Can iPad applications promote pre-primary children’s fine motor skills development?

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1. Introduction

In recent years many children spend less time in active exploration and more time in technology orientated play (Charsleworth, 2011; Sigelman & Rider, 2009). Up to 95% of Australian children aged 5-14 years use technology at home for extended durations (ABS, 2009) and in 2011, 83% of American children accessed a computer at home (Child Trends Databank, 2013). Consequently, along with changing families, community spaces, increased scheduling of children’s time, parent attitudes on safety and risk taking in playing outdoors (Ginsburg, 2007; Little, Sandseter & Wyver, 2012), children’s increased use of technology has contributed to changes in children’s play in Western society.

As technology has become more accessible at home and school concern has been raised by parents, teachers and the community about the impact on children’s normal occupations including everyday tasks such as handwriting (Hiatt, 2012). Some concern on the impact of school iPad use is regarding whether technology provides the same opportunities as traditional play to develop fine motor skills. As 46% of a child’s normal school day is spent engaging in fine-motor skill based activities such as writing, colouring, cutting and pasting (Marr, Cermak, Cohn, & Henderson, 2003) children need adequate fine motor skills to complete tasks.

2. Methods

2.1 Study Design

A two-group non-randomized controlled trial with two pre-primary classrooms (53 children; aged 5-6 years) in an Australian co-educational school, using a pretest-posttest design was undertaken in this study. Twenty eight children were in the experimental group and 25 in the control group. The study looked at the effectiveness of 30 minutes of daily use of specific motor skill iPad applications performed for 9 weeks when compared with a control class performing traditional fine motor tasks. Children completed the Beery Developmental Test of Visual Motor Integration (VMI) and observation checklist, the Shore Handwriting Screen, and self-care items from the Hawaii Early Learning Profile pre and post experiment. iPad applications were chosen for their specific motor skill demands which included finger isolation, precision of finger placement, pressure control and timing of movements, wrist stability, thumb to finger opposition, using a mobile radial side of the hand with stable ulnar side, bilateral integration and rotation. The 30 minute daily iPad program specifically targeted these skills, which are normally targeted in traditional occupational therapy, and provided the opportunity for repetition and practice. The parents and children were asked not to use the same iPad applications outside of school, and parents were asked to not spend time teaching specific occupational performance tasks during the study.

2.2 Data Analysis

Standard descriptive statistics were used to summarize the participants and baseline scores using IBM SPPSS 21.0 (2010). Differences from baseline to end of study on each of the outcome measures were calculated, and paired t-tests were used to identify the statistical significance of changes. Independent samples t-tests were conducted to compare the change in score over the study between groups. A p-value <0.05 was used to indicate a statistically significant association in all tests. Cohen’s d, using the standard formula, was used to calculate the effect size. Effect size was assigned as small when 0.2 < d < 0.49, as medium when 0.5 < d < 0.79, and as large when d > 0.80.
3. Results

3.1 Beery-VMI Motor Scores

On post-testing, the experimental group’s standard scores and age-adjusted equivalent scores made a statistically and clinically significant improvement on the VMI motor co-ordination standard scores with a moderate clinical effect size ($p < 0.001; d = 0.67$).

3.2 Changes in occupational performance tasks

On post-testing the experimental group’s occupational performance in daily tasks improved when compared to the control group in tasks. 23.1% (n=6) of the experimental group improved in dressing skills compared to 4.2% (n=1) of the control group. Mature grasp to perform tasks such as beading and accessing a juice box had similar comparisons with the experiment group showing improvement.

4. Discussion

This study was interested in determining the effectiveness of motor specific iPad applications in improving children’s fine motor performance in their normal occupations. The iPad activity replaced traditional classroom activities for 30 minutes each day and appeared to contribute to improved fine motor control and occupational performance in daily tasks when compared to the control group.

It is not clear how the use of iPad applications were effective in changing motor control when the child did not actually engage in in-hand manipulation or tool use. Possible explanations for the experimental group’s improved performance include the children’s motivation to improve their scores and the daily opportunity to use the iPads to practice these skills. Importantly, the iPad applications were targeted to ensure that timely and accurate use required the students to use precise finger placement, movement, speed and control, all requirements for children’s occupational tasks.

5. Conclusion

This study provides preliminary support for the use of specifically targeted iPad applications as an engaging way to develop fine motor skills. Caution however needs to be taken when generalising and explaining the role of iPads and applications as these were targeted and carefully selected. There is however evidence for the role iPad applications in school and therapy settings to assist children in the development of their fine motor skills.

References


