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TELEVISION IN INFANCY AND EARLY CHILDHOOD—USES & EFFECTS

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Abstract

The use of television and other media—such as video, computer programs, and CD material—in infancy and early childhood can have both positive and negative influences on the intellectual and social development of young viewers. Viewing carefully designed programs for preschool age children, such as *Sesame Street* and *Mister Rogers' Neighborhood*, can have positive effects on social skills and academic preparation that enhance children's development in preschool, early school years and even into adolescence. At the same time, early use of screen media in infancy and toddlerhood, without the intensive support of parents and other caregivers, can disrupt the development of social skills that are normally acquired through consistent and continuous interaction with parents and significant others in the infant's environment. The history of 50 years of research on children and television has demonstrated consistent and persistent media effects across a wide range of experimental and correlational studies. Recent advances in neurological research, including brainmapping and the discovery of mirror neurons, leads to expanded concerns.

The history of research and policy discussions concerning media and early childhood is largely a history of research on "television" and children. Indeed, the concern about the impact of television on the cognitive development and social behavior of children began in the 1950s in the United States and was initially focused on social behavior, particularly the impact of media violence. By the mid- to late-1960s, there was a developing concern about the role that media (i.e., television) could play in facilitating or retarding cognitive development. The landmark research in this latter area was the research designed to establish and evaluate *Sesame Street*, and other programs for preschool children. However, by the 1990s and the first decade of the 21st century, concerns about young children and media had broadened to include computers, video games, and other forms of electronic "screen media" or interactive toys

As a result of research and public discussion of children and media, legislators and scientific and professional associations began to suggest the need to formulate public policy and parental recommendations. These were designed to monitor and curb some of the negative effects of media, while encouraging patterns of use that enhance the positive effects of media in the lives of young children.

The negative effects of screen media were associated with excessive amounts of time spent with media and the harmful effects of particular content such as violence or advertising. The concerns about excessive time spent on media focused on the fact that "screen time" might take time away from other important activities of childhood such as

imaginative play or interaction with other children as well as time spent with parents, being read to and playing, or exploring their expanding social world. So too, the concerns about specific content such as violence, sexuality, and social role portrayals became important. In addition, advertising for unhealthy food products that may lead to disordered food preferences and eating patterns that encourage unhealthy lifestyles were a major concern. Finally, it has been suggested, by some psychologists and pediatricians, that extensive viewing leads to reduced attention span or increased hyperactivity and, in some recent speculative research by a team of economists, that early TV viewing can facilitate the induction of Autism in young children.

In response to these concerns, various professional and scientific organizations, such as the American Psychological Association, the National Association for the Education of Young Children and the American Academy of Pediatrics—including one of its most important advocates Berry Brazelton—have issued policy statements and recommendations about screen media effects such as violence, early childhood learning needs, and children's social development and obesity.

Early in the 21st century, the American Academy of Pediatrics issued an advisory to its members entitled, *Children, Adolescents and Television Policy Statement*, in which it recommended zero screen time for infants under the age of two and only one to two hours of quality educational media per day for those beyond two years of age. This is a fairly "lean" diet for infants and young children and far below the levels that we know, from studies such as those conducted by the Kaiser Family Foundation, these youngsters consume in their typical daily lives.

Why would major professional organizations concerned with the health and well-being of young children adopt such stringent recommendations? How have scientists studied these issues over the past 50 years of research? What do we know about the patterns of use and the effects of television and other media on the development of young children? How can screen media (television, video games, internet information, interactive toys, and CD-rom or video educational material) be used to enhance the learning and lives of infants and young children?

Research Approaches and Concerns

The research history is best described in terms of the nature of the methodological approaches used: correlational, experimental (laboratory and field), and cross-lagged panel studies. Each of these methodologies will be discussed within an historical context, and the ways in which government and public concerns over the years have set the agenda for social science research.

Setting the Agenda

Concern about the influence of TV violence as an issue in the United States began as early as the start of this new medium. The first Congressional hearings were held in the U.S. in the early 1950s. At these early hearings, developmental psychologist Eleanor Maccoby and sociologist Paul Lazarsfeld presented testimony that relied upon some early studies of violence in films, such as the 1933 report, *Boys, Movies and City Streets*, to outline a necessary program of research on the issue of TV violence and its effects on children.

