

Active versus Passive Screen Time for Young Children

Penelope Sweetser, Daniel Johnson, Anne Ozdowska, Peta Wyeth

Queensland University of Technology

penny.sweetser@qut.edu.au

Keywords

Screen Time, children, video games, health

Abstract

In this paper, we report some initial findings from our investigations into the Australian government's Longitudinal Study of Australian Children data set. It is revealed that the majority of Australian children are exceeding the government's Screen Time recommendations and that most of their Screen Time is spent as TV viewing, as opposed to video game play or computer use. In light of this finding, we review the body of research surrounding children's engagement in Screen Time activities and the associated positive and negative effects. Based on existing evidence, we define two categories of Screen Time – Active Screen Time and Passive Screen Time. It is proposed that this distinction provides a more accurate classification of Screen Time and a more informative lens through which to consider the associated benefits and detrimental effects for young children.

Introduction

The Australian Government provides recommendations for the amount of Screen Time that children should be exposed to, in the *Get Up and Grow* publication released by the Department of Health and Ageing (Australian Government, 2011). This publication recommends that children up to two years of age engage in no Screen Time and that children aged two to five years engage in less than one hour of Screen Time per day. These recommendations are similar to (and were in part based on) those of the American Academy of Pediatrics (AAP, 2001).

Screen Time is defined as the viewing or use of anything with a screen, including TV, DVDs, video games, and computers. The Australian government's recommendations stipulate that "For toddlers and pre-schoolers, long periods of screen-time mean less opportunity for active, outdoor and creative play, and fewer of the associated benefits. It also leads to less healthy eating habits, and slower development of language, memory and thinking skills" (Australian Government, 2011). These recommendations suggest that all Screen Time activities are physically and cognitively sedentary. However, there is an increasing body of research that illustrates how certain types of Screen Time can increase children's physical and cognitive activity and that there can be associated benefits for children's health and development.

In this paper, we present some early findings on the Screen Time usage of young children in Australia, drawn from the Longitudinal Study of Australian Children data set, collected by the Australian government. We compare these findings to the government's Screen Time recommendations and raise some key questions that will direct future work in the area. We also define two categories of Screen Time – Active Screen Time and Passive Screen Time. We believe that this distinction provides a more accurate classification of Screen Time and a more informative means of viewing the associated positive and negative effects for young children.

Longitudinal Study of Australian Children

In 2004, the Australian Institute of Family Studies began the first wave of data collection for the Longitudinal Study of Australian Children (LSAC). The LSAC has collected four waves of data over seven years (2004 to 2010) for children aged zero-to-one years (B Cohort, n= 5107) and children aged four-to-five years (K Cohort, N= 4983) in 2004. Participants in the study include the child's parents, childcare providers, teachers, and the child. The sample of Australian children was selected randomly from the Australian Medicare database.

Data for both cohorts has been collected using a combination of interviews, mail back questionnaires, time-use diaries, and interviewer observations. Interviews are conducted both face to face and over the telephone. Families are visited once every two years and questionnaire responses and direct observations are recorded. Observations include the child's height, weight, blood pressure, and a cognitive assessment. Families can also be contacted in-between interviewing years and asked to complete short mail-out questionnaires.

Screen Time Habits of Australian Children

Early investigations of the LSAC data set revealed that the majority of children between ages two and five are exceeding the government's recommendations of less than one hour Screen Time per day (see Table 1). Moreover, it was found that most of the children's Screen Time was spent as TV/DVD viewing, as opposed to video game play or computer use (see Table 2).

Table 1. Percentage of children aged two to five years that exceeded Australian recommendations for Screen Time and mean daily Screen Time.

Cohort	Age	Year	Weekday		Weekend	
			≥1hr	Mean	≥1hr	Mean
B2	2-3	2006	85%	1:58	77%	1:42
B3	3-4	2007	74%	1:59	84%	2:17
B4	4-5	2008	89%	3:34	90%	2:45
K4	4-5	2004	83%	-	79%	-

Table 2. Mean TV, Computer (Com.) and Video Game play (VG) time per weekday and weekend day.

Cohort	Age	Year	Weekday			Weekend		
			TV	VG	Com.	TV	VG	Com.
B2	2-3	2006	1:58	-	-	1:42	-	-
B3	3-4	2007	1:50	0:06	0:17	2:03	0:05	0:09
B4	4-5	2008	3:08	0:09	0:17	2:10	0:16	0:19
B5	5-6	2009	1:31	0:15	0:15	3:19	0:47	0:37
B6	6-7	2010	1:33	0:15	0:20	2:37	0:50	0:38
K6	6-7	2006	1:37	0:10	0:20	2:25	0:29	0:36
K8	8-9	2008	1:41	0:17	0:26	2:37	0:53	0:47
K9	9-10	2009	1:39	0:19	0:28	2:38	1:02	1:03
K10	10-11	2010	1:49	0:20	0:41	2:57	1:02	1:10

Active versus Passive screen time

Current Screen Time recommendations are made based on the sum of all screen-related activities. However, there is emerging evidence that suggests that computer use and video game play should not be classed as the same type of activity as TV viewing.

