"There's an App for That!":

An Overview of Research on the Use of iPads and Other Touch Screen Devices by Individuals with Autism

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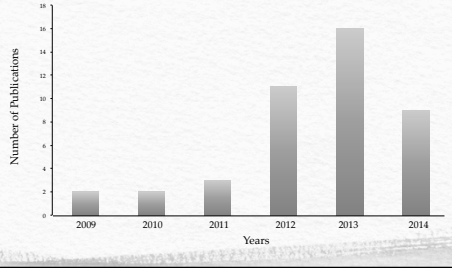
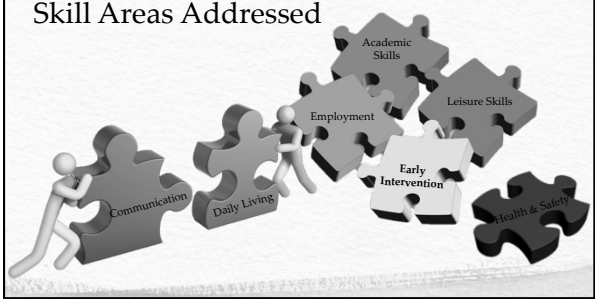
Overview

- Historical perspective
- Application of tablets
  - Skill areas
  - Instructional strategies
- What we know today
- Future directions

Research-Based Publications



Skill Areas Addressed



Communication

- Comparison of tablet-based AAC with other modalities
  - Manual signs
  - Picture-based
- Investigated:
  - Ability to learn each modality
  - Rate of acquisition of manding/requesting
    - Most studies used a field of 1 to 4 symbols
  - Participant preference of modality

Summary of Findings for Comparison Research

- Most participants meet criterion for tablet- and picture-based options; some meet criterion for manual sign
  - Manual sign appears to be the most difficult modality
- Individuals with ASD/DD have preferences regarding AAC modality
  - Most, *but not all,* demonstrate a preference for tablet-based options
- Some participants indicate a preference early and rapidly acquire skills using that modality
  - Others don't demonstrate a preference until they become skillful in a modality

Couper et al., 2014

- Investigated acquisition of manual sign, picture exchange, and SGD (iPod/iPad with Proloquo2Go)
- Nine children with ASD (age range 4:2 – 12:3)
- Varying verbal abilities
  - Echolalia or few single words
  - Pointing or physical guidance of others
  - Few signs
  - Real objects
- Minimal to no experience with manual sign or picture exchange; no experience with SGD

Couper et al., 2014

- SGD
  - iPod Touch or iPad with Proloquo2Go
  - 4 symbol locations; 1 with symbol for 'more' while other 3 left blank
- Picture exchange
  - Laminated card with 4 squares
  - 4 laminated cards; 1 with symbol for 'more' while other 3 left blank
- Manual sign
  - Participants taught the New Zealand Sign Language sign for 'more'
  - Sign was graphically displayed on 1 square of a laminated board; other 3 locations left blank

Couper et al., 2014

- Alternating Treatments Design used to compare each participant's acquisition of the target behavior in each of the three conditions
  - Non-concurrent multiple-baseline across participants design
- 1 to 3 sessions per day over 1 to 3 days per week
  - One AAC modality targeted during a single session
  - 5 opportunities per session

Couper et al., 2014

- Phases
  - AAC system preference assessment
  - Baseline
  - Intervention
    - DTT to teach each of the 3 modalities
    - Criterion was 80% or higher correct requesting over 3 consecutive sessions
    - Procedural modifications were necessary for some children
      - Graduated guidance, physical prompting, differential reinforcement, replacement of iPod with iPad
  - Post-teaching preference assessment
  - Follow-up

Communication

- Acquisition of communication behaviors using tablet-based SGD applications
  - Shape response topography to increase accurate activation of speech output function (Kagohara et al., 2010)
  - Teach individuals to turn on, navigate between 2 pages, and make requests (Achmadi et al., 2012)
  - Teach play dialogue (Murdock et al., 2013)
  - Increase vocabulary usage (Ganz et al., 2014)
  - Teach symbol discrimination (Lorah et al., 2014)
  - Increase spontaneous, social communication (van der Meer et al., 2014)
  - Identify appropriate AAC displays (Gevarter et al. ,2014)

Summary of Findings for Communication Research

- Behavior analytic instructional procedures are necessary
  - Discrete Trial Teaching
  - Errorless instruction
  - Prompting and systematic fading of prompts
  - Time delay
  - Within stimulus prompting
  - Shaping
  - Reinforcement
- Most participants are able to acquire basic manding/requesting behaviors

Summary of Findings for Communication Research

- Success is most often associated with
  - Preference for tablet-based communication
  - Instruction embedded within highly preferred activities
  - Individualized instruction that utilizes behavioral principles
- Most research has focused on teaching manding/requesting with a small set of vocabulary
  - Need to research instruction for purposes other than requesting
  - Need to research instruction with larger set of vocabulary and multiple pages of vocabulary
  - Need to research assessment strategies to aid in selection of display modes

