

**Critical Review:**  
**Effects of Exposure to Touchscreen Tablets on Preschool Children's Emergent Literacy Skills**

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Emergent literacy skills such as knowledge of letter names and sounds, phonological awareness, and early writing are skills that begin developing early and gradually through daily print exposure. Touchscreen tablets may afford opportunities for children as young as preschool age to be exposed to print. This study reports a critical review of four studies investigating the effects of tablet-use and preschool children's emergent literacy skills. The results of this review indicate there is suggestive evidence that adult-supported tablet-use with careful selection of apps has the potential to support the development of emergent literacy skills in preschool children. Areas for future research are outlined.

***Introduction***

Children's knowledge of letter names and sounds, print concepts, early writing, and phonological awareness are amongst a set of 'emergent literacy' skills, which are important predictors of later reading (Whitehurst & Lonigan, 1998). These skills begin developing gradually and early in life with daily print experiences (McPake, Plowman, & Stephen, 2013). For example, the home literacy environment can facilitate children's awareness and understanding of written language (Sylva et al., 2011). Young children's exposure to print can occur not only through paper-based media like books, but also through digital means (McPake et al., 2013).

The advent of touchscreen tablets provides a new opportunity to expose children to digital forms of print. Electronic touchscreen tablets such as the iPad are becoming increasingly common in the average household and educational setting (Neumann, 2017). With their easy-to-use touch-based interface, children as young as preschool age are actively engaging with touchscreen tablets (Marsh et al., 2015). Research shows that as early as two years of age, children can independently use tablets for a variety of purposes (Neumann, 2017). Tablets afford young children opportunities to access gaming apps, ebooks, drawing and creating apps, literacy apps, and a multitude of other applications (Neumann, 2017). App labels and text within apps also expose children to print. Exposure to such print-based interfaces has the potential to influence the development of emergent literacy skills (Hisrich and Blanchard, 2009).

Whether touchscreen tablets can be used to support the development of emergent literacy skills is of particular relevance to educators and professionals tasked with designing Tier 1 preschool programs that support literacy development. This question also bears clinical

significance for recommendations that speech-language pathologists may provide to parents who inquire about optimal tablet-use for their preschool children.

***Objectives***

The primary objective of this review was to critically evaluate whether preschool children's use of touchscreen tablets at home, and in the preschool/daycare setting can foster emergent literacy skills.

***Methods***

Search Strategy

Multiple electronic databases including Proquest, PsychInfo, and Western Libraries were used to locate articles with the following search terms: preschool AND all(emergent literacy) AND all(tablet use).

Selection Criteria

Article selection was limited to peer-reviewed journal articles that included quantitative data on emergent literacy measures in relation to preschool children's tablet use at home or in the preschool or daycare setting.

Data Collection

The search strategy yielded four journal articles. The articles consisted of two single group correlational studies, one nonrandomized control trial, and one randomized control trial.

***Results***

Two of the studies included in this review were single group correlational studies. This study design allows for the exploration of associations between different variables, but does not allow for inferences about causal relationships.

The first correlational study, conducted by **Neumann (2014)**, explored whether there were associations between measures of emergent literacy skills and children's use of tablets. Data on home tablet-use was obtained through a parent questionnaire for 109 typically developing, English-speaking children aged 3–5 years from 11 pre-schools in Queensland, Australia. The questionnaire asked parents to rate the amount of time their children spent using tablets, the types of apps they used, the number of tablets in the home, as well as questions assessing parental views on tablet-use. Preschoolers' emergent literacy skills, which include letter name and sound knowledge, numeral identification, name writing, print concepts and word reading, were assessed using appropriate assessment tools during individual assessment sessions at their preschool.

Correlational analysis was conducted to examine associations between home-tablet use and assessed measures of emergent literacy skills. Though socioeconomic status (SES) was calculated for each family using a gold standard measure, statistical analysis did not control for the effects of SES on emergent literacy measures. Results of the study revealed a weak positive association between the number of tablets in the home and preschoolers' name writing and letter sound knowledge. There was no association between time spent using tablets and any emergent literacy skill.

