Practice Report

iStimulation: Apple iPad Use with Children Who Are Visually Impaired, Including Those with Multiple Disabilities

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Since its creation in the early 1980s, Light Box, a product developed by the American Printing House for the Blind (APH) that is designed for working on functional vision tasks with children who have visual impairments or multiple disabilities, has been an effective tool to help teach children with visual impairments to locate and track items visually (Wright, 2012). The Apple iPad, first available in April 2010, represented a new technological option for such teaching that was significantly more visually appealing and motivating to stimulate visual engagement.

This Practice Report describes a pilot study initiated by the Infant & Early Childhood Program of the Junior Blind of America, which found that the iPad increased progress on developmental goals for children with low vision when compared to the APH Light Box. The multistep study conducted by the Junior Blind was designed to investigate the use of the iPad with children with visual impairments or multiple disabilities as a means of strengthening or initiating visual engagement, parental interaction, communication, visual attentiveness, reaching, and activating (making contact with the screen to initiate a desired response; for instance, turning a page or moving an item to or removing an item from the screen).

The study gathered data from a sample of 60 children ranging from birth to three over a period of six months, and identified the iPad as an appropriate educational tool to increase a child's development in multiple areas. The developmental goals established were based specifically on the child's current cognitive age and developmental and physical abilities.

Methods

Using methods similar to those initiated by Smith and Cote (Smith & Cote, 1982), Junior Blind's study observed the use of the iPad in comparison to the Light Box. Employing six-item pretest and posttest sessions, data was analyzed that focused on the children's performance in executing tasks with the iPad for three months following a three-month period of Light Box use.

The study was structured so that the developmental domains covered the areas of visual engagement, parental interaction, communication, visual attentiveness, reaching, and activating. The domains were monitored with a developmental tool that was created to track the goals reached by each participant in a concrete and objective fashion. Each of the developmental domains covered was divided into subcategories from simple to complex skills. The tool was created by a process of researching developmental guidelines, ages, and stages, and by examining the different milestones a child needs to accomplish in order to demonstrate growth in each of the areas while allowing for the differences in a child with multiple disabilities.

Using multiple iPad applications, measured and divided by difficulty and genre, the iPad was introduced to the participants as a tool similar to the Light Box. Following a similar study conducted at Auburn University, directed by Margaret Flores (Auburn researchers using Apple iPads to help children with autism spectrum disorder, 2010), optimum applications were used that elicited activation and interaction.

Prospective participants were identified before information regarding the study was shared. A parent or guardian of each child participant signed an informed consent form allowing data to be collected regarding the

child and giving full permission to use the child's name, information, pictures, data, and video recordings that were gathered as part of the collection process. This research model followed the World Medical Association's Declaration of Helsinki on Ethical Principles for Medical Research Involving Human Subjects and was reviewed and approved by the Junior Blind Human Subject Research Committee on Junior Blind's Los Angeles campus.

The participating children were divided into two groups. An attempt was made to balance the groups to ensure that equal sets of children with varying disabilities were represented in each group. The control group (group 1) consisted of 30 students who used the Light Box for an initial period of three sessions. Data was monitored, scored, and recorded for each 30-minute session on the length of the child's engagement with the product; the parent's (or caretaker's) interaction with the child; and the child's communication, visual attentiveness, reaching behavior, and ability to activate the device. After three sessions, a baseline was created from the data that was collected. The iPad was then introduced to group 1 for nine sessions to complete a three-month, 12-session cycle. After the final session, scores were compared and data was tallied for all 12 sessions. The experimental group (group 2) had the Light Box for 12 sessions and the iPad for the 12 additional sessions. After the final session with the iPad, the Light Box was reintroduced to group 1, and a posttest was administered to determine the child's ability to retain the skills he or she had gained. The control group continued to use the Light Box for 12 more sessions. Applications that were used in the project were rated by difficulty and genre. Specialists were given a list of specific applications in each genre to present to the children in the study.

Specialists were provided with standardized data-collection sheets and response options to maintain fidelity of information. The data sheets were divided into 12 weeks (12 sessions) (See Figure 1). After completion of the six-month study, results of iPad use and Light Box use were compared. The rating system allowed for staff discretion in scoring a child's performance with the device, while keeping data uniform. (See Box 1).

