness. For example, children can learn self-regulation strategies by viewing episodes in which Cookie Monster practiced self-control and learned how to delay gratification for cookies (Kotler, Truglio, and Betancourt 2016).

In *Sesame Street*'s curriculum, developing stronger children involves teaching children about healthy behaviors and resilience, such as good choices for nutrition, physical activity and hygiene, and using the positive influence of Muppet characters (Lauricella et al. 2011). *Sesame Street*'s kinder curriculum goal promotes prosocial behavior, mindfulness, mutual respect, and conflict resolution. Sesame Workshop has created programs around the world, including in areas of conflict, that promote understanding commonalities between different groups (Cole and Bernstein 2016). For example, Sesame Workshop launched the program *Rruga Sesam/Ulica Sezam* (Albanian/Serbian language) in Kosovo in 2004 during a time of conflict. One of the goals of the program was to encourage viewers to consider things they had in common with children on the other side of the conflict. Compared with children who had not seen the program, children between the ages of five and six who viewed the program demonstrated significant increases in mutual respect and understanding different attitudes (Fluent Research 2008).

The digital game landscape has not been driven by the kind of evidence-based research that *Sesame Street* led the field of educational television in conducting (Sherry 2013). Formative research on the television series examined which features children attended to, which activities they comprehended, and which they enjoyed (Fisch and Truglio 2000). While *Sesame Street* has also extended its curriculum to digital games, there is much more research to be done to understand how this medium best fits into children's play. We briefly review research on smarter, stronger, and kinder focused digital games.

Smarter

When referring to smarter as a goal for children's learning, *Sesame Street* focuses on the developmental factors that lead to cognitive skill acquisition and readiness for school (Wright et al. 2001). Most of the early research on digital games, just like

early research on television, has focused on contributions to children's learning. There are many educational smartphone and tablet applications developed to increase language, literacy, and STEM (science, technology, engineering, and mathematics) skills for preschool children (Callaghan and Reich 2018). Despite educational claims, apps are mostly untested and unregulated in their contribution to learning outcomes (Hirsh-Pasek et al. 2015; Callaghan and Reich 2018). Hirsh-Pasek et al. (2015) provided a framework to help define the types of educational apps that create ideal learning spaces, stating that such apps should follow the Science of Learning call to be active, engaged, meaningful, socially interactive, and have a clear learning goal. These characteristics overlap with the characteristics of play that are known to support learning—such children are actively involved, cognitively engaged, make meaning from the experience, have social partners, iteratively expand the play, and experience joy (Zosh et al. 2018).

One factor relates to whether or not the content of the digital games themselves support cognitive-skill acquisition. Digital games have potential to support smarter curricular goals by focusing on improving academic skills (such as learning letters, numbers, and shapes), on vocabulary and reading, and even on science-related content. A recent meta-analysis by Xie et al. (2018) found an effect of learning from thirty-six studies that compared touch screen groups to groups that did not use touch screens. In addition, researchers coded the studies to incorporate both STEM and non-STEM learning outcomes. Xie et al. (2018) found a stronger effect of learning STEM from touch screens than learning pre-literacy and literacy skills. However, the meta-analysis did not code for the specifics of the children's touch screen activity, which means this meta-analysis did not delineate the digital play environment or interactivity of the apps most supportive of content learning.

How much children enjoy the games and find them meaningful may also affect whether the digital games support the smarter goals (Zosh et al., 2018). Research by Pila et al. (2019) examined whether preschoolers learn coding skills (i.e. the building blocks for computer programming) while playing games designed to teach such skills. One of the games this study used, *Daisy the Dinosaur,* teaches simple coding sequences in which players program the character Daisy to move in a variety of ways. Children learned the specific coding skills with practice, and, importantly, those who liked the game more also learned more.

In addition to its enjoyable and meaningful activities, play with digital games can also support academic learning by keeping children mentally engaged

(Hirsh-Pasek et al. 2015). Critically, not all types of interactivity in digital games promote active mental engagement; some games require only mindless swiping or tapping. These types of digital games may involve manipulative interactivity but not have minds-on engagement necessary for learning through play (see Hirsh-Pasek et al. 2015 for a review).

Sesame Street's smarter curriculum also includes the development of executive functioning skills. Interactive digital games can involve memory, attention, knowledge, and problem solving, therefore they may be able to influence the developmental trajectory of these cognitive functions (Greenfield 1996). Even digital games that are immersive and open-ended have the potential to increase executive functioning, because to play them children must remember rules and make decisions in a goal-directed manner.

