

Introduction

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Digital media is ubiquitous in most children's lives.¹ This fact compels us to determine how electronically mediated communications influence children at all ages and developmental stages. By understanding these effects, parents, teachers, clinicians, and policymakers can help fulfill their shared responsibility of improving the well-being of children.

In response to this need, I established Children and Screens: The Institute of Digital Media and Child Development 4 years ago. Children and Screens promotes research on the effects of digital media on children, and supports the creation and use of objective, research-based guidelines and policies. This endeavor began with a series of one-on-one conversations with leaders in media effects research and related fields. These discussions informed Children and Screens' subsequent collaboration with the National Academy of Sciences, which culminated in the Arthur M. Sackler Colloquium "Digital Media and Developing Minds" held in October 2015, where nearly 200 of the world's leading media researchers in all disciplines gathered to share their knowledge. This supplement builds on what transpired at that event. It describes the current state of youth media effects research and points the way to the necessary next steps in this field.

Children and Screens' President and Board of Advisors asked members to lead interdisciplinary Working Groups and co-author articles to address specific, predefined topics within 3 large domains. Topics were chosen on the basis of core areas of inquiry that have already or are currently in the process of framing the evolving field of children and media. The Working Groups consisted of 107 Children and Screens members and 33 additional experts from diverse disciplinary and institutional perspectives who were invited by Working Group leaders on the basis of their particular competencies, with recommendations from Children and Screens members who expressed interest in participating. Children and Screens communicated to all Working Group leaders its strong desire for objectivity, appropriate balance, and range of expertise. As a result, this supplement reflects contributions not only from pediatrics, but also from the fields of psychiatry, psychology, neuroscience, physiology, sociology, anthropology, communications, education, law, public health, and public policy.

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Children and Screens' Working Groups undertook 2 tasks. The first was to conduct comprehensive, transdisciplinary literature reviews in each subject area. The second was to offer research and policy proposals that highlighted concerns and challenges ahead regarding youth media effects research from their perspectives as recognized experts in the field. The analysis, conclusions, and recommendations contained in each article are solely a product of the individual Working Group and are not the policy or opinions of, nor do they represent an endorsement by, Children and Screens: Institute of Digital Media and Child Development or the American Academy of Pediatrics.

The collective breadth of the 22 articles in this supplement makes categorizing them difficult. Readers may find it useful to group them into 3 broad, overlapping categories: (1) research concerning cognitive, psychosocial, and physical effects on children; (2) research on how media influence family, culture, and society; and (3) research focused on particular types of digital content.

COGNITIVE, PSYCHOSOCIAL, AND PHYSICAL EFFECTS

Cognitive Effects

Two Working Groups broadly address cognitive effects of media. Anderson and Subrahmanyam² describe “the developmental impact of digital screen devices including television on cognitive development.” They consider, among other things, the differences between receptive and interactive content as well as the varied capabilities and vulnerabilities of various age groups. In a complementary article, Uncapher et al³ discuss media multitasking and its association with neural, cognitive, psychological, and learning differences. They make the point that the literature on media multitasking is at a nascent

stage, and much investigation is still required, particularly to determine the direction of causality (ie, whether heavy multitasking with media is causing the observed neural, cognitive, psychological, and learning differences, or whether individuals who exhibit these differences are more prone to media multitasking).

Psychosocial Effects

Five Working Groups specifically deliberate on psychosocial effects research. Uhls et al⁴ address how social media influence identity development, aspirational development, and peer engagement for adolescents (ages 13–18 years). James et al⁵ present the current state of knowledge on how digital lives of tweens and teenagers influence their sense of well-being, social connectedness, empathy, and narcissism. Hoge et al⁶ review the current state of research on the connection between digital media and anxiety and depression. Gentile et al⁷ address the state of the science behind Internet Gaming Disorder (defined by the American Psychiatric Association as “persistent and recurring use of the Internet to engage in games, often with other players, leading to clinically significant impairment or distress”⁸). Parsons et al⁹ write about virtual reality as a tool for psychological assessment, therapy, learning, and rehabilitation. They identified the need for the following: validation studies with psychologically intact participants; large-scale randomized clinical trials; guidelines for the development, administration, and interpretation of virtual reality–based assessments; and ethical guidelines.

Physical Effects

Four supplement articles focus on physical health, either as a direct media effect or as a consequence of media-related behavior. In their write up on digital media and sleep

in childhood and adolescence, LeBourgeois et al¹⁰ observe that the “pervasive use of screen-based media is a likely contributor to widespread sleep insufficiency.” Robinson et al¹¹ report on obesity, stating, “Current evidence suggests that screen media exposure leads to obesity in children and adolescents through increased eating while viewing, exposure to high-calorie, low-nutrient food and beverage marketing that influences children’s preferences, purchase requests and consumption habits, and reduced sleep duration.” Romer and Moreno¹² consider the relationship between digital media and 4 classes of risky behavior: (1) alcohol and other substance use, (2) tobacco use, (3) driving, and (4) gambling. Atchley and Strayer¹³ consider a specific case of media behavior affecting physically risky behavior (ie, the relationship between mobile media and driving safety).

