

Media Multitasking Workshop
Stanford University

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Meeting Preparation
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Multitasking with media can be defined as behavior that combines media use with other non-media activity (e.g., doing homework while listening to music) or engaging with multiple media simultaneously. Although research has documented that media multitasking is highly prevalent in youth, relatively little is known about its developmental course, its neural correlates, and the costs and benefits of multitasking for learning, memory, and cognitive development.

Relevant Research

My research expertise concerns the development of executive functioning in young children. More specifically, we study the dramatic improvements occurring in the preschool period in children's *working memory* (ability to hold rules or goals in mind), *control of attention* (goal-directed thought and action in the face of interference), *cognitive flexibility* (switching goals and representing choices for behavior), and *impulse control* (tempering or delaying approach behaviors).

We are investigating normal development of these skills at multiple levels of analysis. For example, earlier research led me to realize the need for better measurement tools for executive function in very young children: The cornerstone of research advances in this area will depend on validated and standardized measures. I received an R01 from the NICHD and the U.S. Department of Education as part of the Consortium on School Readiness Outcome Measures to develop behavioral (table-top) executive function tasks for children ages 2-5 years. My lab designed a brief battery to tap the major aspects of early executive function development. It is our hope that this assessment tool will be widely used in research, clinical, and educational settings (e.g., in screening for kindergarten readiness and as a pre-post outcome measure for preschool intervention programs). In addition, this research will greatly inform our understanding of the early organization of executive function skills corresponding to brain development in the preschool years, as well as a variety of social-cultural influences on these skills as they develop.

Executive function skills would seem to be highly relevant to media multitasking:

- Working memory: remembering the goals related to media and non-media tasks

- Control of attention: staying on task and following through on a plan in the face of multi-media interference
- Cognitive flexibility: switching smoothly between media and non-media tasks, or among media
- Impulse control: resisting temptation toward highly rewarding, addicting media (short-term gains) in favor of more prudent choices (long-term gains).

My students and I are working to identify factors that help facilitate executive function development. In several studies we have shown that a *make-believe context* makes it easier for young children to exhibit self-control on our measures. This might be due to psychological distancing, which affords a more reflective and flexible (less stimulus-bound) approach to the task. These findings could have important implications for the *content and style* of media in multitasking situations (not simply the number of tasks), such as educational programming that is infused with make-believe.

Finally, I also examine the neural correlates of executive function (e.g., recording ERPs while children perform a gambling task) as well as environmental influences on its development, including bilingualism, parenting, and culture (U.S. minorities, Korea, China, Singapore, and Japan). A full understanding of media multitasking will likely require a similarly broad base of study at multiple levels of analysis.

Research Agenda

Although there are numerous questions to be addressed regarding media multitasking across development (e.g., its effect on driving in teenagers), I will highlight my own questions pertaining to early childhood:

- Is there a developmentally appropriate window for introducing media multitasking?
- Is there an optimal level of multi-media exposure at certain points in development?
- What are its potential costs (e.g., decrements in language learning) and benefits (e.g., increased cognitive flexibility and creativity) early in development? What are the long-term outcomes?
- How are individual differences in executive function related to media multitasking performance, and to these relative costs/benefits?
- Does the medium matter? What aspects matter most (e.g., salient features)?
- Not all tasks in multitasking are desirable. How does motivation play a role?
- Young children often overestimate their abilities to remember to do things (prospective memory), to manage multiple goals, and to resist temptation. How do self-awareness, monitoring, and strategic organization influence media multitasking and its costs/benefits?
- Do special populations of children with known executive function deficits (e.g., ADHD, autism spectrum disorder) also have greater difficulty with performance during media multitasking?
- Neural correlates as a function of frontal cortex development?
- Cultural values and practices with respect to children's media multitasking?