Recent research has found that some interactive digital games can influence executive functioning skills for children as young as six years old (Flynn and Richert 2018). However, research has less often examined whether preschool children's executive-functioning or self-regulation can benefit from digital game play. Huber et al. (2016) examined whether four- to six-year-old children improved at problem solving when they worked on a puzzle (i.e., the Tower of Hanoi) on a touch screen app. The Tower of Hanoi, or Tower Test, involves a task used to assess executive functioning for children older than eight and adults (Homack, Lee, and Riccio 2005), therefore practice with this test may also improve executive-functioning skills. Huber and her colleagues found that children improved on the three-dimensional physical version of the Tower of Hanoi equally by practicing on a touch screen as by practicing with the physical version. The touch screen version of this puzzle task uses manipulative interactivity and has a clear goal, and therefore, this research suggests that preschool children can improve their problem-solving skills by playing interactive digital games. However, the researchers did not measure enjoyment or any aspect of the appeal of playing this game.

One recent study explored whether digital games influence young children's executive functioning differently than passive video viewing. Huber et al. (2018) examined changes in two- and three-year-olds' executive function in three different conditions: a noneducational cartoon (*Penguins of Madagascar* excerpt*)*, an educational video (*Sesame Street* excerpt*)*, and an educational app. The app used in this study was *Shiny Party,* in which children play puzzles and games with the educational objective identified as learning shapes and colors. Children using the educational app more than children who watched the noneducational

cartoon improved their delayed gratification and working memory executive-functioning tasks. The game used in this study does not seem especially designed to increase executive-functioning skills as did the Tower of Hanoi. Therefore, this research suggests that the features and interactivity of digital games may have general benefits for executive-functioning skills. Still, only limited research exists in this area and more is needed.

In summary, certain aspects of digital game play seem to support *Sesame Street*'s curricular goal of smarter. As with play in general, digital games that support children's learning are enjoyable, promote active engagement, and feature qualities of manipulative or contingent interactivity. However, evidence suggests that most existing educational digital games for children do not incorporate these features. Callaghan and Reich (2018) coded popular math and literacy apps for preschoolers using categories developmentally appropriate for learning. The researchers found that most of the coded apps had clear learning goals (~80 percent); however very few apps use features that model how to complete the task, provide in-app guidance, offer feedback, or employ adaptive challenges. These features are the kinds of elements of play and interactivity that would most likely support academic learning toward the goal of making children smarter.

Stronger

Screen media is often linked to a sedentary lifestyle for children (American Academy of Pediatrics 2016). Interactive media can certainly contribute to unhealthy lifestyles, but—used correctly—it can also promote healthy behaviors and lifestyles (Baranowski 2016). *Sesame Street* offers an example of how high-quality television programming can positively influence such behaviors. Evidence exists that interactive media can affect children's health and includes a genre called games for health (G4H). A white paper by Baranowski and his colleagues outlined four types of digital games promoting healthy activities: those that increase knowledge; those that change behavior; those that involve behavior change in game play; and those that influence health precursors. Research has found evidence of positive effects in each of these areas, though very little of it focused on children's behaviors, particularly those of children under the age of five.

A body of research has found that active video games or exergames, such as *Wii Fit* or *Just Dance*, can promote physical fitness for children. These games

involve behavioral change through game play because they require the use of gross motor skills to play. We also find a wide range of interactivity within the genre of active video games, ranging from arm and hand movements (i.e., *Wii Sports* games such as boxing, bowling, and tennis) to full body movements (i.e., *Wii Fit*, *EA Sports Active: Personal Trainer*, and *Just Dance*). This interactivity not only requires use of the body—or parts of the body—but also cognition. In a review of eighteen studies about children and exergaming, Biddiss and Irwin (2010) found that exergaming was the equivalent of light to moderate physical activity. Another review of children three to seventeen years old found that active video games acutely increased the amount of light to moderate physical activity (LeBlanc et al. 2013). In a six-week active video game program for youth in a high-poverty neighborhood in New York City (Flynn et al. 2018), the researchers found that about 50 percent of the subjects were overweight or obese. The participants improved in pre-intervention and post-intervention measures of physical fitness as well as in their attitudes towards fitness. They also reported a high level of enjoyment in playing the *Wii Fit* games.

Although less research exists on preschool children and active video games, a recent study by Gao et al. (2018) used an active video game as an eight-week intervention for preschoolers to increase physical activity, motor skills, and perceived competence. Children in the active video game intervention group increased their moderate-to-vigorous physical activity more than a "business as usual" control group. Although evidence shows that these exercise-based games can compare to traditional exercise in helping children become stronger, less research exists on which specific features children enjoy, especially during preschool years (Baranowski 2016).

