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TOPIC : MOBILE TECHNOLOGY AND COMMUNICATION

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Special Learning



Mobile Technology and Communication

The lack of ability to easily communicate is sometimes very frustrating and can lead to challenging behavior for an individual with an Autism Spectrum Disorder (ASD). Mobile technology offers solutions by enabling those with cognitive and physical challenges to expand their communication abilities and reach. Over six billion people worldwide use mobile technology. Increasingly, those with Autism and disabilities are using mobile technology to improve and extend their communication capacity through innovative mobile communications devices and software. As a result, these individuals are able to increase their level of functioning in society and participate more fully in daily activities.

In this month's articles, we highlight research in mobile communications that reflects impressive progress in the use of adaptive and assisted technologies in the lives of individuals with Autism. These research studies employ widely available technology, such as iPods and cell phones, and easy-to-implement techniques that are accessible to everyone.

More applications are being developed to address the communication needs of those with Autism and disabilities and popping up on iPads, cell phones, and various other mobile devices. Popular applications that improve communication include speech-to-text, voice recognition, virtual dictation, and text messaging. A blind person may benefit from guided GPS while a hearing impaired person may find text or video messaging sign language a fast, easy and convenient alternative to adaptive phone technology. In the course of a day, mobile communications can help increase communication effectiveness, improve productivity, and expand social networks.

A. Special Messaging Technology

A case study by Lancioni et al. (2010) looked at two individuals who, because of acquired brain injury, were severely compromised in their ability to communicate. The special messaging technology used consisted of a small computer, a modem, adapted switches so the participants in the study could easily manipulate the computer, and a software program to enhance text messaging.

Methodology:

This pre/post-test design started with a baseline with no technology available, introduced the special messaging technology, and then collected post-test data. The participants were two adults (a 39-year-old female and a 50-year-

old male) who had suffered acquired brain injury, causing them significant loss of abilities, including effective communication. Both lived in a residential facility. The independent variable was the computer setup that enabled the participants to message each other as a form of communication. The dependent variable was the amount of messages the participants sent and whether they were able to perform messaging and listen to received messages independently.

Results/Outcomes:

The authors found that using a special messaging technology allowed the participants, who were considered severely disabled, to communicate independently. They reported back that the special messaging technology was empowering, allowing them to make choices about what and to whom they would communicate. The results show that the use of mobile technology as a communication tool can be very effective, even for people with significant challenges. The authors suggest that future studies utilize more compact technology, generalize the findings of this study to other populations, and measure the use of technology throughout the day, rather than just concentrating on a certain time of the day.

B. Mobile Phone Technology and Sign Language

A study by Cavender, Vanam, Barney, Ladner, and Riskin (2008) looked at the use of video sign language over mobile phones as a form of communication. This study was conducted to assess the usability of sign language videos on mobile phones as an alternative to texting for people who would rather use ASL than English (only used in texting). The intention was to make communication more accessible in the language of their choice. The authors started with a focus group to assist in the determination of what the phone system should look like.

Methodology:

This was a non-experimental design involving focus group participants. There was no control group. The independent variable was the use of videos on a mobile phone. The videos consisted of an adult woman telling stories in ASL. The dependent variable was the ease of use of the videos and whether participants thought the videos were accessible and something that could potentially be useful to the Deaf community. Eighteen adults from the Deaf community were involved in the study—11 men and 7 women. Ten participants were Deaf, five participants were hearing, and three



participants were children of Deaf adults who considered ASL their first language.

Results/Outcomes:

The results of this study provided evaluation information to the developers of video ASL communication on mobile phones on features such as the optimum screen size, bandwidth, and viewing angle from the Deaf community using the service. In addition, several areas for improvements in the service were identified. Having the ability to view videos in ASL on a mobile phone will create greater accessibility for members of the Deaf community who consider ASL to be their first language or language of choice.

C. Display of Icons in an Application

A study by Reichle and Drager (2010) examined the placement of communication icons on communication devices using gestural and graphic modes. The authors looked at factors such as all the symbols being available to the communicator in one area versus on multiple pages, the size of the symbols, the size of the display, the layout of the display, and the use of color.

Methodology:

This was a review of the literature, and therefore participants, and independent and dependent variables were not used in this study.