As the 1960s progressed, concern in the United States about violence in the streets and the assassinations of President John F. Kennedy, Dr. Martin Luther King, Jr., and

Robert Kennedy, stimulated continuing interest in media violence. In response, several major government commissions and scientific and professional review committees were established to summarize the research evidence and public policy issues regarding the role of television violence in salving or savaging young viewers.

Across five decades, six principal government and professional commissions and review panels—the 1969 National Commission on the Causes and Prevention of Violence; the 1972 Surgeon General's Scientific Advisory Committee on Television and Social Behavior; the 1982 National Institute of Mental Health Television and Behavior Project; the 1982 Group for the Advancement of Psychiatry, Child and Television Drama Review; the 1992 American Psychological Association Task Force on Television and Society; and the 2002 Surgeon General's report on Youth Violence—have been central to setting the agenda for research and public discussion.

In 1982, the National Institute of Mental Health (NIMH) published a 10 year follow up of the 1972 Surgeon General's study. The two volume report, collectively titled, Television and Behavior: Ten Years of Scientific Progress and Implications for the Eighties, provided a reminder of the breadth and depth of knowledge that had accumulated on the issue of TV violence. In this regard, the NIMH staff and consultants concluded:

> After 10 more years of research, the consensus among most of the research community is that violence on television does lead to aggressive behavior by children and teenagers who watch the programs. This conclusion is based on laboratory experiments and on field studies. Not all children become aggressive, of course, but the correlations between violence and aggression are positive. In magnitude, television violence is as strongly correlated with aggressive behavior as any other behavioral variable that has been measured.

In 1986, the American Psychological Association (APA) empanelled a Task Force on Television and Society to review the research and professional concerns about the impact of television on children and adults. The nine psychologists assigned to this committee undertook reviews of relevant research, conducted interviews with television industry and public policy professionals, and discussed concerns with representatives of government regulatory agencies and public interest organizations. The final report, entitled *Big World, Small Screen: The Role of Television in American Society*, published in 1992, included the following observation about television violence:

> American television has been violent for many years. Over the past 20 years, the rate of violence on prime time evening television has remained at about 5 to 6 incidents per hour, whereas the rate on children's Saturday morning programs is typically 20 to 25 acts per hour. There is clear evidence that television violence can cause aggressive behavior and can cultivate values favoring the use of aggression to resolve conflicts.

Clearly, both the federal government and the medical establishment had identified media violence as a problem worthy of extensive inquiry. It's not surprising that the social science researchers took up the topic as well.

Early Correlational (Survey) Studies

The early studies of television's influence began almost simultaneously in England, the United States, and Canada in the mid-1950s. They were designed to take advantage of the regulated introduction of the new medium in order to examine its impact in those early years.

In England, a group of researchers at the London School of Economics and Political Science, under the direction of Hilde Himmelweit, began the first study of children's television viewing patterns while TV was still relatively new. (At the time, there were only three million TV sets installed in the 15 million households in England.) Although proposed by the Audience Research Department of the British Broadcasting Corporation (BBC), the study was conducted by independent researchers. Begun in 1955, the study was published in a 1958 report, *Television and the Child: An Empirical Study of the Effect of Television on the Young.* The American and Canadian study was conducted by Wilbur Schramm and his colleagues at Stanford University. Begun in 1957, the study was published in a 1961 report, *Television in the Lives of Our Childre**n***.

These studies, both correlational in that they compared television viewers and nonviewers in a real-world setting (as opposed to manipulating viewing in a laboratory), provided very important benchmarks for understanding the broad and general effects of television on children. With regard to aggression, these correlational studies did not support an association. Himmelweit and her colleagues "did not find that the viewers were any more aggressive or maladjusted than the controls," and concluded that "television is unlikely to cause aggressive behaviour, although it could precipitate it in those few children who are emotionally disturbed. On the other hand, there was little support for the view that programmes of violence are beneficial; we found that they aroused aggression as often as they discharged it". The conclusions of Schramm, Lyle and Parker (1961) have become something of a mantra, and go a long way toward also summarizing (or foreshadowing) the findings of 50 years of research:

> For *some* children under *some* conditions *some* television is harmful. For *other* children under the same conditions, or for the same children under *other* conditions, it may be beneficial. For *most* children under *most* conditions, *most* television is probably neither particularly harmful nor particularly beneficial.

Yet they also concluded that those Canadian and American children studied who had high exposure to television and low exposure to print media were more aggressive than those with the reverse pattern. Thus, the early correlational studies identified some areas of concern about television violence and set the stage for more focused investigations.

