

Screen time and young children: Promoting health and development in a digital world

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Abstract

The digital landscape is evolving more quickly than research on the effects of screen media on the development, learning and family life of young children. This statement examines the potential benefits and risks of screen media in children under 5 years old, focusing on developmental, psychosocial and physical health. Evidence-based guidance to optimize and support children's early media experiences involves four principles: minimizing, mitigating, mindfully using and modelling healthy use of screens. Knowing how young children learn and develop informs best practice strategies for health care providers.

Keywords: Development; Digital media; Health; Infant; Preschool child; Screen time

Background and methodology

Exposure to digital media in Canadian family life is increasing, as are concerns about how screen time affects children and families. This statement examines potential benefits and risks of screen exposure and use on children under 5 years, and provides evidence-based guidance for health professionals to help families. 'Screen time' refers to time spent with any screen, including smart phones, tablets, television, video games, computers or wearable technology. 'Digital media' refers to content transmitted over the Internet or computer networks on all devices, unless particular ones are specified.

A 2016 survey of Canadian Paediatric Society (CPS) members found that parents sought advice about their children's screen time in four main areas: duration

(how much is too much?), setting limits, the effects on health and well-being, and optimal content. A literature search ^[1] into the effects of screen media on children younger than 5 years old included systematic reviews, guidelines and policy statements on screen media exposure and use. Potential benefits and risks were categorized into developmental, psychosocial and physical domains. Recommendations are based on evidence and expert consensus. Screen time in older children and adolescents, children with neurodevelopmental disorders, and environmental health concerns are beyond the scope of this statement.

Why focus on this age group?

Research recognizes important developmental differences between preschool and later childhood, and TV-based data has established that a child's earliest screen encounters can be formative ^{[2][3][4]}.

- They may be habit-forming, and early overexposure increases the likelihood of overuse in later life ^{[4][5]}.
- Health routines, including family media use, are established more easily in early childhood than later on ^[4].
- Screen use tends to increase over time to include more entertainment (versus exclusively educational viewing) ^{[6][7][8]}.

Some important trends are reshaping early childhood:

- Active Healthy Kids Canada reported in 2014 that children 3 to 5 years old spend an average of 2 hours per day in front of screens ^[9]. Only 15% of preschoolers met current Canadian Sedentary Behaviour Guidelines for the Early Years, which

recommend limiting screen time to less than 1 hour per day [10].

- TV still dominates total screen time and appears to be increasing for this age group [11]. Many preschoolers accumulate screen time at home and in child care [5][12], from a variety of screens that are easily transportable.
- In the U.S., rates of mobile media use among 2- to 4-year-olds increased from 39% to 80% between 2011 and 2013 [12]-[15]. A recent U.K. study found that about 51% of infants 6- to 11 months old use a touch screen daily [16].
- A 2012 U.S. study found that the average child between 8 months and 8 years of age is exposed to nearly 4 hours of background TV on a typical day [17].

Impacts of screen media on development

Whether early exposure to screen media changes the developing brain is not known, and published research on how (and how much) children younger than 5 years of age actually learn from screens remains limited [6][18]-[21]. Still, studies show that while babies do not absorb content from TV, it can catch and hold their attention. They can imitate specific actions they see on screen between 6 and 14 months, and remember brief sequences by 18 months [6].

Children begin to understand content by the end of their second year [5][22]. There is solid evidence that infants and toddlers have difficulty transferring new learning from a 2D representation to a 3D object (e.g., from screen to real life) and are unlikely to learn from TV at this age [6][23][24][25]. By contrast, they learn intensely through face-to-face interaction with parents and caregivers. Early learning is easier, more enriching and developmentally more efficient when experienced live, interactively, in real time and space, and with real people [26]-[29].

Potential benefits for development

Beginning at about 2 years, quality TV—well-designed, age-appropriate programs with specific educational goals—can provide an additional route to early language and literacy for children [30]. Quality programming also fosters aspects of cognitive development, including positive racial attitudes and imaginative play [31]. Early evidence suggests that interactive media, specifically applications that involve contingent responses from an adult (i.e., timely

reactions to what a child says or does), can help children retain taught information. This responsiveness, when coupled with age-appropriate content, timing and intensity of action, can teach new words to 24-month-olds [21][22][32]. There is early evidence that interactive ‘learn-to-read’ apps and e-books can build early literacy by providing practice with letters, phonics and word recognition [21][33]. However, while screens may help with language learning when quality content is co-viewed and discussed with a parent or caregiver [34], preschoolers learn best (i.e., in expressive and vocabulary terms) from live, direct and dynamic interactions with caring adults [35].