Results/Outcomes:

The authors examined key aspects of what makes an augmented communication device user-friendly and what types of variables create a more positive experience for those who use these devices. They offer a number of strategies that can be used to facilitate the navigation of screens using gestural and graphic screens by those with cognitive and physical impairments. Even though this study did not specifically address the use of mobile technology, with the emerging popularity of communication applications and software, studies like these could be valuable in assisting product and service developers with how to make their items as user-friendly as possible. This research could be used to gain empirical support for certain navigation strategies and developmental plans for mobile products in the future.

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Mobile Technology and Employment for Individuals with Disabilities

In the technology-driven workplace, technology developers are aggressively seeking opportunities to create innovative assistive and adaptive technology for those with Autism and disabilities. Individuals with disabilities are not only using this technology but, with its assistance, are also able to play a greater role in developing it as programmers, researchers, and engineers. The following article reviews highlight research into mobile technologies that are making it easier for those with Autism and disabilities to function optimally in employment settings.

A. Mobile Location-Based Social Networking in Supported Employment for People with Cognitive Impairments

Chang and Wang (2010) explore a potentially effective personal digital assistance device (PDA) to help individuals with disabilities increase independence in transporting themselves to employment settings. The authors found that all participants had previously experienced being lost while in transit to either an employment setting or their home from work. Becoming lost is a significant concern for individuals with a regular commute. The mobile devices used configured a special display to make using the devices very simple for the user. If a participant became lost and unsure of his/her surroundings, the user would simply press a HELP button. This would notify the caregiver or job coach of the location. This experiment does not necessarily study the ability of the participants to use the device, but rather explores if the device can perform as it was designed to operate.

Methodology:

This quasi-experimental, post-test only design with no control group involved participants between the ages of 20 and 48 years old. All eight participants had at least one of the following disabilities: traumatic brain injury, physical impairments, intellectual disability, schizophrenia, dementia, organic brain syndrome, or epilepsy. In addition, each participant had previously experienced being lost. The independent variable was the use of a PDA with a mobile location-based social network. The dependent variable was identification of the user to caregivers within a target distance, processing of a request by the user, the ability to relay such information to a caregiver, and the social validity of the technology. The eight participants were recruited based on functioning level (high functioning and very low functioning individuals were excluded), the ability to oper-

ate personal digital assistants (PDAs), and the ability to understand the feedback of the PDA.

Results/Outcomes:

The mobile location-based social networking PDA technology was found to be an effective method for locating an individual potentially lost or in need of assistance when separated from a job coach. The technology was also determined to be able to process a request by the participants and then relay that information to a nearby caregiver or job coach. The PDAs relied on GPS to identify the location of the individual participants. The settings allowed the location to be sent to the server every 8 seconds, and the device to maintain a battery life of 1.7 hours. This was enough time for the participant to begin the routine of traveling to the destination, allow for any instances in which the participant may become lost, and alert the caregiver or job coach to locate them. Settings could be chosen to increase the battery life, but at the expense of losing precision and recall.

Seven of the eight participants felt comfortable with the mobile devices and would like to use such a device. The one participant who was not comfortable only reported feelings of anxiety concerning losing or breaking the device at the onset of the study. Once he was reassured and taught how to carefully use the device, he reported more comfort with the technology. Overall, the results were promising for an easy-to-use mobile device to ensure that individuals can transport themselves to a desired location without fear of becoming lost. The sample size was small (N = 8) and the quasi-experimental design weak for making any causal determination. Further research should explore the fidelity of such a device and identify for whom such a device is best suited.

B. The Effectiveness of Using a Video iPod as a Prompting Device in Employment Settings

Van Laarhoven, Johnson, Van Laarhoven-Myers, Grider, and Grider (2009) studied how video prompting using an iPod affected independence at an employment setting for an individual with a disability. The participant was employed at a no-kill animal shelter where he was responsible for work-related tasks in the public restrooms and kennel area. He did not have any prior experience with the iPod, although he did display independence in using computers, cell phones, and remote controls. In previous studies, the authors found that while mobile devices used for video prompting were effective, in many cases participants con-



tinued to require assistance to use a mobile device. The authors identify the necessity for an intervention that would provide complete independence.

Methodology:

One 17-year-old male participated in this quasi-experimental study, which used a multiple probe across behaviors design. Criteria to participate included employment or seeking employment, informed consent, and permission obtained from the employment site. The participant was diagnosed with Deletion Syndrome, also known as Monosomy 1p36, a chromosomal disorder. The IQ score on the Weschler Intelligence Scale for Children – 3rd Edition was 52. He was also assessed to be in the very low range for reading ability as noted from a score of 64 on the Woodcock-Johnson III Tests of Achievement.