Murdock et al., 2013

- Investigated the use of a story intervention, delivered on an iPad, to increase play dialogue
- Four 4-year-old boys with ASD
- Story created using Keynote
  - Slide show using toy figurines and voice over to represent figurines' speech
- Participants taught to touch the iPad screen to activate voice over and advance slides
  - Sessions lasted less than 5 minutes
  - Each child needed to navigate through the entire story 1 to 3 times and produce or imitate the scripted speech

Murdock et al., 2013

- Multiple baseline across participants
- Phases:
  - Baseline
    - Data probe with adult
  - Instruction
    - iPad introduced; participants required to produce or imitate scripted speech
  - Priming
    - Viewed story once before data probe; no practice or prompts
  - Generalization
    - Viewed story once before play with typically developing peer
  - Withdrawal
    - No story; data probe with adult
  - Follow up for 3 participants

Early Intervention

- Focus on teaching imitation skills
  - Plavnick (2012) taught a 4 year old with ASD to:
    - Attend to and imitate a video model displayed on an iPhone
    - Exchange a picture for communication purposes by viewing video model on iPhone
  - Cardon (2012) taught parents to create video models on an iPad and deliver video model imitation training to their preschool-aged children with autism

Leisure Skills

- Research has focused on teaching individuals to:
  - Use tablets as a leisure activity (watch videos, listen to music) (Kagohara, 2011; Kagohara et al., 2011)
  - Follow picture activity schedules on tablet (Carlile et al., 2013)

Carlile et al., 2013

- Investigated the use of picture activity schedules, delivered on an iPod Touch, to teach children with autism to engage in independent leisure activities
  - 15 potential activities identified by same age, general education peers
  - 10 targeted for each participant (5 for training, 5 for generalization)
- Four boys with autism, aged 8 to 12
  - Enrolled in an ABA-based school program
  - All had used an iPod Touch at school, to play games or listen to music
  - All used non-technical picture activity schedules and timers in their school program

Carlile et al., 2013

- Multiple probe across participants design
- Phases
  - Baseline
  - Intervention
    - Hand-over-hand prompts to teach schedule use and activities; progressive time delay to fade prompts
    - Conditioned reinforcers for correct responding and staying on task; schedule of reinforcement was thinned until faded completely
    - Promoted generalization through varied locations and activities, multiple exemplars, use of the same timer in all picture schedules
  - Maintenance

Carlile et al., 2013

- Social validity assessments indicated that
  - Staff and same age peers rated the procedures and outcomes as acceptable
  - Same age peers indicated they would be more likely to interact with and/or assist their peers with autism using the iPod Touch
  - Community members (n=91) found the iPod Touch schedule to be more acceptable/look more 'typical' than a non-technical schedule
  - Parents of the participants purchased iPod Touch devices and began using similar schedules at home
  - Participants indicated a preference for the iPod Touch schedule

Academic Tasks

- A variety of skills have been addressed
  - Increase time on task and reduce escape-motivated problem behavior (Blood et al., 2011; Neely et al., 2013)
  - Use of spell check (Kagohara et al., 2012)
  - Basic numeracy (Jowett et al., 2012; O'Malley et al., 2014)
  - Solving word problems (Burton et al., 2013)
  - Science vocabulary (Smith et al., 2013)
- Strategies:
  - Video modeling, video self modeling
  - Interactive activities using Keynote app and other learning apps

Smith et al., 2013

- Use of computer aided instruction, delivered on iPad, to teach science terms to students with ASD in a general education setting
- Participants
  - Three middle school students with ASD and an IQ of 70 or below
- Multiple probe across participants design
  - Baseline
  - Intervention
  - Generalization

Smith et al., 2013

- Social validity
  - Study participants, teachers, and peers reported the intervention was effective and appropriate
  - Peers indicated a strong desire to use iPads at school

Daily Living

- Research has focused on:
  - Improving the ability to transition between tasks
  - Cooking
  - Household chores
- Strategies:
  - Video modeling
  - Video prompting
  - Self monitoring

Johnson et al., 2013

- Investigated the effectiveness video prompting via iPod Touch to teach multi-step cooking tasks
- 2 high school students
  - Jerry, 17, moderate ID and autism
  - Alex, 17, moderate ID and cerebral palsy
- Cooking tasks
  - Fruit smoothie
  - Microwave macaroni and cheese
  - Microwave pizza

Johnson et al., 2013

- Video prompts
  - 10 to 11 video prompts per task
  - Each video prompt demonstrated 1 to 3 steps from a task analysis, depending on difficulty of the steps
  - Video prompts loaded into the Picture Scheduler application
    - After completing a step, students could swipe and 'delete' the step