Active video game play allows for multi-player competitive or cooperative team play, providing an opportunity for physical activity and real social engagement with peers or family members (Marker and Staiano 2015; Staiano and Calvert 2011). Playing these games socially adds another layer of benefit. Older children and adolescents who play these games socially are more motivated and more likely to have higher levels of physical exertion (Marker and Staiano 2015; Staiano and Calvert 2011). There exists very little research on the benefits of parents playing digital games with their preschool children and even less on families playing active video games with their preschool children. Using an online survey Rhodes, Nwachukwu, and Quinlan (2018) found that parents reported they played exergames with their six- to fourteen-year-old children,

especially on weekends, and some research on parent-child play in other content areas has found positive effects. For example, Griffith and Arnold (2019) demonstrated that parenting behaviors related to children's positive engagement and affect while playing educational literacy and math apps. Therefore, we might hypothesize that preschool children have higher levels of enjoyment and benefit from higher levels of physical activity when playing active video games with a positive, engaged, and enthusiastic adult.

Sesame Street's curriculum also emphasizes making healthy food choices. Digital games have the potential to teach children about nutrition and cooking just as passive screen media do. For instance, popular media characters can influence healthy food choices, as well as unhealthy ones (Kraak and Story 2015), although existing research focuses on television advertising. Putnam, Cotto, and Calvert (2018) tested whether the presence of the popular PBS character, Dora the Explorer, in an iPad game could influence four- and five-year-old children's snack choices. Children were placed in one of three conditions: Dora with healthy snacks, Dora with unhealthy snacks, or the digital game without Dora. When children were aware that Dora was in the game, they became more likely to select the snack type, healthy or unhealthy, with which she was associated. However, when asked why they selected a specific food item, children said it was for other reasons, such as liking the item or its taste, not because Dora was on the screen. This research highlights the strong parasocial relationships children form with media characters and indicates that digital games can use these characters to influence behaviors.

Digital game play may have high potential to support *Sesame Street*'s curricular goal of stronger. Active video games have unique affordances to provide embodied interactivity (e.g. whole-body play) and can be enjoyed socially with adults or peers. Both of these aspects fit into the play landscape because they are enjoyable and can promote learning, engaging children actively in a meaningful experience. However, so far research in this area has not focused on children younger than age eight for whom there may exist unique barriers to the influence of digital games on their physical development. Preschoolers, for example, are less able to control their movements with digital game accessories if they are not using touch screens (Flynn and Richert 2015), and adults often express concerns about such children throwing, dropping, or damaging accessories, which limits exposure to this kind of game play. As such, young children may not be able to achieve the degree of embodied interactivity needed to promote healthy physical development.

Kinder

When referring to kinder as a goal for children's learning, *Sesame Street* focuses on the developmental factors that lead to prosocial behavior, including empathy, placing others' needs first, and a sense of social responsibility (Hay 1994). Early childhood proves a critical time for supporting prosocial development, because increases in a sense of self and self-interest may relate to decreases in prosociality before children enter formal schooling (Hay, Payne, and Chadwick 2004). Although little research has specifically examined whether or not digital games support the development of social skills in early childhood, Autcraft, a *Minecraft* server created for children (and adults) with an autism spectrum disorder (ASD), offers an example of how social and emotional development might be promoted in digital games (Nebel, Schneider, and Rey 2016). Autcraft creates a safe social space for *Minecraft* players with ASD. This version of the game designates children as "helpers" who have demonstrated they are responsible and helpful. In addition, there is no tolerance for "bullying, killing, stealing, or griefing" in this version of the game. Games that provide secure, choice-making play can provide a safe environment for learning social skills.

Although recent studies have noted worrisome relationships between the amount of digital game play and emotional and behavioral problems in middle childhood, especially in boys (e.g., Mundy et al. 2017), we hypothesize well-designed digital games have an opportunity to be effective in directly supporting children's developing social skills. Studies have suggested that two- and three-year-olds were kinder to their peers after they are encouraged to talk about their emotions and learn about them (Grazzani et al. 2016). This concept could be applied to digital apps. In addition, many games require elements that support children's developing social skills, such as self-regulation (Williams and Berthelsen 2017), perspective taking, and multiplayer cooperation.