Risks for development

Research examining TV exposure has demonstrated associations, although not direct causal relationships, between heavy early screen exposure (more than 2 hours/day by infants less than 12 months old in one study) and significant language delays[26,36]. Evidence of an association between screen time and attentional difficulties is mixed, with negative effects only clearly apparent when exposure is extremely high (i.e., more than 7 hours/day) [6][37]. High exposure to background TV has been found to negatively affect language use and acquisition, attention, cognitive development and executive function in children under 5 years old. It also reduces the amount and quality of parent-child interaction and distracts from play [17][22][35][38]. While e-books have been shown to offer benefits with children’s reading engagement, parents appear to use fewer reading strategies during these interactions. Further, e-book sound effects and animation can interfere with story comprehension and event sequencing in preschoolers, when compared with paper books [21][39]-[42].

Some studies associate prolonged TV viewing with lower cognitive abilities, especially related to short-term memory, early reading and math skills, and language development [12][20][43][44][45]. Fast-paced or violent content can negatively impact executive function[5,46], and these effects may be cumulative. The inability of young children (especially those under 2 years old) to distinguish everyday reality from what happens on screen, along with their efforts to make sense of competing experiential realms, may interfere with and impede executive function [6][47].

What makes the difference? Minimizing and mitigating screen time

Because there are no proven benefits of media exposure for infants and toddlers, and some known developmental risks [20][22][26][48], counsel parents to

minimize young children’s screen time. Minimizing screen time leaves more time for face-to-face interactions, which is how young children learn best.

When children watch educational, age-appropriate content with an engaged adult, screen time can be a positive learning experience. When adults **mitigate** screen time, they:

- Watch with children. Adults can connect what is being viewed with real life, and build language and cognitive skills, such as attention, memory and thinking [6][38][49]. Shared screen time also avoids the disadvantages of solitary viewing.
- Actively curate children’s screen activities by prioritizing educational content or apps, avoiding mainstream or commercial programs, and using a media classification rating (e.g., the Canadian Home Video Rating System) to guide viewing choices.
- Combine touch screen use with creative or active play [50].

Although a ‘digital divide’ between households with and without Internet access persists in Canada, learning apps on mobile devices may help bridge the gap [12]. In 2016, the Canadian Radio-television and Telecommunications Commission pledged to provide Internet access as a basic service for all Canadians [11]. However, even as screen-based educational content becomes increasingly accessible to all families, a new gap may be opening. Children whose parents have the ability to mentor and curate screen encounters may reap benefits that are less accessible in families with fewer financial resources or parents who cannot be as involved. Health providers should be alert to this gap, which may be reflected in other parent-child interactions [51].

The psychosocial impacts of screen media

Co-viewing quality screen content can affect more than children’s learning. Studies have shown that parents can positively influence children’s social adaptive skills, sleep patterns and behaviours by being involved with and setting limits on their screen time [22][52]. Television research shows that socio-economic factors can shape the content and mediation of screen use. Further, TV viewing has been found to be negatively associated with school readiness skills, especially as family income decreases [53]. However, the time spent viewing—across diverse middle-income households,

for example—is stable [6][7][12]. In fact, socio-economic status appears to have little bearing on the degree to which families comply with current screen guidelines [54]. Raising awareness around how children learn best and their need for screen time limits is important for all families, regardless of economic circumstances.

Potential psychosocial benefits

Quality content can enhance social and language skills for all children 2 years and older, particularly for children living in poverty or who are otherwise disadvantaged [26][30]. Educational TV reaches children in lower-income homes almost as much as higher-income homes, and among children whose families own a laptop or mobile device, barriers to accessing and using educational content have almost disappeared [12]. Well designed, age-appropriate educational programs and screen activities can be powerfully pro-social, helping children to learn antiviolence attitudes, empathy, tolerance and respect [31][55]. Appropriately used, screen time can calm a child who is overexcited or distressed (e.g., during a medical procedure) [15][56]. But screen learning can affect behaviour both positively and negatively, so ensuring quality content is crucial [57].