Limitations of this study included lack of statistical control for SES, absence of data on how much time children spent using different types of apps, as well as absence of information about the participants' non-digital home literacy practices that could affect emergent literacy measures. As a result, very low confidence can be attributed to the validity of the reported results. Thus, this study provides equivocal evidence regarding relationships between tablet-use and emergent literacy skills.

**Neumann (2016)** followed up the previous study with a second study that explored relationships between both tablet-based and non-digital exposure to print in the home environment, and emergent literacy measures. This study followed the same methodology as the previous study with a home questionnaire for parents and individual assessments of 57 preschoolers in a daycare setting.

The home questionnaire expanded on the previous study by including questions about how frequently children used literacy and gaming apps, typed or wrote letters and words on the tablet, and read ebooks on the tablet. Questions about non-digital literacy activities

included how frequently the child wrote his or her name, wrote letters of the alphabet, wrote in general, and engaged in shared storybook reading. The parents also checked off whether their child engaged in any of these 6 non-digital writing activities: writing greeting cards, shopping lists, story writing, labelling drawings, name writing, copying letters and words.

Study results indicated a positive association between tablet writing at home and print awareness, print knowledge, and sound knowledge. Other non-digital writing activities were also positively associated with emergent literacy skills. The study concluded that both digital and non-digital home literacy experiences may be important facilitators of emergent literacy skills.

Appropriate statistical analysis was done to determine whether there were any associations between measures of emergent literacy and both tablet-based and non-digital home literacy activities separately, but there was no control for the effects of SES. Limitations of this study also included lack of data on how much time was spent using different types of apps, as well as a limited survey of non-digital writing activities that children engaged in.

Overall, this study provides equivocal evidence that tablet-based and non-digital home literacy practices are positively associated with emergent literacy skills. The clinical implications are suggestive that touchscreen tablets may afford opportunities for preschoolers to engage in digital activities that may be increasing their exposure to print.

The third study included in this review was a nonrandomized controlled trial. This research design compares the effects of an intervention to a control group and provides evidence of causal relationships. However, nonrandom assignment decreases the validity of the results due to the potential for introducing bias within group allocation.

**Reeves, Gunter, & Lacey (2017)** used this quasi-experimental design to investigate how guided instruction using iPads in the classroom improved preschool children's skills in four areas: print knowledge, phonological awareness, mathematic skills, and oral language and vocabulary skills.

English-speaking children aged 4-5 who were enrolled in the Voluntary Pre-Kindergarten program at a public school in Florida participated in the study. Students were enrolled in either the experimental or control classroom. Over a span of 7 months, the experimental classroom used iPad literacy and multi-skills apps to practice emergent literacy and math skills for 15

minutes, with guided instruction from a researcher and the classroom teacher. The control group did not have access to iPads. Emergent literacy and math skills were assessed at the beginning and end of the study through a progress monitoring tool based on the best predictors of later reading and mathematics success.

Though the control and experimental groups had disparate sample sizes, appropriate statistical controls were used to allow comparisons between them. Appropriate statistical analysis was used to determine that both groups were equivalent in their emergent literacy skills prior to intervention.

Results of the study showed that both groups improved their post-test scores on assessments of phonological awareness, print knowledge, math skills, and oral language and vocabulary. The experimental group outperformed the control group with significantly higher post-test scores on phonological awareness and math skills compared to the control group.

Methodological limitations in this study included nonrandom assignment to the control vs. treatment condition, disparate group sizes with the control group being much smaller than the intervention group, and a differing student to educator ratio in the two groups. The sample size was also small and only included two classrooms. Overall, this study provides suggestive evidence that literacy and multi-skills apps may be used to support the development of emergent literacy skills when accompanied by guided instruction from an educator.

