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CHAPTER 25

Children and Electronic Media

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Children grow and develop in a media environment that is unprecedented in scope and influence. From birth throughout the adolescent years, youth living in the United States spend vast amounts of time in the presence of screen media. Media once were only observed or listened to by a mass audience (Calvert, 1999). Now youth interact with media, becoming the creators of content, not just the consumers of it (Pempek, Yermolayeva, & Calvert, 2009).

The creators of media have historically been large corporations with profit making as their goal. In the early 21st century, youth now join those corporations as they make their own media content, such as personal profiles on social networking websites like Facebook and videos viewed by others on youtube.com. The motives for these creations by youth are less about profit, and more about self-expression and communication with friends. New forums for interaction with others and new applications to distribute content online are also rapidly evolving, driven by advances in technology as well as by innovations by the young who live comfortably within the glow of the screen.

In this chapter, I explore the pervasive media environments that increasingly provide a context for development. I focus on media access, exposure, and effects on developmental outcomes. I end with a discussion of future research directions.

Children's Media Environments

Media is a cultural influence that crosses national borders. Most people with electricity own or have access to television sets, and those who live in developed countries typically have access to numerous media interfaces. Content often travels well, crossing the boundaries of time and space within a culture as well as being exported rather handily to other cultures. For instance, reruns of older television programs and films from other eras are easily accessed on U.S. television, providing quick availability to what life was like in decades past. Within or across cultures where there are numerous time zones and considerable ethnic diversity, media can provide a simultaneous viewing of the same content because of broadcast and

cable television as well as through Internet access. Media content from countries like the United States, Canada, the United Kingdom, and Japan is often exported to other countries (Cahn, Kalagian & Lyon, 2008), making the world a much smaller place in the process. The Internet enables 24/7 access to virtually any content a user wants throughout the world, including television and film content as media options increasingly converge into a single screen interface.

The kinds of media available to children and youth are changing rapidly during the digital age. The point of entry for understanding the influence of this media environment on developmental outcomes is an assessment of the media available in children's homes.

Media Access and Penetration

Children who grow up in the United States live in an environment saturated with electronic media. In a nationally representative U.S. sample of 1,384 parents, Common Sense Media (2011) documented that 98 percent of 0-to-8 year-old children live in homes with at least one television set, 80 percent have a DVD player, 72 percent have a computer (68 percent with high speed Internet access), and 67 percent have a video game console. Forty-one percent of these parents own a smartphone, and 8% own tablets, such as an iPad (Common Sense Media, 2011).

Although numerous kinds of media are available to many young children when they are in their homes, socioeconomic and ethnic differences have been found in access to computers. Specifically, Calvert and colleagues (2005) found that well educated higher income families with 6 month to 6 year old children were more likely to own computers and to have Internet access from home than were families with lower incomes and lower educational levels. Hispanic families were least likely to own a computer, and Hispanic and African American families were less likely than Caucasian families to have Internet access at home. Consistent with these findings, 0-to-8-year-old children who live in low-income households, who are Hispanic, or whose families are less well educated are less likely to have computers or high speed Internet access at home than are children whose families are wealthier, are Caucasian, or who are better educated (Common Sense Media, 2011).

Surveys conducted by the Kaiser Family Foundation for 8- to 18-year-olds yield similar findings for access to electronic media (Rideout, Foehr & Roberts, 2010). Ninety-nine percent of these youth live in homes with a television set (84 percent with cable or satellite options); 97% have a DVD or VCR player; 87% have a CD player; 94% have a radio; 93 percent have access to a computer (69 percent with Internet access, and 59 percent is high speed access); 87 percent have access to a videogame console; and 52 percent of homes have a digital video recorder, allowing viewers to easily shift viewing times. Most of these homes have multiple television sets, CD or tape players, and VCRs/DVD players. Two-thirds of all 8-to-18-year-old youth have a cell phone (Rideout et al., 2010).

Given the ubiquitous presence of so many electronic media in children's homes, it is not surprising that the household environments of 8- to 18-year-old U.S. youth were often oriented around media. The television set was usually on during meals for 64 percent of these households, 54 percent of these families had no rules about television viewing, and in 45 percent of these homes, the television set was turned on most of the time, even when no one was watching (Rideout et al., 2010). In short, television provides the backdrop in which many U.S. youth develop.

Media Exposure

For media to impact children and youth, exposure must occur. Media exposure is difficult to measure because of: 1) challenges in defining media exposure; and 2) measurement issues.