Children's metabolic and physiologic responses to video game play have been found to be different than time spent watching TV (Wang & Perry, 2006). It was shown that the energy expended during video game play was significantly higher than that expended during TV watching (where the video game used did not require any gross physical activity beyond holding a controller whilst sitting). It has also been shown that TV viewing, but not computer use, is positively associated with both systolic and diastolic blood pressure (Martinez-Gomez, Tucker, Heelan, Welk & Eisenmann, 2009). Additionally, some video games actively promote increased physical activity (Graves, Ridgers & Stratton, 2008).

This research suggests that video game play and computer use can be considered a different type of activity than TV watching, in terms of physiological effects. As

a result, in this paper we define two different types of Screen Time – Active Screen Time and Passive Screen Time.

Active Screen Time

Active Screen Time involves cognitively or physically engaging in screen-based activities, such as playing video games or completing homework on a computer.

Physically Active Screen Time

Physically active video games have become increasingly popular and prevalent in recent years. With the advent of the Nintendo Wii, Sony PlayStation Move, and the XBOX Kinect, active video games have become readily available and mainstream.

Physically active games are comparable to physical exercise. Some are specifically designed to improve fitness (e.g., Wii Fit) but most are primarily designed to be entertaining with exercise being a side effect of play (e.g., Dance Central) (Lieberman et al., 2011). Playing active games has been shown to be similar in intensity to light to moderate walking, skipping, and jogging (Maddison, Mhurchu, Jull, Prapavessis & Rodgers, 2007).

Emerging research has also shown that active video games can improve academic performance and reduce classroom absenteeism, tardiness, and negative classroom behaviours (Lieberman et al., 2011). Active video games can also be used to motivate young children to exercise and be more active outside of the game setting (Borja, 2006) and can improve group socialisation, bonds, mutual support, and self esteem (Lieberman et al., 2011). There is also evidence that children enjoy playing active video games more than traditional games in school physical education classes (Yeh-Lane, 2011).

Moreover, active video games are increasingly being used in the treatment of children with developmental disorders, such as Autism Spectrum Disorder (Durkin, 2010). Video games have also been shown to help children undergoing chemotherapy or psychotherapy, children with emotional and behavioural

problems (e.g., attention deficit disorder), and children with medical and health problems (e.g., muscular dystrophy) (Griffiths, 2003).

Cognitively Active Screen Time

There is a substantial body of research that illustrates the benefits of Active Screen Time, in terms of cognitive skills and development. Computer use during the preschool years is associated with improvements in school readiness and cognitive development (Li & Atkins, 2004) and higher levels of attention and motivation (McCarrick & Li, 2007), while the instant feedback provided scaffolds children's interactions (Shute & Miksad, 1997). Computers facilitate social interaction and provide an environment for young children to use large amounts of language (McCarrick & Li, 2007) and improve word knowledge and verbal fluency (Shute & Miksad, 1997).

Playing video games has been shown to enhance the capacity for visual attention and dynamic spatial skills (e.g., Boot, Kramer, Simons, Fabiani & Gratton, 2008) and improve problem solving and inductive reasoning (Pillay, 2003). Playing video games can also lead to changes across sensory, perceptual, and attentional abilities, resulting in improvements in contrast sensitivity, spatial resolution, attentional visual field, enumeration, multiple object tracking, and visuomotor coordination and speed (Spence & Feng, 2010).

Passive Screen Time

Passive Screen Time involves sedentary screen-based activities and/or passively receiving screen-based information, such as watching TV or a DVD. There is some evidence that particular types of TV shows and DVDs (e.g., Sesame Street) are beneficial to pre-school age children (e.g., Linebarger & Walker, 2005). However, children learn less from TV than from equivalent real life experiences (Anderson & Pempek, 2005).

TV viewing has been associated with childhood obesity, with mean hours of TV watched being directly proportional to weight (Hancox & Poulton, 2006). Additionally, children have been found to have higher caloric intake while

engaging in sedentary Screen Time (Epstein et al., 2008). In contrast, there is a lack of evidence linking obesity to videogame play or computer use (Wake, Hesketh & Waters, 2003).

TV viewing has been shown to be particularly detrimental to infants and toddlers less than two years of age. Early TV exposure is associated with attentional problems at age seven (Christakis, Zimmerman, DiGiuseppe & McCarty, 2004) and adversely affects cognitive development, reading recognition and comprehension, mathematical proficiency, and short-term memory (Zimmerman & Christakis, 2005), as well as language development and vocabulary (e.g., Linebarger & Walker, 2005). Furthermore, no commercial TV shows or DVDs have demonstrated a benefit for children less than two years of age (Garrison & Christakis, 2005).

