

# The Effectiveness of iPad Handwriting Applications in Improving Visual–Motor and Handwriting Skills in Children With Autism Spectrum Disorder

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## Abstract

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The use of iPad apps for fine motor and visual–motor skills is a common intervention in pediatric occupational therapy (OT). This study provides evidence to support this intervention for children with autism spectrum disorder. Children use handwriting as a main means of communication in their role as students; therefore, OT is highly involved.

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**PURPOSE:** The purpose of this study is to explore the effectiveness of iPad handwriting applications in improving visual–motor, fine motor, and handwriting skills in children with autism spectrum disorder (ASD). Handwriting is a complex process involving interactions among the physical, cognitive, and sensory systems; there is evidence that children with ASD have impairments in these systems, which can result in handwriting difficulties (Kushki, Chau, & Anagnostou, 2011). Children with ASD are also commonly affected by a variety of other deficits that may impact their handwriting abilities, namely, decreases in motor control, visual–perceptual skills, visual–motor integration, and kinesthesia. Handwriting is not only a vital skill throughout the lifespan, but also an important occupation for school-age children. If the use of the iPad applications as an intervention proves to be successful in developing these necessary skills for future success in handwriting within this population, occupational

performance could be positively impacted. This would allow children with ASD to participate in their school-based environments with ease and equal opportunity.

**DESIGN AND METHOD:** A quasi-experimental group pretest–posttest design was used to compare the handwriting performance of children with autism spectrum disorder before and after a 10-wk structured program on the iPad carried out daily for 10–12 min a day. Participants included children ages 5–7 yr with a diagnosis of ASD who received education in a specialized autism classroom. All children were delayed in visual–motor and handwriting skills as stated by a goal in their individualized education program. The dependent variable of handwriting and visual–motor performance was measured both pretest and posttest with the Beery–Buktenica Development Test of Visual–Motor Integration (VMI; Beery, Buktenica, & Beery, 2004) and the Test of Handwriting Skills–Revised (THS–R; Milone, 2007). Data were collected via the iPad application, which measures speed and accuracy of the child’s handwriting skills with each use. Intervention included 10–12 min of iPad use, including handwriting application and visual–motor games.

**RESULTS:** At an alpha level of .05, the VMI scores were tested using both the Wilcoxon signed-rank test and the paired *t* test, and raw scores showed significant changes for each. Additionally, the paired *t* test revealed a significant change in VMI age equivalency from preintervention to postintervention. VMI standard scores and age equivalents both approached a level of significance when analyzed, though not below the .05 level used in statistical analysis. As for the THS–R, none of the post parameters were significantly higher than pre parameters when analyzed. A majority of the participants showed an increase in VMI posttest intervention scores, indicating that the visual–motor skills were transferred from the iPad to pencil and paper.

**CONCLUSION:** By comparing pretest and posttest handwriting samples, we were able to conclude that the results of the THS–R were significant on a clinical level, despite not showing statistical significance. This shows a generalization of the targeted skills. Along with these findings, we were also able to confirm that the iPad is a motivating tool for practitioners, teachers, and children. Limitations include use of a convenience sample with a small sample of children from the same school district, possible previous handwriting intervention, and possible previous exposure to iPad handwriting applications. According to the *Occupational Therapy Practice Framework*, it is our duty as occupational therapists to help individuals fulfill their life roles to the best of their ability and to provide them with the means to do so (American Occupational Therapy Association, 2014). This research offers alternative educational methods for addressing the issues that children with autism face in a learning environment.

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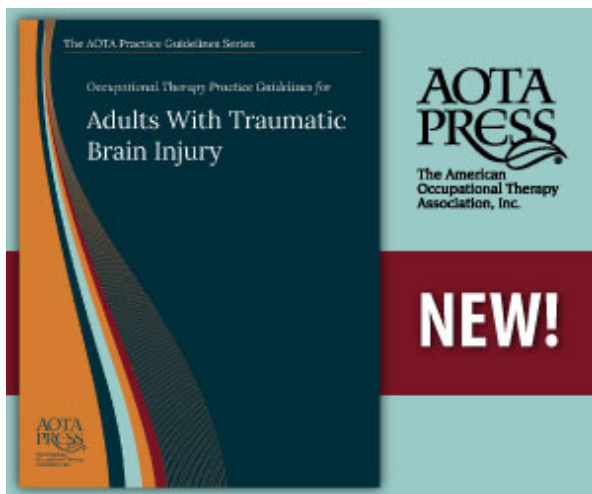
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