Defining media exposure. What does it mean to be exposed to media? In particular, the intense concentration of media available in children's homes and everyday environments means that some exposure is intentional whereas other exposure takes place simply because one happens to be in a place where a medium is on. Sometimes unintentional exposure is not perceived as important for developmental outcomes, but it is. Foreground content is often age-appropriate and potentially informative and meaningful to children whereas background content designed for adults can be a distractor from the important developmental tasks of childhood (D. R. Anderson & Pempek, 2005; Calvert, 2006). Background media exposure can create a world that is rarely quiet and typically noisy, which may disrupt internal regulation patterns, such as sleeping (Thompson & Christakis, 2005), concentrating (Christakis, Zimmerman, DiGiuseppe, & McCarty, 2004), and playing (Evans, Pempek, Kirkorian, Frankfield & D. R. Anderson, 2004).

Another key question is do we want to know how much or what kind of exposure is taking place (D. R. Anderson & Hansen, 2009; Calvert, 1999). *How much media content*, involving the quantity of media use, answers certain kinds of questions, such as the activities that media use displaces. For the American Academy of Pediatrics (1999), any exposure to media content before the age of 2 is thought to be detrimental to developmental outcomes, leading to inferior long-term cognitive performance because of a sensitive period in brain development during the infancy period. Valuable time spent with parents in activities, such as reading, may be displaced when parents place their very young children in front of a video screen while the parent does other activities. Longitudinal data specifically collected to answer this premise are sorely needed.

What kind of media content, which assesses the quality of the media environment, frames the second half of the question about media exposure. D. R. Anderson and Hanson (2009) use the analogy of a media diet to describe content influences. More specifically, exposure to certain kinds of programs, such as those involving educational and prosocial content, are linked to better short-term and long-term academic outcomes over time (D. R. Anderson et al., 2001; Wright et al, 2001). By contrast, exposure to violent or commercial content over time is linked to aggressive (C. Anderson, Gentile, & Buckley, 2007; Huessman, Moise-Titus, Podolski, & Eron, 2003) and overweight (McGinnis, Gootman & Craik, 2006) problems, respectively. The kind of media exposure is also captured by assessing foreground versus background media exposure (D. R. Anderson & Pempek, 2005; Calvert, 2006).

Measuring media exposure. Media exposure is assessed using several different approaches that are sometimes combined with one another to increase the reliability and the validity of the assessment. Six key methodological approaches assess media exposure (see D. R. Anderson & Hansen, 2009; Vandewater and Lee, 2009). One major method used is the *global time estimate*, in which parents or children (or both) estimate exposure to various media (e.g., How many hours did you play video games yesterday?). Kaiser Family Foundation Surveys, which are main sources of access and exposure data in the media literature area, rely on global estimates.

Diaries track both the amount and kind of media use that is occurring. *Time-use diaries*, in which parents of younger children or older children themselves write down all activities done in a set period, say 24 hours in length, is a highly reliable way to assess media exposure. However, this approach is very expensive and rarely used, with a few notable exceptions such as the Panel Study of Income Dynamics (PSID) that includes a subscale, the Child Development Supplement (CDS), that measures child media use patterns (Vandewater & Lee, 2009). *Media diaries*, a third approach to media use measurement, involve a variety of procedures. One approach is to provide participants with a booklet in which they check whether or not they use a particular medium in a specific time interval (e.g., 15 min), and they write in what they viewed or did (see, for example, D. R. Anderson, Field,

Collins, Lorch, & Nathan, 1986; Huston Wright, Rice, Kerkman & St. Peters, 1990).

In *experience sampling methods*, study participants are periodically contacted at random intervals and asked what they are doing at that exact moment in time as well as the quality of that experience. Users are often contacted via an electronic device, such as a pager (see Csikszentmihalyi & Kubey, 1981).

Direct observations can be made of children's media use patterns in the home, or by using video equipment to record exactly what children see on the screen at home using split screen technology (D. R. Anderson et al., 1986). While accurate, direct observations are far more expensive than other methods, such as surveys conducted with global estimates. Using video equipment to record viewing behavior, D. R. Anderson and colleagues (1986) documented that media diaries were a more accurate measure of the television set being turned on while viewers were present than were global estimates. Even so, global estimates and diaries were both positively correlated with the television set being on while a viewer was present in the room.

Finally, *electronic monitors*, such as the Nielsen People Meter, can track exactly who is viewing a specific television program, or *tracking software* can identify exactly where specific users have gone online (Vandewater & Lee, 2009). Electronic monitors are very expensive measurement techniques used by major corporations, such as the Nielsen Company who keeps their findings proprietary, opting to sell them for a profit. Tracking software on a computer, in which cookies lay a trail of a user's behavior, are accurate but raise privacy issues (Thornburgh & Lin, 2002).