One mechanism through which digital games might promote the development of kindness is by encouraging self-regulation. As related to prosocial behaviors, self-regulation involves both emotional regulation (i.e., the ability to adapt by managing emotional responses; Raver 2002) and attentional regulation (i.e., the ability both to sustain and to switch attention; Blair 2002). As we have discussed, digital games that require cognitive engagement from children have demonstrated positive effects on children's executive functioning (Flynn and Richert 2018). The impact of digital games on children's emotional regulation seems less clear. However, fantastical play (Thibodeau et al. 2016)

and guided play that allows children to direct the play interaction with adult support (Zosh et al. 2018) is linked to increased self-regulation in the preschool years. Rasmussen et al. (2019) found that children who played a *Daniel Tiger's Neighborhood* app, which focused on social and emotional competencies, used its emotional regulation strategies more often than a control group who played an app focused on teaching letters and numbers. Thus, digital games that provide children with the opportunity to build a fantasy world or provide them with structural and emotional support when they become frustrated may facilitate the emotional and attentional regulation skills needed to develop prosocial behaviors.

If digital games encourage children to use their perspective-taking skills they also may promote the development of kindness. A recent meta-analysis found a small, but significant, association between theory of mind development and children's exhibition of helping, cooperating, and comforting behaviors (Imuta et al. 2016). However, other studies have suggested that preschool-aged children do not necessarily notice the analogical connection between themselves and fantasy (or animated) on-screen characters (Richert and Schlesinger 2017). In addition, young children do not readily apply prosocial messages learned in the context of an animated program to social situations outside of that program (Mares and Acosta 2008). Brunik et al. (2016) have argued that digital games may be able to promote children's parasocial, one-sided, emotionally tinged relationships with media characters (Calvert and Richards 2014) by using personalized, contingent intelligent agents—and thereby to promote academic learning through social partnerships (Richert, Robb, and Smith 2011). We hypothesize that digital games can use principles of play to promote children's sense of understanding and empathy with either avatars or on-screen children (and even live children via live streaming). Contingent and embodied interactivity are especially likely to leverage children's social cognition in understanding and responding to the perspectives and experiences of others. Virtual reality may be especially effective at helping children take the perspective of others. Studies have suggested that embodying a virtual avatar of a different age than one's own can reduce negative age stereotypes (Yee and Bailenson 2006).

Because cooperative interaction itself is considered a "kinder" behavior, multiplayer digital games promote this behavior by requiring children to work with team members toward a shared goal. This provides children with valuable experience in working in groups and with others. Studies have found that kindergarten children who engage in cooperative classroom activities

demonstrate more prosocial behaviors like sharing, helping, and taking turns for several weeks after the activity (Chambers 1993; Marantz 1988). One recent study has found that eight-year-olds who played competitive digital games with peers had improved peer relations one year later (Lobel et al. 2019). Thus, digital games that provide contingent interaction and allow children to cooperate with each other toward shared goals could support the development of kinder skills.

Conclusion and Future Directions for Research

Children's participation in different types of play activities has changed over time, even before the increase in digital game play. Hofferth (2009) found that children's sports and outdoors activities declined between 1997 and 2003, predating the ubiquity of mobile touch screens. The decrease in time spent in these activities may have been the result of an increased focus on academics and of safety concerns about children engaging in unmonitored outdoors activity (Hofferth 2009). However, because children after the 1990s engaged in many of the same play activities, Marsh et al. (2016) suggested that digital contexts may have contributed to changes in the nature of play. Although digital play occurs in a different context, it can resemble playing with traditional toys; both involve engagement in exploration and the trying of new things.

Further analysis of how digital games affect children's learning, health, and social emotional development (i.e., smarter, stronger, kinder*)* requires much more research about the actual games available to young children and the games they enjoy playing. Future research should take into account the educational and entertainment value of such games, the nature of the interactivity involved in digital games, and the type of play encountered. Play can consist of goal-oriented or more open-ended exploration. A better examination of digital games would allow for a more focused discussion about how digital games can contribute to making children smarter, stronger, and kinder as the *Sesame Street* curriculum intends. Moreover, the landscape of digital games is rapidly changing, and the onset of virtual reality and augmented reality games will further affect the influence of games on children's development and the world of play. Very little research exists on virtual reality and augmented reality games for preschool children and their likely impact on child gamers. This is an important area for future study. As technological innovations have become increasingly complex and media increasingly pervasive in children's lives, we suggest it is crucial to

understand the features of interactive digital games that have the greatest impact on children's social and cultural environments—and particularly on the nature of play.

A National Science Foundation Collaborative Research Grant helped fund this article and the authors consulted with Ahmed Ibrahim in developing of their ideas.

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