Developing a family “media action plan” can help protect and reinforce quality family time [58]. Ideally, planning begins prenatally, accounts for the health, education and entertainment needs of each child and family, includes screen-based activities in child care, and is reviewed periodically. Setting meaningful limits when children are young and sharing them as a family is far easier than cutting back screen time when children are older. Studies have found that parents’ comfort level with saying ‘no’ to their children’s requests to play games on screen, along with their own media-related beliefs, intentions and attitudes, are key components of constructive, positive limit-setting [4][52][59]. For children—and parents—off-screen time is critical for developing essential life skills such as self-regulation [60], creativity and learning through physical and imaginative play.

Psychosocial risks

Recent studies confirm a strong association between parents’ screen time and that of their children [13], raising concerns that increasing media presence is displacing quality (face-to-face) parent-child and family interactions [12]. A recent study of smartphone use in fast-food restaurants observed that as time spent by parents on their phones increased, so too did the likelihood of children acting out to gain attention, often leading to negative interactions [6][61]. Another study

found that parents who allow 1- to 4-year-old children to use their smartphones frequently also report offering the phone to reward or distract more often. Consequently, their children ask for the phone—and become upset if refused—more often [15].

Parents report that their own use of mobile technology demands more intense attention than other distractions, such as reading books or watching TV. Smartphones blur the line between work and home life, timing is unpredictable, and responding often requires emotional investment. In a recent study, parents reported that shifting attention between screens and family life can be stressful, tiring and reduces their ability to interact ‘in the moment’ with children [62].

Recent evidence suggests an association between elevated levels of TV exposure at age 2 and self-reported victimization, social isolation, proactive aggression and anti-social behaviours in middle childhood [63][64]. Excessive TV viewing (more than 2 hours/day) has been clearly associated with early childhood self-regulation difficulties [26][60]. Such effects could be more pronounced in children with special behavioural needs, and self-perpetuating because parents are more likely to use screen media to pacify a child with challenging behaviours [22][60]. Research shows that excessive levels of screen media exposure are associated more strongly with low levels of stimulation in the home and low parental involvement than with socio-economic position [6][12][65].

A large-scale U.S. study from 2013 found that the spread of mobile devices did not appear to affect the amount or frequency of reading to young children. However, it also found that reading was the least-common activity children engaged in on tablets or mobile devices [12]. Other studies suggest that parents found reading to their child from an e-book to be a less positive experience than sharing a paper book, from both fun and learning perspectives [66,67]. Even the most interactive e-books do not support skills like page-turning, and cannot provide the same sensory experiences as traditional books[37][68], which can be affectionately dragged around, manipulated and chewed.

While quality educational programming is a leading mitigator of psychosocial risk on any screen, studies show that children’s access to and choice of optimal content peaks early: at 2 to 4 years old [7][8][12]. As children age, they are more likely to view entertainment programming.

What makes the difference? Mindful use of screen time

Children younger than 5 years old learn best from live, immersive interactions with family members and caregivers. Given the choice, they will nearly always opt for talking, playing or being read to over screen time in any form [22]. By using screen time **mindfully**, parents and caregivers:

- Actively enhance—and limit—media encounters by choosing them together and purposefully (“Let’s watch or play this content, at this time, for this reason”).
- Limit screen use in public places and during family routines, such as at meals. Family times are prime opportunities for social learning.
- Select content from quality, non-commercial sources, to minimize exposure to advertising.
- Pay attention to messages about gender, body image, violence, diversity and social issues when choosing content.(69)

The impacts of screen media on physical health

For preschool children, physical activity is associated with improved measures of health, while sedentary behaviour is associated with less favourable health outcomes [70].

Potential benefits for physical health

Children’s screen time does not have to be passive; digital media use can encourage and complement physical activity [51]. Especially after age 3, children respond to activity-based programming when it is fun, designed for them and encourages imitation or participation [39][71]. One study found that active video games could acutely increase light-to-moderate or moderate-to-vigorous physical activity (PA) in the short term [72]. Families and child care programs may consider using fun, age-appropriate movement (e.g., yoga or dance) and fitness apps or console games to integrate more PA into daily routines [51][73][74]. Mobile devices with apps for exploring the natural world can enhance outdoor PA [50]. Quality content connects on- with off-screen experiences, fosters engagement with caregivers and peers, and supports active, imaginative play [51][75][76]. One 2010 study found that while time spent watching commercial TV was significantly correlated with BMI, time spent watching non-commercial educational TV was not [77].