Screen Time and Physical Activity

The recommendations for limited Screen Time for children aged two to five is partially based on the assumption that engaging in Screen Time means less time for active outdoor and creative play. However, there is increasing evidence that physical inactivity and Screen Time are not directly linked.

Research has shown that Screen Time is largely uncorrelated with physical activity (Biddle, Gorely, Marshall, Murdey & Cameron, 2004), and exceeding two hours of Screen Time daily is not consistently associated with lower levels of physical activity (Melkevik, Torsheim, Iannotti & Wold, 2010). Furthermore, the TV viewing of preschool children has been found to be consistently unrelated to outdoors playtime (Hinkley, Salmon, Okely & Trost, 2010). Moreover, the amount of TV watched per head has not changed for 40 years (Biddle, et al., 2004), despite being more readily available. This research suggests that decreasing the amount of Screen Time might not be effective in increasing the amount of physical activity in children.

Implications of Types of Screen Time

The recommendations made by the Australian Government are based on a definition of Screen Time that does not distinguish between different types of screen-based activities. The research reviewed in this paper suggests that not all Screen Time should be treated as equivalent. Moreover, it is not appropriate to assume that all screen-related activities are negative or harmful.

We propose that a hierarchy of Screen Time is a more accurate and useful construct by which to measure and assess children's time expenditure on screen-based activities. Although it is too early to formalise such a hierarchy, it is clear that it is possible to engage with screen-based media in ways that are more or less active and with a variety of positive and negative effects. Strictly speaking, the extent to which a child actively engages with media is a function of the child, rather than the specific form of media. For example, two children might engage with the same TV show with varying degrees of cognitive activity or with the same video game with differing degrees of physical exertion.

Irrespective of individual variation across children, the research reviewed in this paper suggests that different media tend to engender differing degrees of activity. Specifically, we hypothesise that, on average, TV viewing engenders lower levels of physical and cognitive activity than computer use and video game play. Further research is needed to formalise the proposed hierarchy and to answer questions regarding the conditions under which the positive effects associated with specific types of Screen Time are likely to result.

It should be noted that we do not mean to suggest that all kinds of media are appropriate for children and that no limits should be placed on children's Screen Time. Clearly, certain forms of media (e.g., violent video games) are not appropriate for children and moderation is essential for any positive effects of media to be seen.

Conclusions

In this paper, we reported some early investigations into the Australian's government's LSAC data set. First, it was found that the majority of children are

not meeting the Australian government's recommendations of a maximum of one hour of Screen Time per day for children aged two to five. Second, we have identified that the majority of children's Screen Time is spent viewing TV and DVDs.

In light of this evidence, we have reviewed the body of research surrounding children's engagement in Screen Time activities and identified some associated positive and negative effects of specific activities. Based on existing evidence, we have proposed that Screen Time as a sum of all screen-related activities might not be the most accurate and useful measure. Instead, we have defined two distinct Screen Time categories – Active and Passive Screen Time.

Further research is needed to explore questions around the conditions under which children are more or less active in their media engagement, as well as the circumstances in which they are likely to experience positive or negative effects related to Screen Time. Moving forward, consideration needs to be given to whether government recommendations should take account of these issues. To this end, should parents be encouraging one kind of media engagement over another? Our ongoing research is aimed at exploring these questions, as well as further investigating the effects associated with Active versus Passive Screen Time.

Acknowledgements

This paper uses unit record data from Growing Up in Australia, the Longitudinal Study of Australian Children. The study is conducted in partnership between the Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA), the Australian Institute of Family Studies (AIFS) and the Australian Bureau of Statistics (ABS). The findings and views reported in this paper are those of the author and should not be attributed to FaHCSIA, AIFS or the ABS.

References

American Academy of Pediatrics (AAP), Committee on Public Education (2001). Children, adolescents, and television. *Pediatrics*, 107(2), 423-426.

Australian Government: Department of Health and Ageing (2011). Get Up and Grow: Healthy Eating and Physical Activity for Early Childhood – Family Book. Retrieved 14 October 2011, www.health.gov.au/internet/publications/publishing.nsf/Content/gug-family-toc.

Anderson, D., and Pempek, T. (2005) Television and Very Young Children. *American Behavioral Scientist*, 48(5), 505-522.

Biddle, S.J., Gorely, T., Marshall, S.J., Murdey, I., and Cameron, N. (2004) Physical activity and sedentary behaviours in youth: issues and controversies. *The Journal of the Royal Society for the Promotion of Health*, 124(1), 29-33.

Boot, W.R., Kramer, A.F., Simons, D.J., Fabiani, M., and Gratton, G. (2008) The effects of video game playing on attention, memory, and executive control. *Actapsychologica*, 129(3), 387-98.