The demonstration of a relationship between viewing and aggressive behavior in daily life circumstances is a logical precursor to studies of the causal role that TV violence may play in promoting aggressive behavior. The correlational studies that followed the Himmelweit and Schramm reports, found consistent patterns of significant correlations between the number of hours of television viewed (or the frequency of viewing violent programs) and various measures of aggressive attitudes or behavior.

Correlational Panel Studies

While correlational studies can show us that there is a relationship between viewing media violence and behavior and/or beliefs, they do not address the issue of cause and effect. Although, authors might interpret correlational data to provide evidence of cause and effect, they can't say for sure in which direction the relationship goes. For

example, might naturally aggressive children/teens be more drawn to violent media? And yet, there are some special-case correlational studies in which *"intimations of causation"* can be derived from the fact that these studies were conducted over several time periods. Three of these special surveys and "panel" studies (so named because the same panel of respondents are studied at various points in time) have been highly influential—a 1978 retrospective survey of viewing and current behavior, funded by the private television network CBS; a 1982 panel study, funded by the private television network NBC, and another panel study, funded by the Surgeon General's Committee and NIMH from 1969 to 1986.

The 1978 CBS study was conducted by William Belson in England with 1,565 youths who were a representative sample of 13 to 17 year old males living in London. This retrospective survey looked at the history of viewing violent programs that had been broadcast over 12 years in England and related that to the behavior of the boys during the previous six months. The boys were interviewed concerning the extent of their exposure to a selection of violent television programs (broadcast during the period 1959 through 1971 and rated by members of the BBC viewing panel for level of violence) as well as each boy's level of violent behavior as determined by his report of how often he had been involved in any of 53 categories of violence over the previous six months. The degree of seriousness of the acts reported by the boys ranged from only slightly violent aggravation, such as taunting, to more serious and very violent behavior such as: "I tried to force a girl to have sexual intercourse with me"; "I bashed a boy's head against a wall"; I burned a boy on the chest with a cigarette while my mates held him down;" and "I threatened to kill my father." Approximately 50% of the 1,565 boys were not involved in any violent acts during the six-month period. However, of those who were involved in violence, 188 (12%) were involved in 10 or more acts during the six-month period. When Belson compared the behavior of boys who had higher exposure to televised violence to those who had lower exposure (and had been matched on a wide variety of possible contributing factors), he found that the high-violence viewers were more involved in serious interpersonal violence.

The NBC study (published in 1982), undertaken by Ronald Milavsky and his colleagues, was conducted over a three year period from May 1970 to December 1973 in two cities, Fort Worth and Minneapolis. Interviews were conducted with samples of second- to sixth-grade boys and girls and a special sample of teenage boys. In the elementary school sample, the information on television viewing and measures of aggression was collected in six time periods over the three years. The aggression measure consisted of peer ratings of aggressive behavior. In the teenage sample there were five waves of interviews over the three years and the aggression measures were self-report rather than peer-reported aggression. The results showed that there were small but clear causal effects of viewing violence in the samples of boys and that these effects grew in strength over the three years of the repeated measures during the study period.

Finally, one of the longest panel studies, 22 years, is the work of Leonard Eron and his colleagues. In the initial studies, conducted for the Surgeon General's investigation of TV violence, the researchers were able to document the long-term effects of violence viewing by studying children over a 10-year period from age 8 to age 18. At these two time periods, the youngsters were interviewed about their program preferences and information was collected from peer ratings of aggressive behavior. The violence

levels of their preferred TV programs and other media and measures of aggression across these two time periods suggested the possibility that early television violence viewing was one factor in producing later aggressive behavior. In particular, the findings for 211 boys followed in this longitudinal study demonstrated that TV violence at age 8 was significantly related to aggression at age 8; and the 8-year old violent TV preferences were significantly related to aggression at age 18; but TV violence preferences at age 18 were not related to aggressive behavior at the earlier time period, age 8. When other possible variables, such as parenting practices and discipline style, were controlled it was still clear that early media violence could be part of the cause of later aggressive behavior. Furthermore, in a 1984 follow-up study, when these young men were now age 30, the authors found a significant correlation between TV violence levels at age 8 and serious interpersonal criminal behavior (e.g., assault, murder, child abuse, spouse abuse, rape) at age 30.

