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The Effects of Fast-Paced Cartoons

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Since its invention some 60 years ago, television has been maligned by many as being bad for children's brains. Accusations that it was a "boob tube" have existed almost as long as the medium itself, but they gained considerable traction with the advent of preschool programming in the 1970s when teachers reported that children began school with "five minute attention spans."[1] Initial scientific inquiry failed to substantiate their concerns.[2,3] In fact, early and consistent evidence has demonstrated educational benefits of high-quality preschool programming.[4,5] However, the media landscape has evolved considerably since then. Although the typical child began watching television at 4 years of age in 1970 and consumed ~3 to 4 hours/day, the typical child today begins watching at 4 months of age and is engaged with media for up to 8 hours/day.[6–8] This has led some to distinguish between today's generation of children, the "digital natives," because they have been immersed in media since birth, and their parents, who will remain "digital immigrants."

However, the quantity of media consumed has been an unduly emphasized part of the story. It is not that quantity is unimportant, but the effects of media are mediated more by what is watched than how much is watched.[9] Simply put, television is both good and bad: there are good programs and bad ones. And, what makes programs good or bad has to do not only with the content itself but with what in communications research are known as the formal features of that content. Some sequences are naturally paced (eg, human-Muppet interactions on *Sesame Street*), and some are rapid (eg, *SpongeBob SquarePants*). Others occur in what seems like slow motion (eg, *Mr Roger's Neighborhood*). In addition to the pace of the show, formal features include the edits and cuts. Some shows change scenes more than 3 times per minute, whereas others have greater continuity.[10] The "overstimulation hypothesis" is based on the theory that the surreal pacing and sequencing of some shows might tax the brain or parts of it, leading to short-term (or long-term) deficits. Although this effect has been shown in observational studies of both infants and older children, it remains controversial.[11–15]

This issue of *Pediatrics* features the results of a small experimental study that found that children who watched 9 minutes of a fast-paced cartoon had impairment in their executive function compared with children who were assigned a drawing task and those who watched educational television.[16] It has some notable weaknesses including its small sample and lack of adequate blinding. Similar to many initial forays into a new area, it raises as many (or more) questions than it answers. For example, the outcomes were measured immediately after viewing; are these deficits in executive function transient? The age range selected was quite narrow; does the age of the child matter? Total viewing time was considerably less than that of a typical show or what is typically watched in a day; does the amount of exposure make

a difference? All of these questions warrant further research and confirmation. However, for the purposes of this commentary I wish to stipulate that the findings are robust. Connecting fast-paced television viewing to deficits in executive function, regardless of whether they are transient, has profound implications for children's cognitive and social development that need to be considered and reacted to.

Last month I was attending at the hospital and came to the room of a 13-year-old boy who had been admitted with an asthma exacerbation. He was lying in bed listening to an iPod, playing a video game, and texting a friend while the television was on. All of this high-stimulation media multitasking was occurring while he was sick enough to require albuterol every 2 hours. He was not unique. A Kaiser Family Foundation study found that 30% of children multitask with media, often in the context of doing other productive work (eg, homework).[6] Neuroscience tells us that multitasking is not, in fact, the simultaneous processing of 2 distinct activities but, rather, the rapid oscillation between them; a well-trained (and young and nimble brain such as the one this adolescent possessed) can focus attention on 1 task and then refocus seamlessly on another. It is a skill that is being routinely cultivated by the digital natives among us. As both a clinician and researcher I am commonly asked by anxious digital-immigrant parents if this is healthy or potentially harmful because it is so at odds with the philosophy applied to our generation by our parents: homework is to be done in a quiet, contemplative place free of distractions. As with many salient questions that relate to the ever-changing and rapidly evolving media climate in which our children live, science lags woefully behind in providing much-needed answers. The overstimulation that is inherent to multitasking has long begged the question of its effects on attentional capacity, and results of the Lillard and Peterson[16] study suggest that it is harmful.

It should be noted, however, that there is a competing school of thought that the digital-native generation is becoming acculturated in ways that will make it well suited to the fast-paced world they will grow to inherit. Simply stated, so what if too much of a fast-paced cartoon makes children highly distractible? Distractibility is all relative. Executives of the future (if not the present) will not focus on a single task but on many concurrently while updating their Facebook status. In the 21st century, distractibility is not a liability, some argue, but an asset. It is hard for me to see (let alone acknowledge) that this is the case. Focus seems too central to wise decision-making. Others have lamented that easy and continuous access to the Internet has made us skimmers not readers and that our short attention spans have us processing information superficially.[17] Accommodating the distractible mind will inexorably lead to a paucity of thoughtfulness that the increasingly complex and nuanced world we inhabit requires.

Deficits in executive function, whether transient or permanent, have social implications as well. I recently encountered 2 college students who were sitting outside a café in an urban mall. As they soaked in the rare Seattle sunshine, I noticed that one of them was talking on her cell phone and the other was texting. I could not help but feel that the technology that we all carry in our pockets is tearing at the social fabric of society. What 10 (or maybe 5) years ago would have been an interpersonal interaction in which each young adult had the other's undivided attention was suddenly an ongoing conversation with dozens or possibly hundreds of other "friends." Indeed "undivided attention" is difficult to come by today, but it is central to being authentically present. Focusing on what one's friends have to say is central to friendship, and multitasking friendship by allowing other people or things to intercalate themselves into encounters would seem to undercut it.

The challenges for those of us who care about children and who research media are clear. Eliminating media is neither feasible nor desirable; even reducing media is challenging and misses the point if the wrong types are reduced and a diet heavy with overstimulating content remains. Media is a public health issue, and harm-reduction approaches are what is needed.[18] Steering children and adolescents toward safe or even health-promoting media activities must be a goal, and actionable strategies for reaching that goal must be devised. Unfortunately, the digital immigrants among us are tasked with training the digital natives to be selective and thoughtful in their use of media.

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