EFFECTS ON CULTURE, SOCIETY, AND THE FAMILY

Six Working Groups review research on the social effects of media. Coyne et al,¹⁴ who describe the literature on families, parenting, and media, found that “child characteristics, the parent-child relationship, parental mediation practices, and parents’ own use of media all can influence children’s media use, their attitudes regarding media, and the effects of media on children.” Montgomery et al¹⁵ describe the state of privacy research in the current “Big Data” era. Turner et al¹⁶ discuss research on digital and media literacies in children and adolescents. These authors note that developing such literacies “is one of the most viable intervention strategies to minimize media’s negative consequences and maximize its positive influences on beliefs, attitudes, and behaviors.” Middaugh et al¹⁷ evaluate digital media, participatory politics, and positive youth development. Their work

“suggests a need for greater attention to efforts to promote digital media competencies among adolescents and for greater coordination of research on adolescent risk and adolescent autonomy and empowerment related to internet use.”

Several articles touch on equity issues, but 2 specifically focus on the impact of socioeconomic and geographic differences. Katz et al¹⁸ consider digital inequality in the lives of low-income, immigrant, and minority children. Livingstone et al¹⁹ “outline the important complexities and contingencies that must underpin the future (research) agenda” on children’s digital opportunities globally, particularly with respect to education and learning around the world.

MEDIA CONTENT

Five Working Groups organize their literature reviews around specific types of content. Anderson et al²⁰ focus on screen violence and note that “the effects of screen violence on increased aggressive behavior have been reviewed and affirmed by numerous major scientific organizations.” They specifically look at how media violence affects viewers’ sensitivity to violence and the pain and suffering of others, attentional capacity, academic performance, impulsive aggression, and cognitive skills. Englander et al²¹ review research on digitally mediated social cruelty (cyberbullying) and note the need for more research to be conducted on how such behavior differs fundamentally from its offline counterpart. They further observe that “the lack of a consensual, nuanced definition has limited the field’s ability to examine these issues.” Lapiere et al²² consider the influence of advertising on children through off-line and online channels and as a means of promoting children’s commercial and health-related

behaviors. Dill-Shackleford et al²³ look at how social representations in entertainment media (specifically, representations of race, sex, and other social distinctions) influence behaviors and attitudes toward the self and others. Examples include media portrayals of beauty, sexualization, and other demeaning and objectifying attributes. Collins et al²⁴ review the literature on how sexual content affects the attitudes, beliefs, behavior, and health of young audiences.

We believe that this collective review of the literature is broad enough to inspire more research, practice, and policy recommendations. However, some of the suggestions garnered huge support across the Working Groups, and they merit specific mention here.

One of the suggestions is a call for a current, rigorous, ambitious, and comprehensive approach to research design. Some of the studies reviewed in this supplement focus on different media formats and content that many children now experience, requiring further analysis about generalizable media effects. Others employ limited sampling, measurement, and data-analysis methods that could benefit from new, child-centered, mobile investigative techniques that are becoming available. It is reasonable to suspect that these limitations, along with the dynamic nature of a newly emerging field and the complexities inherent in child development studies themselves, may explain the large number of correlational findings.

Evolving media formats, content, and portability; changes in family and community structures; and changes in children’s bodies and brains as they develop necessitate parallel inquiries into the medium-, content-, context-, and audience-specific effects. Working Groups are calling for more research on the question of variable resiliency or differential susceptibility (ie, what makes

some children more vulnerable to a particular harm or more receptive to a particular benefit).

These concerns have led several Working Groups to recommend the organization and execution of large-scale, multidisciplinary, multivariate, longitudinal studies to be conducted by using more naturalistic research and data-sharing methods than in the past. New ways to gather vast amounts of real-time biological and behavioral data about large numbers of people and their media habits, and new techniques for deriving meaning from that data, is an exciting possibility. Researchers can revisit long-established associations in the literature, identify previously inaccessible causal mechanisms responsible for those associations, and use those discoveries to create specific, targeted, and effective interventions. We can only imagine how negative health outcomes such as attention-deficit/hyperactivity disorder, addiction, violence, and suicide will be minimized. This convergence of the medical and social sciences promises to move media effects research toward youth media policies that can be more widely embraced.

Pediatricians have long understood that quantity, quality, variety, and the time, place, and manner of consumption all matter in the context of what children eat. Researchers for this supplement have suggested that the same is true for children’s media diets,^{25,26} although measuring the duration of children’s media exposure continues to be important. For example, questions persist about the consequences of substituting screen time for other activities and the best use of screen time. Lately, suggestions have been that examining children’s total non-screen time may be a more useful measurement.