Thus, it seems clear that a correlation between television violence and aggression can be established from diverse studies. And, some special cases of longitudinal correlational studies (described as cross-lagged/panel studies) can lead to intimations of causation. However, the issue of causation is best assessed in experimental designs that allow for random assignment of subjects to various treatment conditions or, in the case of field studies, take advantage of naturally occurring variations in television viewing experiences.

Early Experimental Studies

The earliest experimental studies on the effects of media violence on young people emerged in the 1960s, and have proven so influential (and even controversial) that they are still cited today. These initial experiments were conducted by Albert Bandura, at Stanford University, who studied preschool age children, and Leonard Berkowitz, at the University of Wisconsin, who worked with college-age youth. In both instances, the studies were experimental in design, which meant that subjects were randomly assigned to various viewing experiences, enabling the researchers to apply the results of this manipulated viewing to address the issue of causal relationships between viewing and behavior.

The early Bandura studies, such as *Transmission of aggression through imitation of aggressive models* or *Imitation of film-mediated aggressive models*, were set within a social learning paradigm and were designed to identify the processes governing the ways that children learn by observing and imitating the behavior of others. In this context, therefore, the studies used stimulus films (videotape was not generally available) back projected on a simulated television screen. Immediately following the viewing period, the behavior of the children was observed and recorded in a playroom setting. The children who have viewed the model beating a inflated clown (the Bobo doll, hence the generic reference to “Bobo-Doll-Studies”) were more likely to attack the similar toy in the playroom and imitated the voices and words used by the model in the film. Despite the structured nature of these studies, Bandura's research was central to the debate about the influence of media violence.

Moreover, the work of Berkowitz and his colleagues, such as *Effects of film violence on inhibitions against subsequent aggression*, studied the aggressive behavior of youth and young adults following the viewing of segments of violent films, such as a Kirk Douglas boxing film, *The Champion.* The demonstration of increased willingness to

use aggression against others following viewing, further fueled the debate about the influence of media violence.

While the studies of Bandura and Berkowitz set the stage, later experimental studies have employed both the structured, laboratory-based settings as well as more naturalistic settings in schools and communities. For example, one of the earlier studies in this genre, assessed the effects of viewing segments of a violent television program, *The Untouchables*, on the aggressive behavior of 5 to 9 year old boys and girls. In this study, the children viewed either *The Untouchables* or a neutral, but active, track race. Following viewing, the child was placed in a playroom setting in which he or she could help or hurt another child who was ostensibly playing a game in another room. The subject could help the other child by pressing a button that would make the game easier to play and allow the other child to win more points. Similarly, the child could hurt the other child by pressing a button that would make the game very difficult to play and hence lose points. The results indicated that youngsters who had viewed the violent program manifested a greater willingness to hurt the other child than youngsters who had watched the neutral program. Moreover, an elaboration of this study by Paul Ekman and colleagues included the recording of the facial expressions of these children while they were watching the television violence. In this instance, the children, whose facial expressions indicated interest or pleasure while watching TV violence, were more willing to hurt the other child than the youngsters whose facial expressions indicated disinterest or displeasure while watching TV violence. Thus, this set of studies identified some potential moderating variables in the violence-viewing/aggressive-behavior equation.

Other early experiments by researchers using physiological measures of arousal (e.g., GSR—known as galvanic skin response, a measure of sweating on the palms of the hand—and heart rate and respiration changes) while watching violent cartoons found that children were emotionally responsive even to cartoon violence. So too, other studies found that exposure to even one violent cartoon led to increased aggression in the structured playroom settings. Furthermore, studies by Ronald Drabman and his colleagues showed that children who view violent television programs became desensitized to violence and were more willing to tolerate aggressive behavior in others. Moreover, studies with emotionally disturbed children in the 1990s by Tom Grimes and his colleagues found that these youngsters may be more vulnerable to the influence of TV violence. For example, Grimes found that 8 to 12 year-olds who were diagnosed as having either attention-deficit-hyperactivity disorder, oppositional defiant disorder, or conduct disorder, manifested less emotional concern for victims and were more willing to accept violence as justified than a matched group of children who did not have these disorders—the beginnings of concerns about hyperactivity and attention deficit disorder (ADHD) which will be seen in more recent studies on Autism and neurological deficits.

All of these experimental studies described above were conducted in fairly structured laboratory or playroom settings where the display of aggression or emotional arousal or desensitization were relatively contiguous to the viewing of TV violence. However, questions remain about what might happen in more naturalistic settings or field studies of violence viewing and aggressive behavior.