Before the iPad was introduced to participants, activities and goals were established that evolved as the childrens' interests and responses changed. Staff members matched specific applications to desired outcomes, ensuring that the iPad would be used as an educational tool and not an entertainment tool. When an iPad was given to a child, it was used in conjunction with other items (blocks, beads, or a rattle, for example, that were selected based on the preferences and skills of the child), to ensure that the child would generalize the skills he or she was learning on the iPad to other toys and activities.

The iPad curriculum was presented during 30 minutes of the hour-long vision stimulation sessions. All goals and activities were individualized to meet the needs of the children. The iPad sessions were presented during 30 minutes of the one-hour session to allow for the data to be collected clearly and concisely and to allow for transitional time and items to be presented to the children. The introductions of the iPad and Light Box were geared specifically to be individualized based on the child's need. For some children, a transitional toy was a required aspect for the smooth transition to the iPad, while for others it hindered their abilities.

Results

According to our interpretation of the data, the iPad, in comparison with the Light Box, was found to be a superior tool in increasing a child's development in communication,

Junior Blind of America—Infant & Early Childhood Program iPad Study Data Sheet

Child's Name: John Smith **Date of Birth:** 04/05/10 **Group:** **A-Light Box 3 Sessions / iPad 9 Sessions** **Program Start Date:** 05/20/11

Specialist: Vilay Ortega **Diagnoses:** Cortical Visual Impairment

Session #	Date	iPad or Light Box	Length of Engagement	Parent Interaction	Comm	Visual Attent.	Reaching	Activation
1	01/07/11	Light Box	3	no	2	3	4	3
	Notes:							
2	01/14/11	Light Box	3	yes	2	3	4	3
	Notes:							
3	01/21/11	Light Box	3	yes	2	3	4	3
	Notes:							
4	01/28/11	iPad	4	yes	3	3	5	4
	Notes:							
5	02/03/11	iPad	5	yes	4	4	5	4
	Notes:							
6	02/10/11	iPad	6	yes	5	5	5	5
	Notes:							

Figure 1. Sample iPad and Light Box data sheet. Note that under Length of engagement: 1 = 5 minutes or less; 2 = 5–10 minutes; 3 = 10–15 minutes; 4 = 15–20 minutes; 5 = 20–25 minutes; 6 = 25–30 minutes. Under Communication: 1 = nonresponsive (no response at all); 2 = increased body movement; 3 = Actual sounds or vocalization; 4 = Vowel sounds; 5 = Clear verbal communication. Under Visual attentiveness: 1 = Nonresponsive (no visual attentiveness); 2 = Somewhat responsive (momentary focus); 3 = Responsive (tracking items on screen); 4 = Increased response (increased attention); 5 = Fully responsive (engaged and fully attentive). Under Reaching: 1 = No response; 2 = Some increased hand movements; 3 = Reaching out (no direction); 4 = Hand movements (direction of object); 5 = Full reaching to desired object. Under Activation: 1 = No reaction; 2 = Activating somewhat; 3 = Activating object without specific purpose; 4 = Activating object with purpose half the time; 5 = Fully engaged or meaningful activity with object.

visual attentiveness, reaching, and activating. Some children demonstrated growth the first time the iPad was presented and continued their progress through the entire six-month period. The data showed that 100% of the children using the iPad made significant improvements in the following areas: communication, visual attentiveness, reaching, and activating. In each of the targeted areas, children made significant growth of at least one rating (for instance, growth from a level 1 to a level 2 in communication), while multiple children showed significant growth by jumping through the different levels and mastering complex goals in comparison to their initial lack of response in these areas. The data described for each of the developmental areas is for each group as a whole, with the understanding that many children were at higher or lower levels than the overall group and that some children showed growth at a slower or faster pace than their peers.