In October 2016, the American Academy of Pediatrics issued important, revised screen time

guidelines. Salient changes to the previous recommendations include the following:

- Video-chatting by 18 months or younger,²⁷ which is in contrast with the 2013 guidelines discouraging any screen media exposure for infants and toddlers <2 years old²⁸;
- Introducing toddlers who are 18 months to 2 years old to digital media conditioned on high-quality programming and parent co-viewing, which is in contrast with the earlier policy discouraging screen media exposure for children <2 years old²⁷;
- Up to 1 hour of screen use of high-quality programming with caregiver covieing for children ages 2 to 5 years old, which is in contrast with the previous recommendation of <1 to 2 hours per day of entertainment screen time²⁷; and
- Using a Family Media Use Plan for children and adolescents who are 5 to 18 years old.²⁹

Research will need to adopt newly validated techniques for measuring media exposure. In particular, more research is needed on the effects of the early introduction of iPads on infants and toddlers, particularly focusing on language acquisition, attachment, attention, learning, memory, self-regulation, executive function, and socialization. This supplement illustrates the importance of such work to enhance the prospect for personalized, practical "media pediatrics" (ie, pediatrics that can reliably predict, prevent, diagnose, and treat media's negative effects and maximize its positive effects).

Another frequent Working Group recommendation is to engage parents and learn from their concerns and approaches; this can be seen as an extension of the call for a more naturalistic research. Studying children "in the wild" necessitates

taking parents (and siblings) into account. They model positive and negative media behaviors and serve as the authors and enforcers of media time and type limits. Parents also are the source of frontline intelligence for clinical caregivers and potential allies for schools striving to realize the educational benefits of information technology and to promote children's healthy emotional and intellectual development.

Regarding media equity issues, several Working Groups noted the need to learn more about why (and how) children have disparate experiences when it comes to opportunities to develop media literacy skills and media-related behaviors. However, we already know that crucial differences exist not only among American children but also between them and their counterparts elsewhere around the world. In both the domestic and international contexts, this raises important questions about digital media's widely discussed power as a democratizing force. In this field, as in so many others, international collaboration offers 1 way to gain valuable insights.

With such wide-ranging support for change and the availability of necessary tools, the future of media effects research looks promising. We at Children and Screens believe that establishing a new Media Effects Studies Section and Data Archive at the National Institutes of Health may accelerate progress in this regard. We also suggest introducing nationwide validated psychological and medical screening tests of media usage by toddlers, children and adolescents. The new research advocated in this supplement may receive prompt and appropriate consideration if it has a permanent, expertly staffed home within the National Institutes of Health. Given the rapid evolution of media technology, the timely performance of actionable research depends on such efficiency. Achieving it will improve the

likelihood of clinical interventions, product innovations, evidence-based regulations, and a comprehensive national youth media effects policy informed not only by the past but also by children's current and future needs.

Considering the many references to policy in this supplement, we at Children and Screens acknowledge that a great deal remains to be done in this area. One of the most pressing tasks is to compile a comprehensive survey of federal, state, and local laws related to children and media and a multidisciplinary assessment of whether that legal framework strikes a healthy balance between media-related risks and benefits to children. Doing this will require not only the broad engagement of scholars, clinicians, parents, and public officials but also candid exchanges with the industry. Those who make and distribute media have indispensable knowledge about their products and audiences. They also have access to the levers of commercial incentives, through which behaviors of parents and children are often shaped.

We at Children and Screens look forward to working with readers of this supplement to address these issues. In the meantime, we hope to advance the field of media effects research through early-stage grants to innovative researchers. This seed funding is intended to produce the initial results needed to attract longer-term financial support from more traditional sources. In this and other ways, we hope to help test and validate emerging research methods and attract a critical mass of bold thinkers to a field that is defined by great challenges and high stakes.

Children and Screens is grateful to its Board of Advisors and to all of the Working Group leaders and members for their generous investments of time and expertise. In addition to those whose work appears in these pages, we also appreciate Baranowski et al³⁰ and

the Working Group on Games for Health, whose article has been published elsewhere; Brown et al and the Working Group on Guidelines for Parents, whose targeted recommendations will be validated through field research; Espejo et al and the Working Group on Policy, whose efforts contributed to the preparation of this introduction; and Shifrin et al from the Working Group on Media Ratings, who drafted a paper for future publication. We also recognize the National Sleep Foundation for its co-sponsorship of “Digital Media and Sleep in Childhood and Adolescence” (LeBourgeois et al¹⁰).

Finally, we thank every scholar, clinician, teacher, parent, policymaker, governmental organization, and media industry executive who takes the time to read this supplement and share it with others. We hope that this work inspires a lively conversation among you about children and media at the national level. Together, we can develop a common analytical, diagnostic, and prescriptive vocabulary with which to address childhood media effects. We can foster collaboration, allocate resources efficiently, and cultivate the knowledge and research described in this supplement into reliably effective interventions, practical guidelines, and data-driven policies and practices.

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