

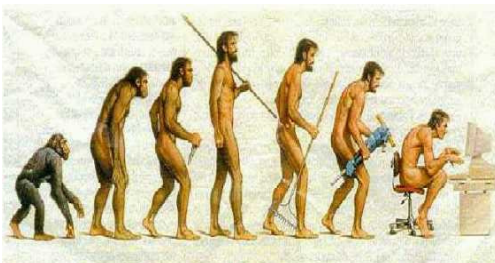
## The Impact of Technology on Child Sensory and Motor Development by Cris Rowan, OTR



Reminiscing about growing up in the good old days is a memory trip well worth taking, when trying to understand the issues facing the children of today. A mere 20 years ago, children used to play outside all day, riding bikes, playing sports and building forts. Masters of imaginary games, children of the past created their own form of play that didn't require costly equipment or parental supervision. Children of the past moved... a lot, and their sensory world was nature-based and simple. In the past, family time was often spent doing chores, and children had expectations to meet on a daily basis. The dining room table was a central place where families came together to eat and talk about their day, and, in between meals, the table was the center for baking, crafts and homework.

Today's families are different. Technology's impact on the 21<sup>st</sup> century family is fracturing its very foundation and causing a disintegration of core values that used to hold families together. Juggling work, home and community lives, parents now rely heavily on communication, information and transportation technology to make their lives faster and more efficient. Entertainment technology (TV, internet, video games, iPods) has advanced so rapidly that families have scarcely noticed the significant impact and changes to their family structure and lifestyles.

Elementary aged children use, on average, eight hours per day of entertainment technology, and 65% of these children have TVs in their bedroom, with 50% of North American homes have the TV on all day (1,2). Add emails, cell phones, internet surfing, and chat lines, and we begin to see the pervasive aspects of technology on our home lives and family milieu. Gone is dining room table conversation, replaced by the "big screen" and take out food. Children now rely on technology for the majority of their play, grossly limiting challenges to their creativity and imaginations, as well as limiting necessary challenges to their bodies to achieve optimal sensory and motor development. Sedentary bodies bombarded with chaotic sensory stimulation are resulting in delays in attaining developmental milestones, with subsequent impact on basic foundation skills for achieving literacy (3,4), causing France to ban all "Baby TV" (5). Violent content found in media has had such an impact on child aggression, that the United States has classified media violence as a public health risk (6,7). Hard-wired for high speed, today's young are entering school struggling with self-regulation and attention skills necessary for learning, eventually becoming significant behavior management problems for teachers in the classroom.



So what is the impact of technology on the developing child? Children's developing sensory and motor systems have not evolved biologically to accommodate the sedentary, yet frenzied and chaotic nature of today's technology. Rapidly advancing technology has contributed to an increase of physical, psychological and behavior disorders that the health and education systems are just beginning to detect, much less understand.

One in six children have a diagnosed developmental disability (8), one in six are obese (9), and 14.3% have a diagnosed psychiatric disorder (10). Diagnoses of ADHD, autism, coordination disorder, sensory processing disorder, anxiety, depression, and sleep disorders can be causally

linked to technology overuse and are increasing at an alarming rate (11-16). An urgent closer look at the critical factors for meeting developmental milestones, and the subsequent impact of technology on those factors, would assist parents, teachers and health professionals to better understand the complexities of this issue and to help create effective strategies to reduce technology use.

The three critical factors for healthy physical and psychological child development are movement, touch and connection to other humans. Movement, touch and connection are forms of essential sensory input that are integral for the eventual development of a child's motor and attachment systems. When movement, touch and connection are deprived, devastating consequences occur (17-19). Young children require three to four hours per day of active rough and tumble play to achieve adequate sensory stimulation to their vestibular, proprioceptive and tactile systems for normal development (20,21). The critical period for attachment development is from birth to seven months, where the infant-parent bond is best facilitated by close contact with the primary parent and by lots of eye contact (22). These types of sensory inputs ensure normal development of posture, bilateral coordination, optimal arousal states and self-regulation necessary for achieving foundation skills for eventual school entry.