Media exposure during the very early years. Nationally representative samples of media use patterns have been collected and examined by researchers primarily by using survey and diary methodologies to document children's media use patterns. The Zero to Six study documented children's early media use patterns using survey techniques in 2003 and 2006 and Common Sense Media documented similar media use patterns for children who were 0-to-8 years-old in 2011. The Child Development Supplement (CDS) of the Parent Study of Income Dynamics (PSID) is a longitudinal study in which time-use diaries track children's behaviors, including media use patterns. The PSID oversamples low-income ethnic minority groups, thereby illuminating similarities and differences in media use patterns between wealthier children who have more protective buffers and poorer children who may be more at risk for adverse developmental outcomes.

In the Zero to Six or Zero to Eight studies of very early media exposure of U.S. children (Common Sense Media, 2011; Rideout & Hamel, 2006; Rideout, Vandewater & Wartella, 2003), parents were asked questions about their youngster's media use patterns. For children who are younger than the age of 2, 66 percent have viewed television, and 52 percent have viewed a DVD (Common Sense Media,). On a typical day, 6-month to 2-year olds watch a television program or a DVD for an average of 61 min of daily screen exposure (Common Sense Media, 2011). Thirty percent of these children have a television set in their bedroom (Common Sense Media, 2011). This level of exposure contradicts the recommendation made by the American Academy of Pediatrics (1999) of limited or no screen exposure prior to age 2.

For 2- to 4-year-olds, screen media use averages 2 hours, 18 min daily which increases to 2 hours, 50 min of daily exposure for 5-to-8- year-old children (Common Sense Media, 2011). During this time frame, children increasingly use interactive media. Just over half of 2-to-4-year-old children have used a computer, which jumps to 90 percent for 5-to-8-year-old children. Similarly, mobile media use via a smart phone, video iPod, or Ipad jumps from 39 percent for 2-to-4-year-old children to 52 percent for 5-to-8-year-old children. An app gap has emerged as a new facet of the digital divide, with higher more so than lower income families exposing their children to content on these newer and mobile platforms. Twenty-three percent of 5-to-8-year-old children also multi-task using more than one medium at a time, with television playing in the background for 21 percent of those children during some of the time that they are doing their homework (Common Sense Media, 2011). The latter pattern could disrupt concentration.

Parents generally perceived the kind of media content that children were exposed to favorably. Earlier studies by the Kaiser Family Foundation reported that 66 percent of parents reported that their children who were ages 0-to 6 imitated positive prosocial behaviors such as helping, while only 25 percent reported seeing their children imitate aggressive behaviors like hitting. Parents observed prosocial behavior the most when their children viewed children's educational programming. Parents reported that sons more so than daughters imitated aggressive behavior. Imitation increased at older ages with children who were a year old imitating less than those who were 2–3 years of age, and 4- to 6-year-olds imitating the most (Rideout & Hamel, 2006; Rideout, Vandewater & Wartella, 2003).

Parents also made discriminations across different kinds of media with computers holding a strong lead on perceptions of positive outcomes, television falling in the middle, and videogames going in a negative direction. Specifically, 69 percent of parents reported that computers mostly help their children versus only 8 percent who thought computers had a negative influence with 15 percent perceiving no influence. Thirty-eight percent of parents viewed television favorably for their children compared to 31 percent who viewed television as a negative influence, and 22 percent who saw no influence. Only 17 percent of parents viewed videogames favorably versus 49 percent who viewed videogames as a negative influence with 22 percent perceiving no influence (Rideout & Hamel, 2006). Although computers were perceived as the most favorable medium by parents, the television set was on approximately 6 hours a day in families' homes from the 2003 sample (Vandewater, Bickham, Lee, Cummings, Wartella, & Rideout, 2005).

The Kaiser Family Surveys on early media use were conducted in 2003 and in 2006. Over that time frame, a significant decrease occurred in the number of households where the television set was on always or most of the time (37 percent in 2003 vs. 32 percent in 2005), as well as a significant decrease in television use during meals (35 percent in 2003 vs. 30 percent in 2005). Despite these declines, it is clear that media exposure is pervasive during the first six years of life. More recently, 39 percent of children under age 8 were found to live in heavy media use homes where the television set was on all or most of the time (Common Sense Media, 2011).