Risks for physical health

Although evidence for an association between screen time and body mass index in very young children is inconclusive, several studies have suggested that risks for overweight established by early screen use can persist into later life [2]-[6][12][78][79]. TV viewing in the early years can become routine, placing children who are heavy viewers at higher risk for being sedentary or overweight [35]. One 2012 Canadian study found that children who watched just 1 hour of TV/day were 50% more likely to be overweight than those who watched less [80]. Another study from 2009 measuring PA and body fat in middle-class preschoolers linked TV viewing to higher body fat, and found this relationship did not change when children's variable PA rates were taken into account [81].

While reinforcing sedentary behaviours, commercial TV also exposes children to advertisements for unhealthy foods and encourages snacking, which increases overall food intake [82][83]. A 2012 systematic review of TV watching and adverse dietary effects in children 2 to 6 years old found most studies reported negative effects with as little as one hour/day of viewing [84].

The amount of time spent viewing screens before bedtime is associated with an increase in sleep problems for this age group [6,85], and evidence suggests that volume of screen time—rather than content alone—is detrimental to sleep patterns [45][53][86][87]. The presence of any electronic device in a bedroom is associated with fewer minutes of sleep per night, due in part to melatonin suppression [26][85].

What makes the difference? Modelling screen time

Children younger than 5 years old require active play and quality family time to develop essential life skills, such as language, self-regulation and creative thinking. Regardless of age, children should not have to compete with screens for parental attention. **When parents model** healthy screen habits, they:

- Minimize their own screen use when young children are present, especially for mealtimes, play and other prime opportunities for social learning.
- Prioritize interactions with children through conversation, play and healthy, active routines.

- Choose when to use media together, and turn off screens when they are not in use.
- Help children to recognize and question advertising messages, stereotyping and other problematic content, and ensure that media used in the presence of children is free of such content.

Recommendations

To promote child health and development in a digital world, physicians and other health care providers should counsel parents and caregivers of young children on the appropriate use of screen time. Specific recommendations include the following:

Minimize screen time:

- Screen time for children under 2 years old is not recommended.
- For children 2 to 5 years, limit routine or regular screen time to under 1 hour per day.
- Ensure that sedentary screen time is not a routine part of child care for children younger than 5 years old.
- Maintain daily 'screen-free' times, especially for family meals and book-sharing.
- Avoid screens for at least one hour before bedtime, given the potential for melatonin-suppressing effects.

Mitigate (reduce) the **risks** associated with screen time:

- Be present and engaged when screens are used and, whenever possible, co-view with children.
- Be aware of content and prioritize educational, age-appropriate and interactive programming.
- Use parenting strategies that teach self-regulation, calming and limit-setting.

As a family, **be mindful** about the use of screen time:

- Conduct a self-assessment of current screen habits and develop a family media plan for when, how and where screens may (and may not) be used.
- Help children recognize and question advertising messages, stereotyping and other problematic content.

- Remember: Too much screen time means lost opportunities for teaching and learning.
- Be reassured that there is no evidence to support introducing technology at an early age.

Adults should model healthy screen use:

- Choose healthy alternatives, such as reading, outdoor play and creative, hands-on activities.
- Turn off their devices at home during family time.
- Turn off screens when not in use and avoid background TV.

10 questions to consider asking families with young children

1. What kind of screens are in your home (e.g., TV, tablet, computer, smartphone)? Which does your child use?
2. Is watching TV or programs/movies on other devices a shared family activity and a common way to relax? How often is a screen on in the background although no one is really watching?
3. Does anyone in the family use screens during mealtimes?
4. What do you watch with your child? What does your child watch alone?
5. Do you encourage or discourage conversation with your child while you are using screens?
6. Do you ever watch adult/commercial programming with your child?
7. Does your child use screens while you do chores around the home? Often? Sometimes?
8. Are there any screen-based activities in your child's day care program? Do you know how much these are used?
9. Does your child use any kind of screen before bedtime? How long before bedtime? Is there a TV or computer in your child's bedroom? Does your child take mobile devices into the bedroom?
10. Does your family have rules or guidelines for screen use that everyone understands and shares?