One early study that assessed these issues in was the 1973 work of Aletha Huston Stein and Lynette Friedrich-Cofer in which they assessed the impact of viewing aggressive vs. prosocial television programs on the behavior of preschoolers in their

normal child-care settings. In this study, the preschoolers were assigned to view a diet of either Batman and Superman cartoons, or Mister Rogers' Neighborhood, or neutral programming that contained neither aggressive nor prosocial material (i.e., special travel stories for preschoolers). The "diet" consisted of 12 half-hour episodes that were viewed one half-hour per day, three days per week, for four weeks. The researchers observed the children in the classroom and on the playground for three weeks prior to the start of the viewing period, to establish a baseline for the amount of aggression or prosocial behavior, and continued to observe the children during the four weeks of viewing and for an additional two weeks. The results were that children who were initially more aggressive and had viewed the diet of Batman and Superman cartoons were more active in the classroom and on the playground, played more roughly with toys, and got into more aggressive encounters. Conversely, youngsters from lower income families who had viewed the Mister Roger's diet increased their prosocial helping behavior. One suggestion from this early field study is that viewing aggressive program content can lead to changes in aggressive behavior, while the opposite is also true for prosocial programming. Moreover, these changes were demonstrated in a relatively short viewing period (12 half hours) and in the context of other viewing that took place outside of the classroom setting.

Other field studies have used restricted populations such as boys in detention centers or secure residential settings. In one such study, published in 1971 and conducted for NBC, Seymour Feshbach and his colleague, presented preadolescent and adolescent males in a security facility with a diet of aggressive or nonaggressive television programs over a six week period and measured their daily aggressive behavior. They found that the youngsters who watched the nonaggressive programs were more aggressive than the other group. However, this study was criticized on methodological grounds relating to the selection of subjects and the assignment of viewing conditions and a subsequent replication failed to duplicate the findings. Moreover, a later study conducted by Leonard Berkowitz and his colleagues, using aggressive or nonaggressive films presented to adolescent males living in minimum security institutions, did demonstrate increases in both verbal and physical interpersonal aggression among the teens viewing the aggressive diet.

Another approach to field studies involved the assessment of the effects of naturally occurring differences in the television exposure available to children in communities with or without television or communities with differing television content. In the 1970s, John Murray and Susan Kippax were able to study the introduction of television in a rural community in Australia, in contrast to two similar communities that had differing experiences with television. In a second set of studies by Tannis Macbeth and her colleagues, the research team studied the introduction of television in a rural Canadian community, in contrast to two similar communities with differing television experience. In general, the results of both the Australian and Canadian studies converge in showing that the introduction of television had a major influence on restructuring the social lives of children in these rural communities. In this regard, both studies found that television displaced other media use and involvement in various social activities—a finding not dissimilar to the earlier studies of children in England by Himmelweit or the U.S. and Canada by Schramm. However, with regard to the effects of TV violence, these newer field studies provide stronger evidence of negative influence, in differing but

complementary ways. Murray and Kippax found changes in perceptions of the seriousness and prevalence of crime among children in the town exposed to higher levels of television violence, while Macbeth found increases in aggression among children following the introduction of television in the town.

Given the range of research approaches identified over the past 50 years, what can be said about the influences of media on very young viewers? What are the patterns of use and the effects on the youngest viewers?

Patterns of Use

Studies of American households consistently demonstrate that television, since its inception 50 years ago, has been a major feature of daily activities and, increasingly in recent years, computers, video games and other electronic entertainment are woven into the fabric of family life.

A 2004 report by the Kaiser Family Foundation, noted that babies six months to three years of age spend an average of over one hour per day watching television and about three-quarters of an hour using other screen media (computers, video games and other video/CD material). Children between the ages of 4 to 6 show similar patterns, with other screen media increasing to about one hour per day. In addition to these patterns of use, the recent expansion of the production of television programs, videos and CDs for infants, such as *Teletubbies* or *Baby Einstein* and related programming, have raised questions about the impact and appropriateness of such material for very young viewers. A result that was confirmed in a 2007 report by Ellen Wartella and her colleagues.