Media exposure from middle childhood through adolescence. The Kaiser Family Foundation and Panel Study of Income Dynamics data are also key sources of information about media exposure from middle childhood through the adolescent years. Survey data collected from 2,002 U.S. youth by the Kaiser Family Foundation in 2009 finds that media use for 8- to 18-year-olds is about 7.5 hours per day (Rideout et al., 2010). When overall media exposure, including multitasking is considered, that figure increases to 10 hours, 45 min per day. On a typical day, television viewing remains a dominant medium, commanding 4 hrs. 29 min. per day on average, followed by music at 2 hr, 31 min., computers at 1 hr., 29 min., videogames at 1 hour, 13 min., reading at 38 min, and movies at 25 min. per day. From 2004 to 2009, 8-to-18-year-old youths' ownership of mobile media increased dramatically with 66 percent owning a cell phone, 76 percent an iPod or MP3 player, and 29 percent a laptop in 2009 (Rideout et al., 2010). When using media, 7th to 12th graders report multitasking with another medium 58 percent of the time for at least one of the media (Rideout et al., 2010).

Using diary data from the Panel study of Income Dynamics, Bickham and colleagues (2003) found that African American children spent more time watching television and playing videogames than Caucasian or Hispanic children did. Caucasian children viewed more educational television programs than African American children, and Caucasian children also played more educational computer games than African

American or Hispanic children (Bickham, Vandewater, Huston, Lee, Gillman Caplovitz & Wright, 2003). The findings reinforce digital divide issues in relation to the quality of content. The implication is that Caucasian children are embedded in an educational media environment more so than children from African American and Hispanic households, a pattern which has implications for future academic and professional success.

Why Do Youth Use Media?

Uses and gratification theory (Rubin, 1994), grounded in the field of communications, provides an important framework for understanding media use patterns by children as well as by adolescents and adults. Uses involve the choices that children make to use different media. Gratification refers to the needs, such as companionship, that are filled by that use.

Using this framework, media are used for a variety of reasons including entertainment, communication, companionship, relieving boredom, and finding information. These choices are driven more by content area (e.g., news, entertainment) than by medium differences. For example, news content provided by online or televised news fills the same kind of need for information. However, how that information is understood does vary somewhat by medium. In particular, audiovisual images on television news come and go quickly whereas written online text can be read slowly or rapidly based on user skills (Calvert, 1999). Moreover, pictures and words together provide a different symbol system for processing information whereas only one symbol system is provided for processing written text alone (Calvert, 1999).

A companionship need that television and film content are particularly good at fulfilling is a parasocial relationship, in which a viewer acts as if they are in a relationship with an onscreen character (Hoffner, 2008). This kind of relationship is promoted in children's television programs by parasocial interactions in which the onscreen character looks directly at the audience through a camera lens and addresses the audience as if they are in an actual conversation. Fred Rogers pioneered this approach in *Mister Rogers' Neighborhood*. The technique of speaking directly to the audience is now a common technique in U.S. children's educational programs like *Blue's Clues* and *Dora the Explorer* where the characters look at children through the camera lens, talk to them, pause for a reply, and then act as if the child said something to them. Put another way, the feelings that children develop for media characters in these relationships become a tool to reach them and to deliver an educational message. The relationships that children form with characters have also been exploited to collect information from children for marketing purposes, as when Batman asked children to participate in an online "census" about their households for Gotham City (Montgomery & Pasnik, 1996).

Children and youth may also view television, films, and DVDs because they like to watch other people, becoming emotionally involved in the stories that are presented. Children's and youths' higher scores on fantasy empathy, which assesses how immersed one becomes in stories, predict emotional involvement with, and comprehension of, feature length DVDs (Calvert & Conger, 2007; Calvert, Strouse & Murray, 2006). Even adolescents on social networking websites like Facebook spend more time observing the content made by others, known as lurking, than in creating their own content (Pempek et al., 2009). For these reasons, observational media may never be fully replaced by interactive media in terms of children's and adolescents' time investment.

Effects of Media on Children's Developmental Outcomes

While overall exposure to content is important, the kind of content is a crucial organizer for understanding media effects (D. R. Anderson et al., 2001). Certain content can be constructive, leading to beneficial developmental outcomes, or content can be harmful, leading to negative developmental outcomes.

Educational media. When the kind of media exposure is examined, a positive picture of media exposure emerges for certain content. Take, for example, the program *Sesame Street*, which was built from its inception on an educational curriculum. When *Sesame Street* was introduced, researchers were quick to assess the effects of home viewing on children's cognitive development. An initial evaluation conducted by Ball and Bogatz (1970) examined the effects of *Sesame Street* on 3- to 5-year-old children who were encouraged or not encouraged to view. The encouraged group received small toys and parents were given directions about how to use the program whereas the control group did not receive any toys or information. Because the program was so popular, however, most children watched the program. Thus, the researchers created a strategy that divided children into quartiles based on the amount of home viewing. Boys and girls from different socioeconomic backgrounds who frequently viewed *Sesame Street* learned number and letter recognition, geometric forms, and classification and sorting information better than infrequent viewers did. For the children who entered school the next year, teachers rated the higher more so than the lower viewers of *Sesame Street* as having better attitudes about school and their peers.