Infants with low tone, toddlers failing to reach motor milestones, and children who are unable to pay attention or achieve basic foundation skills for literacy are frequent visitors to pediatric physiotherapy and occupational therapy clinics (16). The use of safety restraint devices, such as infant bucket seats and toddler-carrying packs and strollers, have further limited movement, touch and connection, as have TV and video game overuse. Many of today's parents perceive that outdoor play is "unsafe," further limiting essential developmental components usually attained in outdoor rough and tumble play (23). Dr. Ashley Montagu, who has extensively studied the developing tactile sensory system, reports that when infants are deprived of human connection and touch, they fail to thrive, and many eventually die. Dr. Montagu states that touch-deprived infants develop into toddlers who exhibit excessive agitation and anxiety and may become depressed by early childhood.



As children are connecting more and more to technology, society is seeing a disconnection from themselves, others and nature. As little children develop and form their identity, they often are incapable of discerning whether they are the "killing machine" seen on TV and in video games, or just a shy and lonely little kid in need of a friend (24). TV and video game addiction is causing an irreversible worldwide epidemic of mental and physical health disorders (25), yet technology overuse continue to escalate in both home and school settings. Where 100 years ago we needed to move to survive, we are now under the assumption we need technology to survive. The catch is that technology is killing what we love the most...connection with other human beings. Connection is integral to that developing child's sense of security and safety. Healthy attachment formation results in a happy and calm child. Disruption or neglect of primary attachment results in an anxious and agitated child. Family over-use of technology is not only gravely affecting early attachment formation, but also having a negative impact on child psychological and behavioral health.

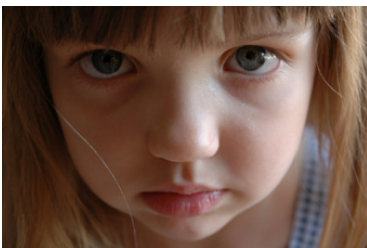


Further analysis of the impact of technology on the developing child indicates that while the vestibular, proprioceptive, tactile and attachment systems are under stimulated, the visual and auditory sensory systems are in “overload.” This sensory imbalance creates huge problems in overall neurological development, as the brain’s anatomy, chemistry and pathways become permanently altered and impaired (26). Young children who are exposed to violence through TV and video games are in a high state of adrenalin and stress, as their bodies do not know that what they are watching is not real. Children who overuse technology report persistent body sensations of overall “shaking,” increased breathing and heart rate, and a general state of “unease.” This can best be described as a persistent hyper-vigilant sensory system, still “on alert” for the oncoming assault from video game characters.

While the long term effects of this chronic state of stress in the developing child are unknown, we do know that chronic stress in adults results in a weakened immune system and a variety of serious diseases and disorders. Prolonged visual fixation on a two-dimensional screen at a fixed distance grossly limits ocular development necessary for eventual reading and printing. Consider the difference between visual location on a variety of different shaped and sized objects in the near and far distance (such as practiced in outdoor play), as opposed to looking at a fixed distance glowing screen. This rapid intensity, frequency and duration of visual and auditory stimulation results in a “hard wiring” of the child’s sensory system for high speed, with subsequent devastating effects on a child’s ability to imagine, attend and focus on academic tasks. Dr. Dimitri Christakis found that each hour of TV watched daily between the ages of birth and seven years equated to a 10% increase in attention problems by age seven (13).



In 2001 the American Academy of Pediatrics issued a policy statement recommending that children less than two years of age should not use any technology (27), yet toddlers up to two years of age average 2.2 hours of TV per day. The Academy further recommended that children older than two should restrict usage to one to two hours per day, yet parents of elementary children are allowing an average eight hours per day. How can parents continue to live in a world where they know what is bad for their children, yet do nothing to help them? It has been known for some time that getting out in nature and vigorous exercise improves attention and learning ability (17,28,29), yet many schools are spending increasing amounts of money purchasing computers and allowing unrestricted access to technology during recess and lunch. It appears that today’s families and schools have been pulled into the “Virtual Reality Dream”. Choosing to isolate themselves from their “pack”, children now crave violent and immediate gratification found in TV, video games and internet technology. Technology has now replaced the desire for human connection, raising the question every parent fears – are children no longer sustainable?