Studies conducted in Australia by the Australian Broadcasting Authority, as well as studies in The Netherlands and the United States, have documented the widespread use of screen media by infants and toddlers. The media environment, which children living in industrialized nations experience, is both rich and varied, even accounting for the differences in social and economic conditions across various groups within those countries. For example, a study conducted in 2000 by the Annenberg Public Policy Center in the U.S., which was a national interview survey of 1, 235 parents of 2 to 17 year olds and interviews with 416 youngsters ages 8-16 years, found that homes with children under the age of 17 years contained a wide range of media: 98% of the households had at least one television set, 97% had a VCR, 78% subscribed to basic cable television services—with 31% subscribing to premium cable (with its expanded programming for children, along with more adult programming), 70% owned a computer, 68% owned video games, and 52% of households had access to online services connecting to the Internet.

In a related study by the Kaiser Family Foundation in 2003, which was a survey of 1,065 parents of children birth to 6 years, it was found that children under 6 years were spending approximately 2 hours per day with screen media (including television, computer use and video games—with 48% using a computer and 30% playing video games). And, among the 4-6 year olds who used the computer and video games, they did so for an average of 1 hour per day. In the Australian study of 157 families in Sydney--which was a longitudinal tracking of children at ages 4 months, 12 months, and 30 months—they found that infants were exposed to 44 minutes of television per day at age 4 months, 62 minutes per day at 12 months, and 84 minutes per day at 30 months. So

too, a study using a nationally representative sample of the parents of American children, ages birth to 12 years, found that children aged 2 and younger watched an average of 10 hours and 45 minutes of television each week, while the same report, in a longitudinal study of 240 children from low-income families, found that total TV viewing increased from 19.2 to 20.8 hours per week between the ages of 3 to 5 years.

Thus, it seems clear that screen media, particularly television, occupy a significant portion of the daily activities of infants, toddlers and young children. The next question is how do children come to understand and process the images that they are viewing and does this viewing and media interaction have any positive and negative effects on these youngsters?

Viewing Processes

We know that children begin viewing television and video material in infancy, and are exposed to significant amounts of this electronic storytelling throughout their earliest years. Therefore, the process of viewing has received some research attention in recent years. For example, in The Netherlands researchers investigated the attention patterns of 50, 6- to 58-month olds while they viewed segments of Sesame Street, Teletubbies, the Lion King and news clips, in their own homes. The authors hypothesized that attention to the screen material should be maximized when the content was congruent—but slightly discrepant—with the infant's developmental needs and interests, related to familiarity with the topic and content. This approach posited the "moderate-discrepancy" view, which states that children pay most attention to television content that is only moderately discrepant from their existing knowledge and capabilities. In this study, "salient" content features (such as loud noise, bright or fast visual changes in the display) attracted the attention of the youngest viewers. The authors report that these features also attracted the attention of the older viewers but, in addition to the salient content, the older children were also attracted to the nonsalient content features such as moderate action by the characters, letters and numbers, and meaningful dialogue. The authors noted that this shift from salient to nonsalient content started between 1.5 and 2.5 years. This is a particularly interesting finding because it tracks closely the long-known theoretical formulations of Jean Piaget concerning the use of symbols in the transition from Sensorimotor to Preoperational stages of cognitive development. Related to this finding, recent research on mirror neurons (areas of the brain that respond to the observed behavior or emotions of others by showing identical patterns of brain activation as that occurring in the other person—hence mirroring the other person's experience) and the development of language, by Michael Arbib and Giacomo Rizzolati, suggest that the ability to imitate the physical actions of others—controlled by the mirror neurons—may be the neurological basis of the development of language, a notion first raised in the mid-20th century by both Jean Piaget and Lev Vygotsky in their descriptions of language as "internalized actions." On a broader scale, we are beginning to see that these internalized actions, drawn from observations of others in the child's environment, may control both thought and behavior in the infant and young child.

In other studies, a program of research on attention and comprehension by John Wright and Aletha Huston has provided an outline of the sequence of shifts in attention and comprehension during the early years of viewing. In this program of research, the authors followed the viewing patterns of 240 children from low-income families in a

large city in the Midwestern area of the United States, for 3 years, in two cohorts, from ages 2 to 5 and 4 to 7 years. The authors found shifts in the types of programs viewed by preschoolers and early school years—a shift from less cognitively demanding to more demanding program content (with cognitive demand measured by the redundancy of scenes and characters—easier—and the amount of temporal integration required to understand the scene and storyline—harder).