In the second season of *Sesame Street*, Bogatz and Ball (1971) compared children who did and did not have access to *Sesame Street* by manipulating access to a cable that linked them to UHF stations where *Sesame Street* was then broadcast. The treatment group was given a cable, and the control group did not get a cable, thereby creating differences between the groups in who did and who did not view *Sesame Street*. Those who viewed *Sesame Street* were better than those who did not on a number of language and numerical skills, including Peabody Picture Vocabulary skills.

A subsequent study of *Sesame Street* conducted by Wright and colleagues focused solely on working-class or low-income disadvantaged children for a 3-year period. Two cohorts were compared: a 2-year-old group and a 4-year-old group. Naturalistic viewing patterns, as assessed by home diary measures, revealed that children from ages 2 to 4 viewed about two hours of educational television programs per week, most of which was *Sesame Street*. When the younger cohort was age 5, those who had been heavier viewers of *Sesame Street* performed better on Peabody Picture Vocabulary, math, and school readiness skills than the lighter viewers did. When the 5 year olds turned ages 6 and 7, those who had been heavier viewers of *Sesame Street* were better readers and better adjusted in school. Similarly, Rice and colleagues (1990) found that those who viewed *Sesame Street* more at age 3 had better vocabularies by age 5, but that *Sesame Street* was not as helpful for vocabulary acquisition for the cohort who began the study at age 5.

More than a decade after home viewing data were collected, the research teams headed by D. R. Anderson and by Huston and Wright joined forces to examine the long-term influences of educational television on children's outcomes, including academic success. These youth, who were now adolescents, were recontacted and asked various questions via a phone survey. Because of the time when the data were collected, most of the educational programming that children had viewed was *Sesame Street*. Early viewing of educational television programs was associated with long-term gains in the areas of science, math, and English grades in high school. Benefits of viewing educational television programs were stronger for boys than for girls. Frequent more so than infrequent viewers of educational television programs during childhood were also more creative, read more, and had more favorable attitudes about academic success when they were adolescents. Presumably, viewing educational programming early in life sets a trajectory associated with academic interests and gains over time. By contrast, girls who viewed heavy doses of action-oriented content, which tends to be associated

with violent content, had lower academic achievement.

Other educational programs such as *Blue's Clues* yield beneficial outcomes for cognitive skills as well (D. R. Anderson, Bryant, Wilder, Crawley, Santomero, & Williams, 2000). In the diary data from the Panel Study of Income Dynamics, young children's use of educational television with a cognitive curriculum was related to better reading scores, a stabilizing factor for children who were growing up in stressful home environments (Vandewater & Bickham, 2004). Overall, then, television series with educational curricula yield beneficial educational outcomes.

Exposure to computers in the home environment is also associated with improved academic success by low-income children. For instance, Jackson and colleagues provided low-income 10- to 18-year-olds with computers and Internet access in their homes. Their Internet use was automatically and continuously recorded for a 16-month period. After 6 months, students who used the Internet more had higher reading comprehension scores than those who used the Internet less. After one year, students who used the Internet more frequently also had higher overall grade point averages than those who used the Internet less frequently. Grades in math were not affected. The authors suggest that time online was spent reading web pages and gathering information for class assignments, which, in turn, led to improved reading scores (Jackson, von Eye, Biocca, Barbatsis & Zhao, 2006).

While the quality of media content is associated with positive educational outcomes during childhood and adolescence (D. R. Anderson et al., 2001), growing up in the almost constant presence of television yields negative outcomes. Using data from the Kaiser Foundation *Zero to Six* study, analyses were conducted to examine the prevalence and developmental impact of "heavy-television" households on very young children. Thirty-five percent of the children lived in a home where the television is on "always" or "most of the time" (Vandewater et al, 2005). More than one third of children who are between ages 0 and 6 had a television set in their bedroom (Rideout & Hamel, 2006). Regardless of their age, children from heavy-television households watched more television, read less, and spent less time doing homework than other children, particularly when they had a television set in their bedroom (Vandewater et al, 2005). Moreover, children exposed to constant television were less likely to be able to read than other children (Vandewater et al, 2005). These findings are supported by data from the Child Development Supplement in which television sets in the bedroom are associated with less home work activity, more television viewing, and less reading for older children and adolescents (Vandewater & Lee, 2007). Overall, the data link heavy television usage, particularly in children's bedrooms, to adverse cognitive outcomes.