It’s important to come together as parents, teachers and therapists to help society “wake up” and see the devastating effects technology is having not only on our children’s physical, psychological and behavioral health, but also on their ability to learn and sustain personal and family relationships. While technology is a train that will continually move forward, knowledge regarding its detrimental effects, together with action taken toward balancing the use of technology with exercise and family time, will work toward sustaining our children, as well as saving our world. While no one can argue the benefits of advanced technology in today’s world, connection to these devices may have resulted in a disconnection from what society should value most, the next generation. Rather than providing children with

more video games, TVs in the car, and the latest iPods and cell phone devices, creating a deep and widening chasm between parent and child, let's resolve to do more hugging, playing, rough housing, and conversing with our children.

## References

1. Rideout VJ, Vandewater EA, Wartella EA. Zero to six: electronic media in the lives of infants, toddlers and preschoolers. Menlo Park (CA): Kaiser Family Foundation; Fall 2003.
2. Active Healthy Kids Canada [2008 report card on the internet]. Available from: [http://www.activehealthykids.ca/Ophea/ActiveHealthyKids\\_v2/upload/AHKC-Short-Form-EN.pdf](http://www.activehealthykids.ca/Ophea/ActiveHealthyKids_v2/upload/AHKC-Short-Form-EN.pdf).
3. Zimmerman FJ, Christakis DA, Meltzoff AN. Television and DVD/video viewing in children younger than 2 years. *Archives of Pediatric Adolescent Medicine*. 2007; 161 (5): 473-479.
4. Thakkar RR, Garrison MM, Christakis DA. A systematic review for the effects of television viewing by infants and preschoolers. *Pediatrics*. 2006; 118: 2025-2031 [PubMed](#) .
5. France pulls plug on TV shows aimed at babies [CBC online article Wednesday, August 20, 2008]. Available from: <http://www.cbc.ca/world/story/2008/08/20/french-baby.html>.
6. Anderson CA, Berkowitz, L, Donnerstein E, Huesmann LR, Johnson JD, Linz D, Malamuth NM, Wartella E. The Influence of Media Violence on Youth. *Psychological Science in the Public Interest*. 2003; 4:81-110.
7. Christakis DA, Zimmerman FJ. Violent Television During Preschool Is Associated With Antisocial Behavior During School Age. *Pediatrics*. 2007; 120: 993-999
8. Hamilton S. Screening for developmental delay: Reliable, easy-to-use tools. *Journal of Family Practice*. 2006; 55 (5): 416-422.
9. Addressing childhood obesity: the evidence for action. Canadian Institutes of Health Research [Evidence report January 12, 2004]. Available from: <http://www.cihr-irsc.gc.ca/e/23293.html>.
10. Waddell C, Hua JM, Garland O, DeV. Peters R, McEwan K. Preventing Mental Disorders in Children: A Systematic Review to Inform Policy-Making. *Canadian Journal of Public Health*. 2007; 98(3): 166-173.
11. Hancox RJ, Milne BJ, Poulton R. Association of television during childhood with poor educational achievement. *Archives of Pediatric and Adolescent Medicine*. 2005; 159 (7): 614-618.
12. Paavonen EJ, Penonen M, Roine M. Passive Exposure to TV Linked to Sleep Problems in Children. *Journal of Sleep Research*. 2006; 15: 154-161.
13. Christakis DA, Zimmerman FJ, DiGiuseppe DL, McCarty CA. Early television exposure and subsequent attentional problems in children. *Pediatrics*. 2004; 113 (4): 708-713.
14. National Dissemination Center for Children with Disabilities, 26th Annual Report to Congress, US Department of Education, 2005. <http://www.nichcy.org/pubs/factshe/fs7txt.htm>.
15. Robinson JP, Martin S. What Do Happy People Do? *Journal of Social Indicators Research*. 2008; 89:565-571.
16. Jennings JT. Conveying the message about optimal infant positions. *Physical and Occupational Therapy in Pediatrics*. 2005; 25 (3); 3-18.
17. Ratey JJ, Hagerman E (2008). *Spark: The Revolutionary New Science of Exercise and the Brain*. Little, Brown and Company, New York.
18. Korkman M. Introduction to the special issue on normal neuropsychological development in the school-age years. *Developmental Neuropsychology*. 2001; 20 (1):325-330.
19. Montagu, A. *Touching: the Human Significance of the Skin* 2<sup>nd</sup> Edition. New York: Harper and Row; 1972.
20. National Association for Sport and Physical Education. NASPE Releases First Ever Physical Activity Guidelines for Infants and Toddlers. February 6, 2002. Available at: <http://www.aahperd.org/naspe/template.cfm?template=toddlers.html>.

