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Tablets, toddlers, and tantrums: The immediate effects of tablet device play.

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In an increasingly digital world, greater than 90% of young children have a mobile device such as a tablet in their home.[1] Though children have quickly adapted to tablets, growing evidence suggests that apps are not necessarily designed with children's development in mind. Children's apps have embraced behavioral reinforcement, such as autoplay, bright colors and influential characters,[2,3] designed to sustain attention for long periods. One negative outcome of such design is that toddlers may have trouble transitioning away from tablets.[4] Understanding the immediate effect of tablet play is important because it has implications for how parents use tablets with their toddlers, or manage their behavior immediately afterwards. We aim to test the hypotheses that compared with a print book, toddlers exhibit more tantrums following tablet play and that tablets prime young children to have lower collaboration and compliance.

This study was approved by the University of Michigan IRB; parents consented, and received $50. We invited 72 parent-toddler dyads to a living-room laboratory to engage in videotaped protocol with three Fisher Price nursery rhyme apps on tablet or print format in randomized, counterbalanced order: 1) enhanced tablet app (animation, sound, auto-play), 2) basic tablet app (animation, sound effects when tapping hot spots), and 3) print book (created from app screen shots).

The tablet apps and print book were contained in boxes labeled 1-3, on a shelf. Dyads were instructed to play with each format (tablet/print) together for three minutes each, then place it on top of the box. The two periods of time in which neither party was directly playing was termed the "transition," during which toddler tantrums were coded, with 0 indicating no tantrum, and 1 indicating verbal complaint, crying, screaming, or frustration (Intraclass correlation [ICC] = 0.88-0.96).

Following engagement with all three tablet/print book activities, dyads engaged in a structured collaborative task in which they took turns building a tower. Collaboration was coded from 1-5 (1=low collaboration; 5 = high collaboration; ICC = 0.93-0.98). Then parents instructed their toddlers to sort blocks into same-colored bins. Child compliance was coded from 1-5 (1=defiance; 5=committed compliance), ICC = 0.94.

Procgenmod with repeated measures compared between-subjects differences in tantrums, collaboration and compliance immediately after enhanced tablet, basic tablet, and print conditions (n=23-24 for each condition), using SAS 9.4.

Parents were 33.0 years (SD 4.3), 93% mothers, 69% with 4-year college degrees, and 86% married. Toddlers were 30.2 months old (SD 3.7), 40% boys, 84% white non-Hispanic, 5% black non-Hispanic, and 28% exhibited any tantrum behavior. As in Figure 1a, 22% [95% CI 4.8-38.9] exhibited tantrums following enhanced tablet (p=.01 vs print) and 25% [95% CI 4.6-37.1] following the basic tablet (p=.005 vs print) compared with 0% following the print book during transition 1. Differences in tantrum behaviors during transition 2 were not significant: 21% [95% CI 4.6-37.0] (p=.45 vs print) exhibited any tantrum following enhanced tablet and 25% [95% CI 4.6-37.1] following the basic tablet (p=.28 vs print) compared with 12.5% [95% CI 0-25] following print. There were no differences between tablet and print formats for toddler collaboration (enhanced 4.3 [SD 1.2],

p=0.54 vs print; basic 4.3 [SD 1.1], p =0.90 vs print; print 4.5 [SD 1.1]) or compliance (enhanced 3.8; [SD 1.4], p=0.62 vs print; basic 3.5 [SD 1.4], p =0.59 vs print; print 3.6 [SD 0.9]).

Immediately following play with a tablet, compared with a print book, toddlers might experience more tantrum behaviors related to the transition. We suspect that there were no statistically significant differences in tantrum behaviors during the second interval because children who exhibited more tantrums during the first transition continued to do so during the second transition, regardless of app format.

Toddler behavioral dysregulation after any tablet play may be the result of engagement-promoting design features of tablet apps, as found in prior content analyses of popular children's apps.[3] The tablet did not have a priming effect on toddlers' behavior in cooperative activities, which suggests that abrupt discontinuation of tablet play is what incites tantrum behaviors and not negative priming; however these tasks were completed last and toddlers may have adjusted to the challenge of removing the tablet, after two transitions.

Limitations include laboratory design which elicited parents' removal of the tablet after a short duration of time (at home, children are likely engaging with tablets for longer periods). Our sample was predominantly white, college-educated mothers with higher levels of income compared to the general population, which limits the study generalizability. Parents' behavioral response to tantrums was not coded, but could be a next step. Nevertheless, transitions away from tablet play are common, as are tantrums that follow. Parents using a tablet with their toddlers may therefore wish to provide advanced notice before discontinuing tablet play, setting a timer as a visual reminder, transitioning to an enjoyable collaborative activity (e.g.: building), and knowing that tantrums eventually dwindle when toddlers are accustomed to positive limit-setting.

Figure 1A) Proportion of tantrums occurring in transition 1 and 2 for each format—note for the print book, 0% exhibited tantrums during transition 1. n=24 for each format category with exception of enhanced tablet transition 1 (n=23). Figure **1B)** Average rating for collaboration, and compliance for each format; * p <.05; ** p<.01.

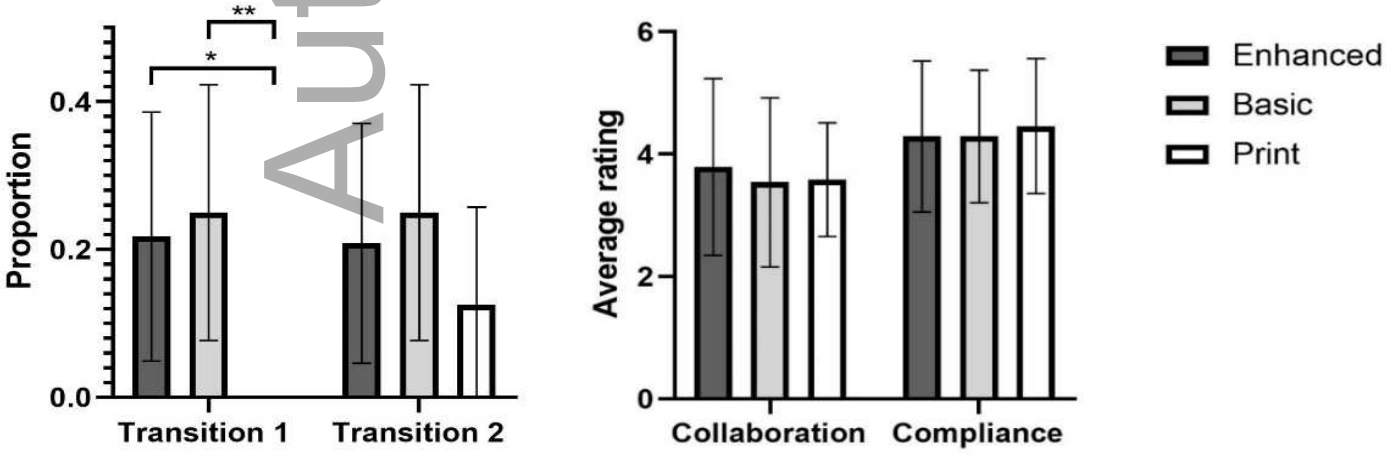

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Figure 1A) Proportion of tantrums occurring in transition 1 and transition 2 for each type of tablet app—note for the print book, 0% of children exhibited tantrums during transition 1. Figure **1B)** Average rating for collaboration, and compliance behaviors for each type of tablet app; * p <.05; ** p<.01