Exposure to adult-directed television content, not child-directed content, appears to be a key reason for poor cognitive outcomes by young children. In one study (Barr, Lauricella, Zack & Calvert, 2010), 60 parents filled out 24-hour television diaries when their children were 1 and 4 years of age. At age 4, children completed a series of cognitive measures and their parents completed an assessment of their children's executive functioning skills. Results indicated that high levels of exposure to programs designed for adults during both infancy and at age 4, and high levels of household television usage during early childhood, was associated with poorer executive functioning skills at age 4. High exposure to television programs designed for adults during the early childhood years was also associated with poorer cognitive outcomes at age 4. In contrast, exposure to television programs designed for young children at either time point was not associated with any outcome measure at age 4.

Violent media. The effects of exposure to violent media on children's aggressive behavior has been a topic of hot debate for more than 50 years. In an early longitudinal study conducted by Eron (1963), children who were 8-years-old rated one another on how aggressive other children in their class acted. Children's mothers were asked to identify which television programs their children viewed. Boys who viewed more aggressive television programs were more likely to be rated as aggressive by their peers. Ten years later, these children's aggressive behavior was tracked (Eron, Lefkowitz, Huesmann & Walder, 1972; Lefkowitz, Eron, Walder, & Huesmann, 1972). The boys whose mothers reported the heaviest viewing of violent programs at age 8 were the most aggressive youth at age 19. By contrast, being aggressive at age 8 did not predict viewing violent television programs at age 19. This research suggests that viewing violent content causes aggressive conduct. By age 30, the heavy early viewers of violence were more likely to have been convicted of violent crimes (Huessman & Miller, 1994). A follow-up study of more than 500 elementary-aged children revealed that boys and girls who reported more exposure to violent television were more aggressive when they were young adults 15 years later (Huessman, Moise-Titus, Podolski, & Eron, 2003). Similarly, a cross-cultural comparison of U.S. and Finnish boys and girls also found positive correlations between viewing television violence and peer nominations of aggressive behavior (Huesmann, Lagerspetz & Eron, 1984). D. R. Anderson and colleagues (2001) found that children who identified with media characters and who used aggressive media content in their play were more aggressive as adolescents. Intelligence also moderated aggressive influences in one study (Wiegerman, Kuttschreuter & Baarda, 1992), but not in another study (D. R. Anderson et al., 2001). Taken together, these studies implicate early exposure or investment with violent television content to long-term antisocial conduct by both boys and girls.

Negative effects of exposure to violent television are also found in field experiments. For example, Friedrich and Stein (1973) showed children aggressive cartoons, prosocial episodes from *Mister Rogers' Neighborhood*, or nature films. Exposure took place three times per week for a 1-month period in their preschools. Children's aggression at their preschool prior to exposure was compared to their aggression after exposure. Children who were initially more aggressive became even more aggressive after a steady diet of violent cartoons.

Violent videogame exposure over time has also been linked to children's aggressive conduct. In a study of third- and fifth-grade children, C. Anderson and colleagues (2007) found that those who reported playing more violent videogames were more aggressive five months later than those who did not play violent videogames. Increases occurred in both physical and verbal aggression. Meta-analyses that analyze bodies of experimental research also find that playing violent videogames increases children's aggressive behavior, their aggressive cognition, and lowers their prosocial behavior (C. Anderson, 2001).

Prosocial media. Media have the potential to enlighten and improve developmental outcomes by increasing prosocial behaviors like helping, sharing, and feeling empathy for others. Children who were exposed to *Mister Rogers' Neighborhood* in their preschools for a 1-month period, for example, increased in following rules, persisting at tasks, and in tolerating delays (Friedrich & Stein, 1973). Children who were from low-income backgrounds also became more nurturing, expressed their feelings more often, and cooperated better with others.

Teachers can use techniques in their classrooms to improve the effectiveness of exposure to prosocial television programs. For instance, Friedrich-Cofer and colleagues (1979) had Head Start teachers sing and engage in puppet play with children after the children viewed *Mister Rogers' Neighborhood*. Other groups of children viewed with materials in the classroom, with irrelevant materials in the classroom, or viewed neutral films with irrelevant materials in the classroom. Exposure and classroom activities took place over a 2-month period for 30 minutes each day. Prosocial interactions increased with peers the most when viewing the prosocial programs was accompanied by teacher-led rehearsal activities. Exposure to other prosocial programs, such as *Barney and Friends* and *Sesame Street*, yield similar

beneficial prosocial outcomes when viewed in school settings with teacher-led discussions and materials that support the program message (Singer & Singer, 1998; Zielinska & Chambers, 1995).