Information for parents is available at www.caringforkids.cps.ca

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References

1. McGowan J. A summary of literature: Benefits and harms associated with screen use in children under 5; Prepared for the Canadian Paediatric Society's Digital Health Task Force, April 2016.
2. Kostyrka-Allchorne K, Cooper NR, Simpson A. The relationship between television exposure and children's cognition and behaviour: A systematic review. *Developmental Review* (2017): <http://dx.doi.org/10.1016/j.dr.2016.12.002> (Accessed April 11, 2017).
3. Hoyos Cillero I, Jago R. Systematic review of correlates of screen-viewing among young children. *Prev Med* 2010;51(1):3-10.
4. Hamilton K, Spinks T, White KM, Kavanagh DJ, Walsh AM. A psychosocial analysis of parents' decisions for limiting their young child's screen time: An examination of attitudes, social norms and roles, and control perceptions. *Br J Health Psychol* 2016;21(2):285-301.
5. Duch H, Fisher EM, Ensari I, Harrington A. Screen time use in children under 3 years old: A systematic review of correlates. *Int J Behav Nutr Phys Act* 2013;10:102.
6. Lerner C, Barr R. Screen sense: Setting the record straight; Research-based guidelines for screen use for children under 3 years old. *Zero to Three* 2014: <https://www.zerotothree.org/resources/series/screen-sense-setting-the-record-straight> (Accessed April 11, 2017).
7. Linebarger DL, Barr R, Lapierre MA, Piotrowski JT. Associations between parenting, media use, cumulative risk, and children's executive functioning. *J Dev Behav Pediatr* 2014;36(6):367-77.
8. Anderson DR, Huston AC, Schmitt KL, Linebarger DL, Wright JC. Early childhood television viewing and adolescent behaviour: The recontact study. *Monogr Soc Res Child Dev* 2001;66(1):i-viii,1-147.
9. Active Healthy Kids Canada, 2014. Report on physical activity: Is Canada in the running? 10th edn.:43: www.participaction.com/sites/default/files/downloads/

