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Advancing Research on Mobile Screen Media and Young Children’s Cognitive Skills

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WHAT’S NEW

Recent research has demonstrated the importance of the interactivity of mobile device apps, the methods used to assess mobile device learning, and the context of both parents’ and young children’s mobile device use in learning, language, and self-regulation.

Our recent review published in this journal summarized empirical associations between young children’s use of mobile screen media devices, or simply “mobile devices” such as smartphones and tablet computers, and children’s learning and transfer (ie, one’s ability to apply something learned to a new context or situation), language, and self-regulation.¹ We found that, for learning to occur, mobile device apps must provide levels of interactivity and contingency that are appropriate for the task’s demands and young children’s capabilities. We also called for further exploration of the context of children’s mobile device use and how caregivers and children can engage with mobile devices in ways that support cognitive development. Since our review’s submission in March 2020, the COVID-19 pandemic has increased millions of young children’s screen time both for educational and entertainment purposes, with reports indicating the detrimental effects of the pandemic on their learning and development.² This Progress Report discusses our initial review in relation to research published since March 2020 examining young children’s mobile device use and their learning and transfer, language, and/or self-regulation.

LEARNING AND TRANSFER

Wang et al³ found that preschoolers showed greater improvements in telling time from touchscreen learning than video learning when assessed across 3 test media:

a telling-time tablet computer app, toy clock, and clocks printed on paper. The tablet computer app showed the largest difference in *near* transfer, or the application of skills learned in one context to a similar context, between touchscreen and video learning groups. Both touchscreen learning and gesture learning videos were associated with better *far* transfer, or the application of skills learned in one context to dissimilar contexts, than nongesture video learning, emphasizing the importance of interactivity via gesture in young children’s mobile device learning.³

Choi et al⁴ found that toddlers’ age and working memory moderated the effects of tablet computer touchscreen contingency, that is, active response to touch, on the transfer of symbol-mediated learning when tested with an object retrieval task. Tablet computer touchscreen contingency had minimal effects on transfer for toddlers with high working memory, regardless of their age. For toddlers with relatively low working memory, however, tablet computer touchscreen contingency increased transfer for those who were older but decreased transfer for those who were younger.⁴ These findings suggest age and working memory contribute to toddlers’ differential susceptibility to media effects, specifically their learning from mobile devices.

LANGUAGE

Sundqvist et al⁵ examined toddlers’ mobile device use, home environment, and language. Parents reported that 64% of toddlers used a smartphone daily, and 52% used a tablet computer daily. Children’s mobile device use was not related to their vocabulary, grammar, or pragmatics. However, greater parental use of mobile devices, such as texting and watching videos, during daily routines with children, such as playtime, mealtime, and bedtime, was

associated with children's poorer vocabulary and grammar.⁵

Bohicchio et al⁶ found that, when completing the Tower of London task, a measure of executive functioning, 5-year-olds used more private speech or self-talk when using physical materials than when using a tablet computer. Mobile device use during daily routines with children may suppress parents' child-directed speech⁵ and children's use of private speech,⁶ and, in turn, disrupt young children's language and executive function development, respectively.

SELF-REGULATION

Cerniglia et al⁷ conducted a 4-year longitudinal study to test whether using mobile devices at age 4 years in excess of the American Academy of Pediatrics' recommendation of 1 h/d⁸ is related to greater emotional and behavioral dysregulation at 6 and 8 years. Excessive screen time was associated with greater dysregulation at ages 6 and 8, with age 6 dysregulation mediating the negative effect of screen time on academic achievement at age 8. Furthermore, low maternal teaching behavior, such as naming objects, during children's screen time at age 4 was associated with greater dysregulation over time.⁷

Helm and McDermott⁹ administered developmentally appropriate go/no-go tasks before and after 3.5- to 5-year-olds performed a cooking task either on a tablet computer or using toys. Children who used tablet computers performed worse on post-test go/no-go tasks, demonstrating immediate disruptive effects of mobile device use on self-regulatory performance.⁹ Thus, recent correlational and experimental evidence suggests excessive and/or immediate mobile device use disrupts self-regulation in early childhood, but mixed findings persist among studies with varying research designs and screen time measures, as recognized in our initial review.¹

FUTURE WORK

This progress report highlights that the influence of mobile device use on young children's cognitive outcomes is shaped by how mobile devices are incorporated into children's everyday contexts.^{5,7} One contextual factor that shapes how children interact with and are influenced by mobile devices is joint media engagement (JME), which refers to when people, such as parents and their children, utilize media together in interactive ways that support learning. Research on JME shows that, after watching a demonstration video on a tablet computer, 2-year-olds recalled more from the video when parents were instructed to engage in JME by discussing the video with their children as it was playing, compared to children who viewed the video without parent JME.¹⁰ Yet, children who viewed live task demonstrations had better recall than both the non-JME and JME video-viewing groups.¹⁰

More work on contextual factors like JME is needed to determine how to utilize mobile devices as educational tools.

Our ability to understand the effects of young children's mobile device use hinges on the development of measures that can be used cross-culturally and cost-effectively to assess the amount, content, and context of media usage.¹ Passive-sensing apps for mobile devices, time-use diaries, and other innovative tools can address challenges raised in our initial review.¹ When used together, these measures can be leveraged in future studies investigating mobile screen media content, mobile device app interactivity,^{3,4} and contextual considerations of young children's mobile device use,^{5,6} such as JME.^{7,10}

DECLARATION OF COMPETING INTEREST

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