Meta-analyses indicate that exposure to prosocial programs can improve altruism and other social behaviors, yielding moderate (Hearold, 1986) or weak-to-moderate effect sizes (Mares & Woodard, 2005). While Hearold (1986) found positive effects in both home and experimental studies, Mares and Woodard (2005) found stronger effects in experimental than in home situations.

Obesity. Obesity is a major epidemic in the United States as well as in many other areas of the world (Kaplan, Liverman, & Kraak, 2005). Energy balance is a key concept in obesity prevention and in weight control more generally. That is, to maintain a consistent weight, the amount of energy consumed must be balanced by the amount of calories burned through physical activity (Kaplan et al., 2005). Obesity may be caused by exposure to food commercials (an intake issue); or obesity can be caused by the sedentary patterns involved in most media experiences that may limit physical activity (an output issue); or both factors can contribute to obesity.

In an evaluation conducted by the Institute of Medicine and the Board on Children, Youth, and Families at the National Academies, the role that marketing plays in obesity and dietary patterns of children and youth was examined. After examining more than 100 studies, strong evidence was found that television advertising influences food and beverage preferences and purchase requests of children ages 2–11 years, strong evidence was found that television advertising influences the *short-term food consumption* of children ages 2–11 years, and strong evidence was found that diet-related health is associated with adiposity in children ages 2–11 years and teens ages 12–18 years though possible causal factors in that final link could not be ruled out definitively (for ethical reasons, experimental studies cannot be conducted that could make children obese, which are needed to establish that final link causally) (McGinnis, Gootman & Kraak, 2006). Other data suggest that obesity is associated more with television advertising rather than the sedentary life styles that can come as a result of media exposure (Vandewater & Cummings, 2008).

Videogames have also been examined as a potential reason for overweight and obese youth. Using national diary data from the Panel Study of Income Dynamics, moderate video game play had a clearer negative impact on obesity than did heavy levels of television exposure (Vandewater, Shim & Caplovitz, 2004). However, videogames are increasingly being created as exergames that require gross motor movement for effective results. Youth who play Wii sports exergames, for instance, expend more calories than those who play a videogame (Graves, Stratton, Ridgers & Cable, 2007) or who work on a computer (Staiano & Calvert, 2011). Caloric expenditure is greatest when adolescents compete against a peer rather than solely against a machine (Staiano & Calvert, 2011). The pattern of results suggests complex and multifaceted reasons for obesity that are related to differential media use and exposure patterns.

Content analyses of the kinds of food products marketed on popular children's websites find the same high fat, low nutritional foods marketed online as those that are advertised on television (Alvy & Calvert, 2008). However, some of the same marketing techniques that lead to obesity could also be used to promote healthier eating habits. For example, a pacman advergame in which a child's character earned points for "eating" healthy snacks and beverages and lost points when their character "ate" unhealthy snacks led to healthier snack selections by low-income African American children than when a child's character was rewarded for eating the unhealthy snacks and punished for eating the healthy snacks (Pempek & Calvert, 2009).

Developmental considerations. What children bring to a media experience strongly influences what they take away. In the first two years of life, infants and toddlers demonstrate a video deficit in which they are

able to imitate the behaviors demonstrated in a live presentation better than from a video demonstration of the same content. Repetition decreases the video deficit (Barr, Muentener, Gracia, Fujimoto, & Chávez, 2007) as does verbal labeling of the content (Barr & Wyss, 2008). Because very young children will watch the same video repeatedly, the video deficit may not be as big an issue in the home as it is when children are in experimental lab studies. Even so, the superiority of learning from live presentations by very young children should provide pause for those who market their video products as educational when they are directed at such a young audience. Motor skills that allow very young children to participate in computer activities are also poorly developed in toddlers. According to Kaiser Family survey data, children shift from using a computer from a parent's lap to autonomous computer use between ages 2½ to 3½ (Calvert et al., 2005). However, touchable tablet interfaces such as the iPad, which are easier for very young children to use than a mouse interface, could allow autonomous computer use at younger ages.

During the preschool through early childhood years, children experience considerable difficulty in comprehending plots, particularly those directed at an older audience (Calvert, Huston, Watkins & Wright, 1982). Mature plot comprehension requires children to separate the central plot relevant from the incidental irrelevant material, link those central events together in a temporal sequence, and draw inferences to connect that content together as well as infer how characters feel and what their motives are (Collins, Wellman, Keniston & Westby, 1978). Plot comprehension can be improved by live or onscreen adults who label content for children, repeated exposure to the content, and the judicious use of production features, such as pairing attention-getting auditory features with important central content (Calvert et al., 1982). Computer skills continue to be difficult for young children, with those who have better developed executive functioning skills demonstrating better skills at using a mouse (Lauricella, Barr & Calvert, 2009). Even so, Latina 4-year-old girls who interact with program content learn it better than those who view that content with an adult who does not describe or engage the child with the content in any way (Calvert, Strong, Jacobs, & Conger, 2007).