The independent variables were the interventions that were developed to increase independence on the three targeted tasks. These interventions included video prompting as utilized on the iPod and video feedback (being referred back to the video model on the iPod as part of an error correction procedure). The dependent variables were measured on the three tasks that were the target of the instruction. These include cleaning the bathroom, mopping the floor/emptying the garbage, and cleaning kennels. The dependent measures included the percentage of independent correct responses, the percentage of error correction prompts with video feedback alone, the percentage of error correction prompts with video feedback plus a controlling prompt, and the percentage of prompts to use the technology.

Results/Outcomes:

Baseline probes showed minimal independence in completing the three targeted skills. For cleaning the bathroom, they demonstrated that the participant was able to complete 20% of the tasks independently. For mopping the floors and taking out garbage, the participant completed the tasks independently in 20% of the opportunities observed. When probed for the task of cleaning kennels, the participant independently completed the task in approximately 15% of the opportunities. After intervention, the participant reached independence in 100% of opportunities for all tasks.

The authors also studied the social validity of utilizing the iPod for video feedback. The participant enjoyed using the technology to learn to complete the skills independently. The guardians of the participant were pleased with the mo-

bile device and would like to continue using the device in the future. The employer also was pleased with the mobile device and was impressed with the performance of the participant. The employer indicated that the use of the mobile device for video prompting would be beneficial for all new employees. While the results of the study are promising, generalizability is limited due to the fact that there was only one participant in this study. Future research needs to explore the effectiveness of mobile devices in increasing independence in vocational settings, specifying the necessary variables that impact success.

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Mobile Technology and Video

Individuals with Autism often experience limitations in socialization, communication, and adaptive living skills. Mobile technology can be a non-intrusive intervention to teach various skills within these domains. One example of such utilization of mobile technology is through video modeling and prompting. Video modeling consists of the occurrence of a behavior by an observer that is similar to the behavior being shown on a video clip (Nikopoulos & Keenan, 2004). A variation of video modeling, video prompting, breaks down a longer video into shorter clips showing only a portion of the task at one time. This may be advantageous for individuals who have difficulty attending to a lengthy video (Sigafoos et al., 2007).

A. Key Questions About Video Modeling Interventions

Rayner, Denholm, and Sigafoos (2009) evaluated several unanswered questions regarding video-based interventions when applied to individuals with Autism. Video-based interventions (VBI) encompass approaches such as video-modeling, video prompting, video self-modeling, computer-based video instruction, and video priming. The primary purpose of this article was to acknowledge contributions and findings already made using this approach, compare and contrast reviews to assist in providing a broader context for the various VBI procedures, and assess relevant issues to provide greater confidence in the findings.

Methodology:

The reviews included in this article were published in a peer-reviewed journal in English and provided a formal review of the relevant studies, including studies which used a video-based teaching procedure as the independent variable to change an aspect of behavior, and those in which participants in the studies had a learning disability, as well as at least one study involving participants diagnosed with Autism.

Results/Outcomes:

Although a range of behaviors have been the focus of VBI studies, they are mostly aimed at improving and increasing social interaction, language/communication, functional skills, and consistency of compliant/appropriate behaviors, as well as reducing challenging behaviors. This article categorized procedural variations to VBI into six areas: (1) video feedback, (2) video modeling, (3) video self-monitoring,

(4) subjective point-of-view, (5) interactive video instruction, and (6) computer-based video instruction. Of the five reviews included in this article, all five unanimously describe the applications of VBI as successful and leading to positive intervention effects overall.

This article finds no definitive evidence to indicate who may or may not benefit from VBI, but it is noteworthy that individual characteristics such as visual processing and language skills as well as rates of problem behavior may influence the effectiveness of video modeling interventions. According to some reviews, there does not appear to be a significant difference in the use of 'self' versus 'other' as a model, but the reviews are mixed. Some suggest that self and peers appear to be the most effective models with the learning theory self considered to be more effective. In summary, some unanswered questions include:

Who would benefit from these procedures?

What kind of model and perspective should we use?

What other procedures should/can be combined with VBI and the presentation of video footage?

How should the video footage be presented?