- Participaction-2014FullReportCard-CanadaInTheRunning_0.pdf (Accessed April 11, 2017).
10. ParticipACTION, 2016. Are Canadian kids too tired to move? The ParticipACTION report card on physical activity for children and youth: www.participaction.com/reportcardn (Accessed April 11, 2017).
 11. Canadian Radio-television and Telecommunications Commission. Communications monitoring report, 2016:149. Ottawa, Ont.: www.crtc.gc.ca/eng/publications/reports/PolicyMonitoring/2016/cmr.pdf (Accessed April 11, 2017).
 12. Common Sense Media. Zero to eight: Children's media use in America 2013; A Common Sense research study: www.commonsensemedia.org/research/zero-to-eight-childrens-media-use-in-america-2013 (Accessed April 11, 2017).
 13. Lauricella AR, Wartella EA, Rideout VJ. Young children's screen time: The complex role of parent and child factors. *Journal of Applied Developmental Psychology* 2015;36:11-17.
 14. Vanderwater EA, Rideout VJ, Wartella EA, Huang X, Lee JH, Shim MS. Digital childhood: Electronic media and technology use among infants, toddlers and preschoolers. *Pediatrics* 2007;119(5):1006-15.
 15. Roy R, Paradis G. Smartphone use in the daily interactions between parents and young children. Philadelphia, PA: Society for Research in Child Development (poster) 2015: https://www.csustan.edu/sites/default/files/groups/Child%20Development/srcd_poster_2015_smartphones.pdf (Accessed April 11, 2017).
 16. Cheung CHM, Vota W; LSE Department of Media and Communications. What are the effects of touchscreens on toddler development?: <http://blogs.lse.ac.uk/parenting4digitalfuture/2016/12/28/what-are-the-effects-of-touchscreens-on-toddler-development/> (Accessed April 11, 2017).
 17. Lapierre MA, Piotrowski JT, Linebarger DL. Background television in the homes of U.S. children. *Pediatrics* 2012;130(5):839-46.
 18. Wartella EA, Richert RA, Robb MB. Babies, television and videos: How did we get here? *Developmental Rev* 2010;30:116-27.
 19. Wartella EA, Lauricella AR. Should babies be watching television and DVDs? *Pediatr Clin North Am* 2012;59(3): 613-21, vii.
 20. Lin LY, Cherng RJ, Chen YJ, Yang HM. Effects of television exposure on developmental skills among young children. *Infant Behav Dev* 2015;38:20-6.
 21. Radesky JS, Schumacher J, Zuckerman B. Mobile and interactive media use by young children: The good, the bad, and the unknown. *Pediatrics* 2015;135(1):1-3.
 22. Courage ML, Howe ML. To watch or not to watch: Infants and toddlers in a brave new electronic world. *Developmental Rev* 2010;30(2):101-15.
 23. Klein-Radukic S, Zmyj N. The relation between contingency preference and imitation in 6-8-month-old infants. *Int J Behavioral Development* 2016;40(2): 173-80.
 24. Moser A, Zimmerman L, Dickerson K, Grenell A, Barr R, Gerhardstein P. They can interact, but can they learn? Toddlers' transfer learning from touchscreens and television. *J Exp Child Psychol* 2015;137:137-55.
 25. Barr R. Transfer of learning between 2D and 3D sources during infancy: Informing theory and practice. *Dev Rev* 2010;30(2):128-54.
 26. American Academy of Pediatrics, Council on Communications and Media. Media and young minds. *Pediatrics* 2016;138(5):pii:e20162591.
 27. Elliot L. What's Going On in There? How the Brain and Mind Develop in the First Five Years of Life. New York, N.Y.: Bantam Books, 2000.
 28. Hewes J. Voices from the field: Learning through play: A view from the field. *Encyclopedia on Early Childhood Development*, 2010: www.child-encyclopedia.com/sites/default/files/docs/perspectives/hewesangps.pdf (Accessed April 11, 2017).
 29. Christie JF, Roskos KA. Play's potential in early literacy development. In: Tremblay RE, Barr RG, Peters RDeV, Boivin M, eds. *Encyclopedia on Early Childhood Development*. Montreal, Que.: Centre of Early Childhood Development, rev. June 2013: www.child-encyclopedia.com/play/according-experts/plays-potential-early-literacy-development (Accessed April 11, 2017).
 30. Linebarger DL, Vaala SE. Screen media and language development in infants and toddlers: An ecological perspective. *Developmental Review* 2010;30(2): 176-202.
 31. Thakkar RR, Garrison MM, Christakis DA. A systematic review for the effects of television viewing by infants and preschoolers. *Pediatrics* 2006;118(5):2025-31.
 32. Roseberry S, Hirsh-Pasek K, Golinkoff RM. Skype me! Socially contingent interactions help toddlers learn language. *Child Dev* 2014;85(3):956-70.
 33. Kucirkova N. iPads in early education: Separating assumptions and evidence. *Frontiers in Psychology* 2014;5(article 715):1-3.
 34. Linebarger DL, Walker D. Infants' and toddlers' television viewing and language outcomes. *American Behavioral Scientist*, 2005;48(5):624-45.
 35. Courage ML, Setliff AE. When babies watch television: Attention-getting, attention-holding, and the implications for learning from video material. *Developmental Review* 2010;30(2):220-38.
 36. Chonchaiya W, Pruksananonda C. Television viewing associates with delayed language development. *Acta Paediatr* 2008;97(7):977-82.
 37. Zimmerman FJ, Christakis DA. Associations between content types of early media exposure and subsequent attentional problems. *Pediatrics* 2007;120(5):986-92.
 38. Lillard AS, Li H, Boguszewski K. Television and children's executive function. *Adv Child Dev Behav* 2015;48:219-48.
 39. Moody AK, Justice LM, Cabell SQ. Electronic versus traditional storybooks: Relative influence on preschool