Johnson et al., 2013

- Multiple probe across behaviors design
  - Percentage of steps completed independently
  - Teacher prompts to perform task
  - Teacher prompts to use iPod Touch
- Phases
  - Baseline
  - Video prompting
  - Maintenance
- Data collected on teacher implementation fidelity

Health and Safety

- Use of iPad-delivered social scripts to reduce stress response, problem behavior, and procedure duration during imaging appointments for children with autism (Johnson et al., 2014)
- Use of iPad to record nutrient intake by adults with intellectual disabilities (Ptomey et al., 2013)
- Use of video iPod to improve pedestrian navigation in young adults with intellectual disability residing at college (Kelley et al., 2013)

Employment

- Research has focused on:
  - Increasing independent task completion
  - Transitioning between tasks and/or remembering what tasks to do
  - Reduction of errors
- Strategies
  - Video prompting
  - Video modeling
  - Use of basic apps (calendar, timer, etc.)

Burke et al., 2013

- Use of video modeling, video prompting, and feedback to improve job training and job performance
  - Complex shipping warehouse tasks with a mean of 73 steps (64 – 104 steps)
- Participants were four unemployed men with ASD
  - Aged 19 to 28 years
  - Composite IQ scores ranged from 70 to 121
  - One participant also diagnosed with OCD, ADHD, and Tourette Syndrome
  - Another participant also diagnosed with a visual impairment

Burke et al., 2013

- VideoTOTE application on a Samsung Galaxy Tab
- Video models
  - 104 possible task steps required for error-free produce shipping
    - Organizing all materials to be shipped
    - Checking or testing individual items to ensure working order
    - Replacement of faulty equipment
    - Placement of materials in shipping container
    - Printing and attaching shipping label to container
  - Total 13 minutes, 10 seconds of video; edited into 36 segments
- Performance criterion of 100%; required by the employer

Burke et al., 2013

- Multiple probe across participants
- Prior to baseline each participant experienced a 45 minute, typical on-site training
  - Steps demonstrated by trainer
  - Participants attempted task and received feedback
- Phases
  - Baseline
  - Intervention
    - One week with tablet at home; asked to watch the video as much as possible
    - Told to use VideoTOTE while performing tasks

Summary of Findings for Employment Research

- Tablet-based supports can increase independence and decrease reliance on job coaches
  - Video modeling and video prompting
- Basic apps (calendar, timer, etc.) and specialized apps can assist employees with disabilities to manage time, transition between tasks, remember assigned tasks, and manage anxiety
- Tablets are viewed as acceptable within the context of employment settings

What Do We Know Today?

- Emerging support for the use of tablet devices
  - Across ages and ability levels
  - In a variety of environments
  - Implemented by parents and professionals
- Assessment is critical
  - Making decisions regarding type of device and/or app
  - Ongoing evaluation
  - Individual preference matters

What Do We Know Today?

- Behavior analytic instruction is crucial
  - Teach pre-requisite skills (attending and imitation)
  - Teach device operation (on/off, navigation, etc.)
  - Teach device use within context of instruction
  - Teach device maintenance

What Do We Need to Consider?

- Time required to create tablet-based supports
  - Video models
  - Visual supports
- Implementer training
  - Device use and maintenance
  - Integration within natural settings
  - Instructional strategies
- Which apps to load
  - SGD app only (dedicated device)
  - Use of guided access to prevent exiting from apps

Tablets as a Prosthetic Device
(Lorah et al., 2014)

- Lindsley (1964) suggested that deficient behavior of individuals with developmental disabilities was not an inherent problem, but one of a mismatch between the individual and his/her environment
- Environmental prostheses could narrow the gap between one's skills and the general requirements of the environment

Tablets as a Prosthetic Device

- Lindsley (1964) suggested three strategies:
  - Construction of prosthetic devices
  - Prosthetic training
  - Construction of prosthetic environments
- Although presumably not envisioning tablet devices, Lindsley's suggestions are very applicable when considering current technology…

Prosthetic Devices

- i-Devices
  - iPad
  - iPod Touch
  - iPhone
  - iWatch
- Android Devices
  - Samsung Galaxy
  - HTC One
  - Nexus 10

Prosthetic Training

- Individualized, applied behavior analytic instruction
  - Discrete Trial Teaching
  - Errorless instruction
  - Prompting and prompt fading
  - Time delay
  - Shaping
  - Chaining
  - Within stimulus prompting
  - Differential reinforcement
  - Video prompting, video modeling

Prosthetic Environments

- Tablets for information in community settings
- Tablet kiosks
- Tablets at restaurants

Where Do We Go From Here?

- Ongoing need for research regarding
  - Effective, individualized assessment
    - Device and app selection
    - Progress monitoring
  - Instructional strategies to teach target behaviors
  - Implementer training
  - Effectiveness of tablet use across
    - Lifespan
    - Environments
    - Behaviors or skills
    - Implementers

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