**Neumann (2018)** conducted a randomized controlled trial, a research design that provides the highest level of experimental evidence, to investigate the effectiveness of tablet-based literacy apps in fostering emergent literacy skills in preschoolers. 48 English-speaking Australian preschoolers in a daycare setting were randomly assigned to the experimental or control groups. The experimental group completed activities using literacy apps on the iPad for 30 minutes a week over nine weeks. An instructor supervised the use of the iPads to introduce the apps and to ensure the participants remained on task. Before and after intervention, both groups were assessed on print concepts, letter name and sound knowledge, numeral knowledge, name writing skills, and letter writing skills using appropriate assessment tools.

Appropriate statistical analysis was used to ensure there were no between-group differences in emergent literacy skills and home access to touchscreen tablets prior to intervention. Results of the study showed significantly higher scores for letter and sound knowledge, print

concepts and name writing skills for the experimental group compared to the control group. Lack of change in numeral knowledge, which was not targeted in the intervention, improved confidence in treatment specificity.

One limitation of this study was a lack of instructor fidelity check to ensure the study procedure was followed accurately for each group of children in the experimental condition. The intervention was also limited to literacy apps, which reduces generalization of results to other app types. Overall, this study provides highly suggestive evidence that use of literacy apps on touchscreen tablets can support the development of emergent literacy skills with minimal guidance from an instructor.

### *Discussion*

Of the four studies reviewed, the two correlational studies provide the weakest evidence in support of a relationship between emergent literacy skills and preschoolers' use of touchscreen tablets. Failure to control for SES during correlational analysis was a significant flaw in both studies as SES is a well-established predictor of language skills overall (Sylva et al., 2011). The existence of a relationship between emergent literacy skills and the number of iPads in the home, but not the amount of time spent using the iPads, adds further weight to the notion that SES may be a more significant variable in literacy development compared to tablet use, as the number of iPads in the home is likely to be a reflection of SES.

Furthermore, these studies did not adequately assess how much time children were spending using different types of apps, which did not allow for investigation of how the nature of the apps may differentially influence emergent literacy skills. While e-book apps may provide significant exposure to text, gaming or video-based apps may not. The two experimental studies where iPad use led to improvements in emergent literacy skills targeted those skills through specific apps that provided exposure to print in a child-friendly manner. Thus, it is important that future studies explore the extent to which different app types may influence emergent literacy skills.

Another area requiring further investigation is the amount and type of adult-scaffolding necessary for preschoolers to benefit from use of touchscreen tablets. Both iPad interventions with positive results in emergent literacy skills reported adult guidance or supervision as a component of the intervention. It is possible that adult-scaffolding is necessary for preschoolers to make meaning of the text they are exposed to while using tablets.

Finally, all studies reviewed included a relatively homogenous sample of English-speaking children. This limits the extent to which the results generalize to preschoolers from other cultural and linguistic backgrounds. Future randomized controlled trials should explore the effects of tablet-use on emergent literacy skills with a diverse population of preschoolers.

### ***Conclusion***

Two experimental trials provide evidence that suggests that adult-supported use of literacy and multi-skills apps with touchscreen tablets can support the development of letter and sound knowledge, print concepts, name writing skills, and phonological awareness in preschool children. There is no evidence to suggest that incidental exposure to text through independent exploration of touchscreen tablets aids in the development of emergent literacy skills. Future research should focus on exploring the types of apps that may be most beneficial for preschoolers, and the role of adult-scaffolding in the development of emergent literacy skills using touchscreen tablets.

### ***Clinical Implications***

Though research focused on tablet-use and emergent literacy skills is only emerging, the current studies provide some evidence that has clinical significance for speech-language pathologists (SLP) and educators. SLPs and educators can recommend with some confidence that limited and supervised use of touchscreen tablets with careful selection of apps has the potential to support the development of emergent literacy skills in preschoolers.

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