Borja, R. (2006) Dance Video Games Hit the Floor in Schools. *Education Week* 25(22), 1.

Christakis, D., Zimmerman, F.J., DiGiuseppe, D.L., and McCarty, C. (2004) Early television exposure and subsequent attentional problems in children. *Pediatrics*, 113(4), 708-713.

Durkin, K. (2010) Videogames and young people with developmental disorders. *Review of General Psychology*, 14(2), 122-140.

Epstein, L.H., Roemmich, J.N., Robinson, J.L., Paluch, R., Winiewicz, D.D., Fuerch, J.H., et al. (2008) A randomized trial of the effects of reducing television viewing and computer use on body mass index in young children. *Archives of Pediatrics & Adolescent Medicine*, 162(3), 239-245.

- Garrison, M., and Christakis, D. (2005) A Teacher in the Living Room? Educational Media for Babies, Toddlers, and Preschoolers. Retrieved 16 October 2011, www.kff.org/entmedia/upload/7427.pdf.
- Graves, L.E.F., Ridgers, N.D., and Stratton, G. (2008) The contribution of upper limb and total body movement to adolescents' energy expenditure whilst playing Nintendo Wii. *European Journal of Applied Physiology*, 104(4), 617-623.
- Griffiths, M. (2003) The Therapeutic Use of Videogames in Childhood and Adolescence. *Clinical Child Psychology and Psychiatry*, 8(4), 547-554.
- Hancox, R.J., and Poulton, R. (2006) Watching television is associated with childhood obesity: but is it clinically important? *International Journal of Obesity*, 30(1), 171-175.
- Hinkley, T., Salmon, J., Okely, A.D., and Trost, S.G. (2010) Correlates of sedentary behaviours in preschool children: a review. *International Journal of Behavioral Nutrition and Physical Activity*, 7, 66.
- Li, X., and Atkins, M.S. (2004) Early childhood computer experience and cognitive and motor development. *Pediatrics*, 113(6), 1715-1722.
- Lieberman, D., Chamberlin, B., Medina, E., Franklin, B., Sanner, B.M., and Vafiadis, D.K. (2011) The Power of Play: Innovations in Getting Active Summit 2011: A Science Panel Proceedings Report From the American Heart Association. *Circulation*, 123(21), 2507-2516.
- Linebarger, D., and Walker, D. (2005) Infants' and Toddlers' Television Viewing and Language Outcomes. *American Behavioral Scientist*, 48(5), 624-645.
- Maddison, R., Mhurchu, C.N., Jull, A., Prapavessis, H., and Rodgers, A. (2007) Energy Expended Playing Video Console Games: an Opportunity to Increase Children's Physical Activity? *Pediatric Exercise Science*, 19(3), 334-343.

Martinez-Gomez, D., Tucker, J., Heelan, K., Welk, G.J., and Eisenmann, J.C. (2009) Associations between sedentary behavior and blood pressure in young children. *Archives of Pediatrics & Adolescent Medicine*, 163(8), 724-30.

McCarrick, K., and Li, X. (2007) Buried treasure: the impact of computer use on young children's social, cognitive, language development and motivation. *Association for the Advancement of Computing In Education Journal*, 15(1), 73-95.

Melkevik, O., Torsheim, T., Iannotti, R.J., and Wold, B. (2010) Is spending time in screen-based sedentary behaviors associated with less physical activity: a cross national investigation. *The International Journal of Behavioral Nutrition and Physical Activity*, 7(1), 46.

Pillay, H. (2003) An Investigation of cognitive processes engaged in by recreational computer game players. *Journal of Research on Technology in Education*, 34(3), 336-350.

Shute, R., and Miksad, J. (1997) Computer assisted instruction and cognitive development in preschoolers. *Child Study Journal*, 27(3), 237-254.

Spence, I., and Feng, J. (2010). Video games and spatial cognition. *Review of General Psychology*, 14(2), 92-104.

Wake, M., Hesketh, K., and Waters, E. (2003) Television, computer use and body mass index in Australian primary school children. *Journal of Paediatrics and Child Health*, 39(2), 130-134.

Wang, X., and Perry, A. C. (2006) Metabolic and physiologic responses to video game play in 7- to 10-year-old boys. *Archives of Pediatrics & Adolescent Medicine*, 160(4), 411-415.

Yeh-Lane, M., Moosbrugger, M., Liu, J., and Arnold, R. (2011) Enjoyment of interactive video games in physical education. *Research Quarterly for Exercise and Sport*, 82(1), A56.

Zimmerman, F.J., and Christakis, D. (2005) Children's television viewing and cognitive outcomes: a longitudinal analysis of national data. *Archives of Pediatrics & Adolescent Medicine*, 159(7), 619-625.