- children's engagement and communication. *Journal of Early Childhood Literacy* 2010;10(3):294-313.
40. Parish-Morris J, Mahajan N, Hirsh-Pasek K, Michnick Golinkoff R, Fuller Collins M. Once upon a time: Parent-child dialogue and storybook reading in the electronic era. *Mind, Brain and Education* 2013;7(3):200-11.
 41. Reich SM, Yau JC, Warschauer M. Tablet-based ebooks for young children: What does the research say? *J Dev Behav Pediatr* 2016;37(7):585-91.
 42. Estevez-Menendez M, An H, Strasser J. The effects of interactive multimedia iPad E-books on preschoolers' literacy. In: An H, Alon S, Fuentes D, eds. *Tablets in K-12 Education: Integrated Experiences and Implications*. Hershey, PA: IGI Global, 2014.
 43. Barr R, Lauricella AR, Zack E, Calvert SL. The relation between infant exposure to television and executive functioning, cognitive skills, and school readiness. *Merrill-Palmer Quarterly* 2010;56:21-48.
 44. Zimmerman FJ, Christakis DA. Children's television viewing and cognitive outcomes: A longitudinal analysis of national data. *Arch Pediatr Adolesc Med* 2005;159(7):619-25.
 45. Tomopoulos S, Dreyer BP, Berkule S, Fierman AH, Brockmeyer C, Mendelsohn AL. Infant media exposure and toddler development. *Arch Pediatr Adolesc Med* 2010;164(12):1105-11.
 46. Lilliard AS, Peterson J. The immediate impact of different types of television on young children's executive function. *Pediatrics* 2011;128(4):644-49.
 47. Li H, Boguszewski K, Lillard AS. Can that really happen? Children's knowledge about the reality status of fantastical events in television. *J Exp Child Psychol* 2015;139:99-114.
 48. Courage ML, Troseth GL. Infants, toddlers and learning from screen media. *Encyclopedia on Early Childhood Development: Technology in Early Childhood Education*, November 2016: www.child-encyclopedia.com/sites/default/files/textes-experts/en/4738/infants-toddlers-and-learning-from-screen-media.pdf (Accessed April 11, 2017).
 49. Mendelsohn AL, Brockmeyer CA, Dreyer BP, Fierman AH, Berkule-Silberman SB, Tomopoulos S. Do verbal interactions with infants during electronic media exposure mitigate adverse impacts on their language development as toddlers? *Infant Child Dev* 2010;19(6):577-93.
 50. Marsh J, Plowman L, Ymada-Rice D. et al. Exploring play and creativity in pre-schoolers' use of apps: A report for early years practitioners: www.techandplay.org/reports/TAP_Early_Years_Report.pdf (Accessed April 11, 2017).
 51. U.S. Department of Education; U.S. Department of Health and Human Services. Early learning and educational technology brief, October 2016: <http://tech.ed.gov/earlylearning> (Accessed April 11, 2017).
 52. Gentile DA, Reimer RA, Nathanson AI, Walsh DA, Eissenmann JC. Protective effects of parental monitoring of children's media use: A prospective study. *JAMA Pediatr* 2014;168(5):479-84.
 53. Ribner A, Fitzpatrick C, Blair C. Family socioeconomic status moderates associations between television viewing and school readiness skills. *J Dev Behav Pediatr* 2017 38(3):233-9.
 54. Hinkley T, Salmon J, Okely AD, Crawford D. The correlates of preschoolers' compliance with screen recommendations exist across multiple domains. *Prev Med* 2013;57(3):212-9.
 55. Kirkorian HL, Wartella EA, Anderson DR. Media and young children's learning. *Future Child* 2008;18(1):39-61.
 56. McQueen A, Cress C, Toth A. Using a tablet computer during pediatric procedures: A case series and review of the 'apps'. *Pediatr Emerg Care* 2012;28(7):712-4.
 57. Christakis DA, Garrison MM, Herrenkohl T, et al. Modifying media content for preschool children: A randomized controlled trial. *Pediatrics* 2013;131(3):431-8.
 58. American Academy of Pediatrics, Family media plan: www.healthychildren.org/English/media/Pages/default.aspx (Accessed April 11, 2017).
 59. Nikken P, Schols M. How and why parents guide the media use of young children. *J Child Fam Stud* 2015;24(11):3423-35.
 60. Radesky JS, Silverstein M, Zuckerman B, Christakis DA. Infant self-regulation and early childhood media exposure. *Pediatrics* 2014;133(5):e1172-8.
 61. Radesky JS, Kistin CJ, Zuckerman B, et al. Patterns of mobile device use by caregivers and children during meals in fast food restaurants. *Pediatrics* 2014;133(4):e843-9.
 62. Radesky JS, Kistin C, Eisenberg S, et al. Parent perspectives on their mobile technology use: The excitement and exhaustion of parenting while connected. *J Dev Behav Pediatr* 2016;37(9):694-701.
 63. Pagani LS, Lévesque-Seck F, Fitzpatrick C. Prospective associations between televiewing at toddlerhood and later self-reported social impairment at middle school in a Canadian longitudinal cohort born in 1997/1998. *Psychol Med* 2016;46(6):3329-37.
 64. Livingstone S, Smith PK. Annual research review: Harms experienced by child users of online and mobile technologies: The nature, prevalence and management of sexual and aggressive risks in the digital age. *J Child Psychol Psychiatry* 2014;55(6):635-54.
 65. Mistry KB, Minkovitz CS, Strobino DM, Borzekowski DL. Children's television exposure and behavioural and social outcomes at 5.5 years: Does timing of exposure matter? *Pediatrics* 2007;120(4):762-9.
 66. Roy R, Paradis G. Parents' perceptions of book versus tablet shared reading experiences. Society for Research in Child Development 2015 (poster): www.csustan.edu/sites/default/files/groups/Child%20Development/srcd_poster_2015_-_book_vs_tablet_1.pdf (Accessed April 11, 2017).
 67. Sosa AV. Association of the type of toy used during play with the quantity and quality of parent-infant communication. *JAMA Pediatr* 2016;170(2):132-7.