In the area of length of engagement, the experimental group began at level 1, in which they were interested in the Light Box for under five minutes, the majority of them for under one minute. Upon the introduction of the iPad, the length of engagement of the

The rating system that was used for each section of data collected (30-minute sessions)

Length of engagement

1. 0–5 minutes
2. 5–10 minutes
3. 10–15 minutes
4. 15–20 minutes
5. 20–25 minutes
6. 25–30 minutes

Communication

1. Nonresponsive (no response at all)
2. Increased body movement (breathing changes, eyes widening, smiling)
3. Actual sounds, vocalization (babbling, cooing, laughing)
4. Vowel sounds: *A, E, I, O, U*
5. Clear verbal communication (combination of vowels to make a word)

Visual attentiveness

1. Nonresponsive (No visual attentiveness)
2. Somewhat responsive (momentary focus and exploring contents on screen)
3. Responsive (tracking items on screen horizontally and vertically)
4. Increased response (increase in amount of attention to activity on screen)
5. Fully responsive (engaged and fully attentive to activity on screen)

Reaching

1. No response
2. Some increased hand movements
3. Reaching out (no direction intended)
4. Hand movements in direction of desired object
5. Full reaching to desired object (grasping or landing hand on desired object)

Activation

1. No reaction
2. Activating object without specific purpose (intent) (10–20% of the time)
3. Activating object without specific purpose (intent) (20–40% of the time)
4. Activating object with purpose (intent) half of the time
5. Fully engaged in meaningful activity with object

Box 1

children in group 2 increased from level 1, showing interest for less than two minutes, to a level 4, spending approximately 20 minutes of the 30-minute session actively engaged with the iPad.

In the area of communication, the experimental group began at a level two, with their communication skills showing some increased body movements (for example, breathing changes, eyes widening, and smiling). By the end of their participation, group 2 had moved to a level four, and the majority of the children made not only some vocalizations but actual vowel sounds.

Data on parent interaction was the only area that fluctuated. At the beginning of the sessions, parents were not engaged with the Light Box. Upon the introduction of the iPad, however, they were immediately drawn to it and the different activities included in the device. Over time, the excitement of parents diminished to more typical levels.

In the area of visual attentiveness, the experimental group began at level 2, where they were somewhat responsive and showed some momentary, but inconsistent, focus and exploration of contents on screen. Upon the introduction of the iPad, group 2 jumped to a

level 4, with an increase in both amount of attention to the activity on screen and in tracking items on the screen both horizontally and vertically.

Reaching was an area of concern for the majority of the children in the program. The experimental group began at a level 2, in which they demonstrated some increased hand movements, but not consistently in the desired direction. By the end of their participation in the study, group 2 had increased to a level 5, in which they were fully reaching to the desired object and were fully engaged with the iPad.

Activating was an area that coincided with reaching. Children moved from reaching in front of them to activating the items on the screen. Reaching and activating are key skills that, if learned, children can generalize to make contact with other items in front of them—for example, eventually learning to feed themselves. The experimental group began at a level 2, activating an object without specific intent only 10–20% of the time (the other 80–90% of the time, they were not making any contact in front of them) and ended at a level 4, where they were activating an object with intent 50% of the time.

As a whole, the children showed growth in at least two areas, and many children showed significant growth, by more than three levels, exceeding expectations based on maturity alone. The areas covered as part of the pilot study were all areas in which staff members had been focusing with the children during their regular vision stimulation sessions, but in which they had not been successful.

The data showed that 10% ($n = 6$) of participants in the control group made significant improvements, but the majority of the progress for children in group 1 was unremarkable—more of a sustaining of skills previously learned. Although six children in group 1 did show growth in multiple areas, their growth did not increase more than one level, while in comparison the majority of the children in group 2 showed a growth of more than two levels and generalized those skills for use with the Light Box and other toys.

After the second cycle, the majority of children in group 1 who moved from the iPad to the Light Box were found to have retained the skills they learned, but performance of the skills became inconsistent (for instance, they used only their reaching skills to communicate dissatisfaction with the Light Box). Only 7% of the participants in the control group made improvements or gained new skills. In contrast, 100% of those in group 2 who transitioned from the Light Box to the iPad in the second cycle of the study made significant progress in the areas assessed.

Discussion

As a result of the growth that the children demonstrated, the study team decided to create an iPad curriculum that would provide specific information on how to introduce the iPad to children using different scenarios and provide appropriate support and guidance to both a high-functioning child and a more involved child. The curriculum was created in both a written format and as a video tutorial. The video tutorial consists of 12 descriptive videos of the top six applications, with specifics on how to modify each application for use with both a high-functioning and an involved child. The curriculum DVD has been made available through Junior Blind as a resource for both parents and educators free of charge. Further information on the curriculum can be requested from the lead author.

References

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