Building on the earlier work of Dan Anderson and his colleagues, who demonstrated that children attended to content that was comprehensible even when it was not presented with salient features, Huston and her colleagues outlined a clear pattern of shifts in attention based on children's understanding of the production conventions associated with particular media content. In this instance, the authors proposed that children quickly learn the "formal features" of programs that are 'child-friendly' and easily understood---the formal features of such programs include, for example, child and female voices as a prominent content feature. As a result of these studies, the authors developed the notion that young children "sample" the television content to determine whether the program is child-oriented and potentially interesting and understandable. This "stimulus sampling model" suggested that initial brief attention to the screen will increase if the child recognizes that the material is "appropriate" for their interests. This notion was elaborated into the concept of the "Traveling Lens Model" of attention and comprehension in children's viewing patterns, which is outlined in Figure 1.

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Thus, the arousal of interest and attention will be highest if the stimulus material is perceived as falling between the poles of familiar vs. novel; simple vs. complex; redundant vs. inconsistent; repetitive vs. unpredictable; and expected vs. surprising. Hence, children attend most to scenes that are moderately novel, of intermediate complexity, somewhat regular, somewhat ordered, and recognizable.

Effects of Viewing

So, what are the implications of this extensive use of screen media in infancy and early childhood, coupled with the changing patterns of attention and comprehension throughout the early years of viewing?

Most of the concern about this early viewing and screen time has focused on the lack of interactivity between the infant and toddler and his or her caregiver. As the American Academy of Pediatrics, noted, the most important activities and interactions in infancy are those social, face-to-face, interactions that establish the basis for interpersonal relationships. Television and video viewing tends to be more solitary, although there are newer videos, such as that developed by Sesame Workshop (*Sesame Beginnings: Beginning Together*; a DVD for 6-months and up) that encourages parental involvement in the viewing experience by explicitly designing "co-viewing" tasks for caregiver and infant.

However, other concerns have been raised about the early viewing experience and the effects on later development. Marie Evans Schmidt and Dan Anderson, in the Pecora, Murray and Wartella book (***Children and Television; Fifty Years of Research***), review the evidence for and against such viewing by noting the positive gains from viewing specific educational programming vs the tradeoffs concerning lost interpersonal interaction and the charges that such viewing leads to reduced attention span or

intellectual and physical passivity. As the authors note: "To us it is clear that most of the effects of television on cognitive development and academic achievement stem from the particular content viewed. There is little question but that educational television programs teach, and that this teaching has beneficial short- and long-term consequences for schooling. These consequences are due not only to academic content and skills learned from the programs, but also from the social teaching of impulse and aggression control. Most of the negative effects of television stem from entertainment programs, particularly those with violent content. The negative effects include reading displacement in the early elementary years and modeling of aggression, restlessness and impulsivity, according to Schmidt and Anderson,

With regard to the development of behaviors that are incompatible with smooth progress in social and intellectual development, it is the issue of the fostering of restlessness, impulsivity and disrupted attentional processes that has sparked the most concern. For example, Dimitri Christakis and his colleagues, in a study of 1,345 children, found that an extra hour of daily television viewing at ages one and three led to a 10% higher probability that children would exhibit behaviors consistent with a diagnosis of ADHD (Attention Deficit Hyperactivity Disorder) by age seven. Also, a 2007 report by Carlin Miller and colleagues in the *Journal of Pediatric Psychology*, confirms the risk of attentional problems in preschool children who engaged in extensive television viewing.

Following on this research, a team of economists led by Michael Waldman at Cornell University, explored the possibility that extensive television viewing in infancy and early childhood might serve as a "trigger" for the development of autism in young children. This is a highly controversial proposition, but the authors provide interesting statistical analyses showing correlations between autism rates at the county level in California, Oregon, Washington, and Pennsylvania and variables that should be correlated with early childhood television viewing. Using the United States Bureau of Labor Statistics study of the "American Time Use Survey" they first show that TV viewing by children under three is positively related to the amount of precipitation in the environment. They then examine county level autism rates in California, Oregon and Washington (which have varying levels of precipitation), and show that autism diagnosis rates are positively related to precipitation—as the television-as-trigger hypothesis would suggest. In a second test of the hypothesis, the authors compared cohorts of children in California and Pennsylvania who were born between 1972 and 1989 and found that the county-level autism rates were significantly related to the percentage of households who subscribed to cable television even after controlling for the trend increase in cable percentages during the time period (which was spreading rapidly through those areas during that 72-89 time period). Thus, the authors conclude that the findings from their "natural experiments" are sufficiently suggestive of the television-as-trigger hypothesis that more direct testing is warranted