B. Video Modeling and Social Initiations

Nikopoulos and Keenan (2004) sought to examine the effects of video modeling on social initiation and play behaviors in three children with Autism. In this study, a typically developing peer (the model) was taped in the video. The results support the use of video modeling with children with Autism.

Methodology:

In this multiple baseline across subjects design, three participants ages 7 to 9 years old, diagnosed with Autism took part. The independent variable included video modeling. There were four different conditions to video modeling. In condition B1 (after baseline), the participant viewed a 35-second video clip and then was taken into a room with toys and the experimenter (opportunity to engage in the dependent measures). Condition B2 was introduced if social initiation did not occur, which was a video clip of the sequence of behavior simplified. Condition C tested to see if the participant would emit social initiation to instigate reciprocal play using a toy that differed from the one depicted



in the video. Follow-up sessions were conducted 1 and 3 months later. For the dependent variable, social initiation, reciprocal play, latency to social initiation, and total duration of reciprocal play were measured.

Results/Outcomes:

The results suggest that video modeling enhanced social initiation and reciprocal play skills across all participants. Additionally, during the one- and three-month follow-up, the skills were maintained, time engaged in reciprocal play with each toy increased, and latencies to social initiation were relatively low. This study contributes to the research demonstrating the effectiveness of video modeling with children with Autism.

C. Comparisons of Picture and Video Prompts to Teach Daily Living Skills

Van Laarhoven, Kraus, Karpman, Nizzi, and Valentino (2010) compared the effectiveness of video prompting using a computer with in vivo picture prompting to teach daily living skills to two adolescents with Autism. The participants were taught two skills, making microwave pasta and folding clothes, each with a similar level of difficulty and number of steps. They were taught the two different skills under each of the instructional conditions (i.e., one skill was taught utilizing video prompts and one taught utilizing picture prompts).

Methodology:

A within-subject adapted (treatments are applied to different but equally difficult, independent behaviors or skills) alternating-treatments design was implemented using two male participants with mild to moderate intellectual disabilities and Autism, ages 13 and 14. Picture prompts and video prompts were the independent variables. The picture prompts consisted of photographs and the video prompts were delivered on the computer with voiceover narrations. The independent variables were the percentage of independent correct responses, percentage of error correction prompts, the percentage of prompts to use the technology, the number of sessions to reach criterion, the percentage of independent correct responses on a measure of generalization, and efficiency measures (computed by considering the ratio of each participant's growth from pre-test to post-test to the “cost” of minutes required to create instructional materials).

Results/Outcomes:

The authors found that both video prompting and picture prompting were effective in increasing independent responses, and/or decreasing external prompts and prompts to use the technology. They concluded that video prompting was somewhat more effective across all dependent measures. A considerable finding in this study was in relation to the cost-effectiveness of each prompting strategy when the ratio of growth per minute of preparation was considered, which can be vital to teachers and caregivers. When the measures were analyzed, video prompting appeared to be more efficient, in addition to being more effective.

D. Video Prompting and Fading Procedures

Sigafoos et al. (2007) evaluated the effects of video prompting and fading procedures in adults with developmental disabilities learning to wash dishes. Each step of the dish washing task analysis was shown in a video clip that was later withdrawn. The authors found that performance deteriorated when video prompting was withdrawn. As a result of this problem, this study also sought to examine a novel procedure for fading video prompts. This procedure consisted of “chunking” multiple steps into one video clip that was shown. The overall data suggested video prompting can be an effective method to teach daily living skills.

Methodology:

Applying a multiple baseline across subjects design, this study involved three adults, ages 27 to 33, with developmental disabilities living in a community-based group home. All were diagnosed with Autism and mental retardation (one had mild and two had moderate mental retardation). The independent variables in this study were the video clips shown to the participants on a portable computer. The video clips contained one or two steps for washing dishes; the mean duration was 14 seconds. A voice-over instruction was also included. The dependent variable was the percentage of steps in the dish washing task analysis that were completed correctly.

Results/Outcomes:

When the video prompting procedure was introduced, each participant demonstrated immediate increases in correct responding. High levels of performance (90-100%) were reached and maintained after relatively few exposures to

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the video prompting procedure. The results of the video chunking phase of the study indicated that this may be an effective method of reducing the number of separate video clips and fading out video prompting techniques. The authors noted that data indicating independence was not maintained without some level of video prompting, but it was possible to effectively fade the number of separate videos shown.

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