21. Braswell J, Rine R. Evidence that vestibular hypofunction affects reading acuity in children. *International Journal of Pediatric Otorhinolaryngology*. 2006; 70 (11): 1957-1965.
22. Insel TR, Young LJ. The neurobiology of attachment. *Nature Reviews Neuroscience*. 2001; 2: 129-136.
23. Burdette, HL, Whitaker RC. A national study of neighborhood safety, outdoor play, television viewing, and obesity in preschool children. *Pediatrics*. 2005; 116: 657-662.
24. Anderson C, Gentile D. *Violent Video Game effects on Children and Adolescents*. Oxford: Oxford University Press; 2007.
25. Block, JJ. Issues for DSM – V: Internet Addiction. *Journal of Clinical Psychiatry*. 2008; 67 (5): 821-826.
26. Small G, Vorgan G. *iBrain: Surviving the Technological Alteration of the Modern Mind*. HarperCollins Publishing; 2008. New York.
27. Children, adolescents and television. American Academy of Pediatrics, Committee on Public Education. *Pediatrics*. 2001; 107 (2): 423-426.
28. FaberTaylor A, Kuo FE, Sullivan WC. Coping With ADD – The Surprising Connection to Green Play Settings. *Journal of Environment and Behavior*. 2001; 33(1):54-77.
29. Kuo FE, Faber Taylor A. A Potential Natural Treatment for Attention-Deficit/Hyperactivity Disorder: Evidence from a National Study. *American Journal of Public Health*. 2004; 94(9):1580-1586.

### Biography – Cris Rowan

Cris Rowan is an impassioned occupational therapist who has first-hand understanding and knowledge of how technology can cause profound changes in a child's development, behavior and their ability to learn. Cris received her Bachelor of Science in Occupational Therapy in 1989 from the University of British Columbia, as well as a Bachelor of Science in Biology, and is a SIPT certified sensory integration specialist. Cris is a member in good standing with the BC College of Occupational Therapists, and an approved provider with the American Occupational Therapy Association, the Canadian Association of Occupational Therapists, and Autism Community Training. For the past fifteen years, Cris has specialized in pediatric rehabilitation, working for over a decade in the Sunshine Coast School District in British Columbia.



Cris is CEO of Zone'in Programs Inc. offering products, workshops and training to improve child health and enhance academic performance. Cris designed *Zone'in*, *Move'in*, *Unplug'in* and *Live'in* educational products for elementary children to address the rise in developmental delays, behavior disorders, and technology overuse. Cris has performed over 200 *Foundation Series Workshops* on topics such as sensory integration, attention and learning, fine motor development, printing and the impact of technology on child development for teachers, parents and health professionals throughout North America. Cris has recently created *Zone'in Training Programs* to train other pediatric occupational therapists to deliver these integral workshops in their own community. Cris is an expert reviewer for the Canadian Family Physician Journal, authors the monthly *Zone'in Development Series Newsletter* and is author of the following initiatives: *Unplug – Don't Drug*, *Creating Sustainable Futures Program*, and *Linking Corporations to Community*. Cris is author of a forthcoming book *Disconnect to Reconnect – How to counteract the negative effects of technology to improve child performance at school and home*.

Cris is a proud mom of Canadian Navy Submariner Officer Matt, and resides in Sechelt, British Columbia on the Sunshine Coast with her equestrian daughter Katie, partner Ian, as well as two dogs, three cats, a bird and a horse. Cris loves the outdoors and spends a great deal of time with her family exploring the natural beauty of her community.