Naturally, there is much discussion about the speculative and complex trail of correlations outlined in the Waldman, et al. study of autism and early TV viewing. However, there is evidence discussed earlier by Schmidt and Anderson and Christakis and his colleagues, suggesting that both the content (violent, high-action programs) and the amount of time spent viewing television in early years can lead to increases in impulsivity and disorders of attention. Furthermore, the speculations about the

relationship of viewing and hyperactivity, as a neurological problem of focus and attention that relates to autism, may be supported in the recent reports of longitudinal studies of the effects of extensive television viewing in the development of attention and learning difficulties during adolescence, in a 2007 report by Jeffrey Johnson and his colleagues. Also, brainmapping studies by John Murray and Mario Liotti and their colleagues, of older children (8-12 years), demonstrated that there are unique patterns of brain activations associated with viewing violence. Indeed, in looking at the brain scans of the youngsters while they were viewing video violence there was evidence that they were attempting to imitate the violent boxing actions through activation of the prefrontal cortex—premotor cortex in the right hemisphere (see Figure 2, area PF9/6) suggesting the role of mirror neurons in affecting the thought and behavior of young viewers.

------Insert Figure 2 about here-----

And, descriptions of the behavioral manifestations of autism note that one of the striking characteristics of children at high-risk for autism (children who have older siblings who are autistic) is their failure of "disengagement of visual attention" such as their inability to "break attentional contact" with the television screen when viewing. Clearly more research is needed in this area, but this highlights some of the concerns about excessive amounts of "screen time" and the potential influence on infants and young children.

So too, on a more positive note, Anderson and his colleagues, in a 2001 report in the *Monographs of the Society for Research in Child Development*, reported on their longitudinal study of the impact of educational programs such as *Sesame Street*. Their findings show that *Sesame Street* viewing at age 5 years not only prepared children for preschool and early school years but also predicted better High School grades in English, math and science.

Thus, there are both positive and negative outcomes from early experience with screen media. However, the cautious response to questions about the effects of television and other screen media in infancy and early childhood is to limit the amount of exposure to these media and to very carefully monitor the content of the program material by emphasizing planned educational programming and maintaining parental interaction in the young child's viewing experience. As many psychologists and pediatricians have noted, it is the "human interaction factor" and not technology, that most advances the intellectual and social development of infants and young children.

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Glossary

ADHD (Attention Deficit Hyperactivity Disorder): A biologically based psychological disorder that is characterized by restlessness, impulsivity, inattention and distractedness.

Autism (or Autism Spectrum Disorders): A developmental disorder characterized by deficiencies in language and communication, social interaction skills, and the presence of repetitive behaviors and obsessive-compulsive (OCD) interests.

Formal Features: Production features of television and other screen media programs such as pace, film angles and cuts, sounds, voices (male, female, child), frequency of scene changes, temporal integration.

Mirror Neurons: Areas of the brain that are responsive to—and 'mirror'—the observed physical actions of others; first discovered in the 1990s by Giacomo Rizzolatti when studying primate brains.

Moderate Discrepancy Hypothesis: The notion that young viewers will attend to visual portrayals that are moderately novel, moderately complex and somewhat surprising in the context of the viewer's experience (see, Traveling Lens Model).
Screen Media/Screen Time: A general category of a range of media involving visual stimulation, including computer games, CD material, television and video. Also, the amount of time spent with such media is described as "screen time."
Traveling Lens Model: A model for describing the factors that enhance or diminish children's attention to screen media; such factors as novelty, complexity, consistency, integration and repetitive vs. unpredictability.

Keywords

television viewing; television violence; media effects; mirror neurons, brainmapping; autism; ADHD; public policy.

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Figure Captions

FIGURE 1: The Traveling Lens Model of Children's Attention to Television Content
Source: Huston, Bickham, Lee, & Wright (2007). *From attention to comprehension: How children watch and learn from television.*. In: N. Pecora, J.P. Murray, & E.A. Wartella (Eds.). ***Children and television: fifty years of research***. (p. 52). Mahwah, NJ: Lawrence Erlbaum Associates.

FIGURE 2: A Brain Scan from fMRI showing mirror neurons active in the prefrontal cortex—the Right hemisphere Premotor Area (PF-9/6**).**
Source: John P. Murray and Mario Liotti, 2007.