68. Korat O, Tal O. How new technology influences parent-child interaction: The case of e-book reading. *First Language* 2010;30(2):139-54.
69. Common Sense Media, 2015. Children, teens, media and body image: A Common Sense Media research brief: www.commonsensemedia.org/research (Accessed April 11, 2017).
70. Garriquet D, Carson V, Colley RC, Janssen I, Timmons BW, Tremblay MS. Physical activity and sedentary behaviour of Canadian children aged 3 to 5. *Health Rep* 2016;27(9):12-23.
71. Anderson DR, Hanson KG. From booming, buzzing confusion to media literacy: The early development of television viewing. *Developmental Rev* 2010;30(2): 239-55.
72. LeBlanc AG, Chaput JP, McFarlane A, et al. Active video games and health indicators in children and youth: A systematic review. *PLoS One* 2013;57(3):212-9.
73. Vanderloo LM. Screen-viewing among preschoolers in childcare: A systematic review. *BMC Pediatrics* 2014;14:205.
74. Best Start, Have a ball together: <http://haveaballtogether.ca/> (Accessed April 11, 2017).
75. National Association for the Education of Young Children and the Fred Rogers Center for Early Learning and Children's Media. Technology and interactive media as tools in early childhood programs serving children from birth through age 8. Position statement, January 2012: www.naeyc.org/files/naeyc/file/positions/PS_technology_WEB2.pdf (Accessed April 11, 2017).
76. Takeuchi LM. Families matter: Designing media for a digital age. N.Y.: The Joan Ganz Cooney Center at Sesame Workshop: <http://joanganzcooneycenter.org/Reports-29.html> (Accessed April 11, 2017).
77. Zimmerman FJ, Bell JF. Associations of television content type and obesity in children. *Am J Public Health* 2010;100(2):334-40.
78. Downing KL, Hnatiuk J, Hesketh KD. Prevalence of sedentary behavior in children under 2 years: A systematic review. *Preventive Medicine* 2015;78:105-14.
79. Hinkley T, Salmon J, Okely AD, Trost SG. Correlates of sedentary behaviours in preschool children: A review. *Int J Behav Nutr Phys Act* 2010;7:66.
80. Shenouda N, Timmons BW. Preschool focus: Physical activity and screen time. Hamilton, Ont. Child health and exercise medicine program. McMaster University, Issue 5, January 2012: <https://fhs.mcmaster.ca/chemp/documents/PreschoolerFocusIssue5ScreenTime-updatedSECURED.pdf> (Accessed April 11, 2017).
81. Jackson DM, Djafarian K, Stewart J, Speakman JR. Increased television viewing is associated with elevated body fatness but not with lower total energy expenditure in children. *Am J Clin Nutr* 2009;89(4):1031-6.
82. AAP Council on Communications and Media; Strasburger VC. Children, adolescents, obesity, and the media. *Pediatrics* 2011;128(1):201-8; erratum 128(3): 594.
83. Hingle M, Kunkel D. Childhood obesity and the media. *Pediatr Clin North Am* 2012;59(3):677-92,ix.
84. Ford C, Ward, D, White M. Television viewing associated with adverse dietary outcomes in children ages 2-6. *Obes Rev* 2012;13(12):1139-47.
85. Cheung CH, Bedford R, Saez De Urabain IR, Karmiloff-Smith A, Smith TJ. Daily touchscreen use in infants and toddlers is associated with reduced sleep and delayed sleep onset. *Sci Rep* 2017;7:46104.
86. Garrison MM, Christakis DA. The impact of a healthy media use intervention on sleep in preschool children. *Pediatrics* 2012;130(3):492-9.
87. Nathanson AI, Fries PT. Television exposure, sleep time, and neuropsychological function among preschoolers. *Media Psychology* 2014;17(3):237-61.

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