What youth do and say online reflects key developmental issues, such as identity development. Avatar construction of online characters in late childhood, for instance, remains an accurate reflection of biological sex (Calvert, Mahler, Zehnder, Jenkins & Lee, 2003; Calvert, Strouse, Strong, & Huffaker, & Lai, 2008), with girls and boys often struggling to find a common thread of interaction. For instance, whether children know each other or not, boys in multiuser domains (MUDs), which are online forums where children can interact with one another in settings like audiovisual animated backdrops, typically play by making up games or engaging in pretense whereas girls prefer to talk, reflecting traditional gender roles (Calvert et al, 2003; Calvert et al., 2008). Racial issues permeate online interactions. For instance, racist speech is present in online venues like chat rooms, even though the Internet *per se* offers the opportunity of a color-blind experience (Tynes, Reynolds, & Greenfield, 2004).

During adolescence, youth increasingly create rather than just consume media. For instance, youth create profiles on social networking websites such as myspace.com and facebook.com that reflect who they are, including their media preferences (Pempek et al., 2009). In their blogs, adolescents create and present intimate details of their lives, such as their sexual identity (Huffaker & Calvert, 2005). Coded language systems (e.g., the letter *u* represents the word *you*) are created that allow youth to discuss events in real time at about the speed of talking (Greenfield & Subramanyam, 2003).

Directions for Future Research

For an area that changes so rapidly, that is so pervasive, that covers so many different content areas, and that consumes so much of our

children's time, it is striking that so much research fails to include measures of media influence on developmental outcomes. The Panel Study of Income Dynamics (PSID) and its associated Child Development Supplement (CDS), which tracks media use over time in relation to multiple developmental outcomes, is a notable exception. Inclusion of some of the questions from the PSID-CDS, such as those that address exposure to the newer media, would be highly useful for determining a range of developmental outcomes, including aggression, obesity, cognitive skills such as executive function skills, educational attainment, and prosocial behavior.

Although cross-sectional in nature, the media use survey conducted by the Kaiser Family Foundation provided a standard set of questions in which data were being systematically collected. Qualitative studies are also added to pursue some of the more interesting findings, such as why parents put television sets in very young children's bedrooms. Tracking multiple cohorts over time with this survey could be very fruitful. For instance, does having a television set in the bedroom create an environment where children go to sleep with a television set on? If so, how does this kind of experience set the stage not only for restful sleep, but also for academic performance and long-term self-regulation patterns over time.

Because multitasking is now the normal experience of middle childhood through the adolescent years (Rideout et al., 2005), it is important to update our knowledge about the reliability and validity of media exposure measures. This issue has not been tackled since the study conducted by Anderson and colleague in the early 1980s. Since then, a proliferation of media being used by children and youth simultaneously has complicated the task of reporting their own media use patterns. The use of newer technologies to quantify media exposure, such as time sampling measures in which children are called on cell phones and asked what they were just doing, could be highly informative. At a broader level, what does exposure mean if one is listening to music and writing a report on a computer while also replying to instance messages and visiting websites such as Facebook and youtube? Is there a primary task, a secondary task, and tertiary tasks, or all they all primary tasks that are rotated through very rapidly? How does such exposure influence basic cognitive processes such as attention and learning? Media interfaces are now mobile and touchable. How do these shifts in portability and mode of access (touching) influence media use patterns and the age at which children can readily use interactive media?

The United States recently transited to high definition digital television as the standard broadcast format, replacing the traditional analog format (Calvert, 2008). This shift allows youth a much more compelling media experience than that of generations past. How will the larger "television" sets and the surround sound home theaters that offer amazing visual and auditory clarity influence developmental outcomes?

Conclusion

Children's lives are embedded in an ever-changing media environment. Wherever they go, whatever they do, screen media are almost always with youth. Media content can delight, entertain, and educate our children. Or media content can lead to undesirable outcomes such as aggression and obesity. While the interfaces are rapidly changing, the developmental capabilities and needs of children are not. The challenge of the 21st century is for societies to accentuate the positive opportunities afforded by media while minimizing the negative ones. To do so, a clear understanding of how media effects take place in relation to multiple developmental outcomes, which is facilitated by reliable and valid measures of media exposure, is essential.

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Part IV

MEASUREMENT