Using Animated Language Software with Children Diagnosed with Autism Spectrum Disorders

Rita Mulholland
Ann Marie Pete
Joanne Popeson

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Abstract

We examined the impact of using an animated software program (Team Up With Timo) on the expressive and receptive language abilities of five children ages 5-9 in a self-contained Learning and Language Disabilities class. We chose to use Team Up With Timo (Animated Speech Corporation) because it allows the teacher to personalize the animation for each student. All five students worked with Team Up With Timo three times a week for four months. We were able to program the software with specific vocabulary and pictures based on each student's needs. We also chose what the animated tutor would say to each student in introducing the words and in responding to students' choices. The results of the intervention showed three of the five students demonstrated increased language ability, while four of the students showed increased time on task. One student showed no motivation to work with the computer, but was able to use a voice output system for communication.

Keywords
autism spectrum disorders, language disorders, animated software

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Autism has many characteristics with each individual manifesting varying levels of language disorders. According to the Autism Society of American (2008),

> Autism is a complex developmental disability that typically appears during the first three years of life and is the result of a neurological disorder that affects the normal functioning of the brain, impacting development in the areas of social interaction and communication skills. Both children and adults with autism typically show difficulties in verbal and non-verbal communication, social interactions, and leisure or play activities.

One of the major deficits of children with autism spectrum disorders (ASD) is in the area of communication. One challenge facing teachers is to create the instructional program that meets each student's expressive and receptive language needs to assist them in developing a functional use of the language. Current research shows that integrating computer based instruction into classroom practice is an effective way to promote language development for students experiencing autism (Coleman-Martin, Wolff Hellar, Cihak & Irvine, 2005; Simpson, Langone, & Ayers, 2004). Frith (2003) found that although students with ASD do not automatically integrate new information, they are able, when presented with explicit prompting, to functionally respond to the communication request and for some students, to eventually initiate communication with some type of support. Computers seem to appeal to students with autism because of their predictability. Studies have shown that students seem able to focus for longer periods of time, which can lead to more engaged learning (Jordan, 1995). If students are able to focus for longer periods of time using the computer, then conducting a study looking for increased language ability evidence using the computer is of immediate value. Hetzroni & Tannous (2004) in evaluating relevant and irrelevant speech, echolalia (repetition of words spoken by others), and communication initiations with students experiencing ASD, found that their language much improved with computer based interventions as measured by decreased echolalia and increased communication initiations. Individuals without ASD typically demonstrate the ability to link closely related words to a visually or orally presented word, whereas students with ASD are not as capable in doing so (Beersdorf, Narayanan, Hillier & Hughes, 2007), and therefore language development is effectively impaired.

One study, which focused on vocabulary acquisition and behaviors, found computer based instruction to be very motivating for students and engaged them for longer periods of time than instruction by traditional behavioral interventions (Moore & Calvert, 2000). Several advantages in using computer based instruction to promote language acquisition have been documented to show how sounds, images, and animation improve students' language and memory (Bosseler & Massaro, 2003). Computer based video instruction research is showing promising results in the area of promoting functional behaviors (Ayres & Langone, 2002; Mechling, Gast & Langone, 2002) and more research is needed to combine the use of video in establishing word context with interactive animated software for students demonstrate improved expressive and receptive language.

The purpose of our quasi-experimental study was to determine if, and how effective, using personalized vocabulary animated software is in supporting expressive and receptive language development needs of

students. *Team Up With Timo* (Animated Speech Corporation, 2006) is a language software program for children ages K-4 who experience language learning delays, including autism. The tutor, Timo, uses realistic and visible speech. We chose this software because of its flexibility to change what Timo says as the vocabulary words with pictures are presented to each student. The tutor can be programmed to offer encouragement and as much needed direction as necessary for each student to learn. *Timo* turns his head, moves his eyebrows, and speaks in sentences, using words and expressions we programmed for each student. In addition to data reports provided by the software, we videotaped (parent permission was obtained) each student once using the software, and also recorded whenever students demonstrated the ability to use words in correct context outside of their work on the computer. Both the speech therapist and the special education teacher.

Methods

The participants included five male children, ages 5-9, who were enrolled in a Learning and Language Disabilities class. Three students were diagnosed with Autism Spec-

trum Disorders. In this room there were two students who were non-verbal, two who were verbal, and one who had emerging language.

- Student SD was a six year old. At age five, he was non-verbal and used the Picture Exchange Communication System (PECS). While he was able to speak without the use of visual aids, he continued to have some problems with expressive language.

- Student AR was a five year old. He was non-verbal and had a 1-1 assistant.

- Student MT was a six year old diagnosed with severe cognitive impairment. He was unsuccessful using the PECS program. He has a 1-1 assistant.

- Student JL was an eight year old. He had difficulty managing his emotions and had frequent behavioral outbursts.

- Student GP was a nine year old. He was non-verbal and used a voice output system. He had a 1-1 assistant.

Table 1: Student Information

Student	Age	Specific Needs
SD	6.3	Expressive
AR	5.7	Expressive
MT	6.2	Receptive
JL	8.3	Expressive
GP	9.4	Receptive

We programmed the animated tutor with basic information, such as each student's name, greetings, as well as colorful reward manifestations, which included ants, robots or

sea shells showing up on the screen when a student responded correctly. As the student used the program, he heard his own name spoken by the animated tutor, along with ex-

pressions such as, "Good to see you again", "Hello", or "Good Job." Based on the students' current needs we chose specific vocabulary to be visually (software embedded pictures) and verbally (spoken by animated tutor) presented to each student. We programmed a pre and post test for each lesson to judge each student's needs.

Box 1: Software Information

*Team Up with Timo (*ASC, 2006), allowed us to select how each student would be engaged in the lessons. We used the pre-test, presentation, identification, imitation, elicitation, and post-test sections, but not the spelling and reading because of the level of language severity these students were experiencing.
http://www.animatedspeech.com/index.html

To introduce the students to *Timo*, we worked with one student at a time to ensure that the student understood what he would be doing. Some initial reprogramming was required, such as having Timo say the student's name more often to help the student stay focused, and changing the number of words being visually presented on a page for a student to learn. While four pictures presented together worked for one student, another student could only work with one picture at a time. We also had to work with students in adjusting to wearing headsets. For the three verbal students, we had to teach them to speak into the microphone.

We separately walked each student through Timo's greeting, pointed out the words Timo was highlighting on the screen, and guided the student in using the mouse to respond to Timo's requests. One student initially used a Touch Screen but within a month started using the mouse. As each student worked with the program, the animated tutor greeted him by name, told him what words he would learn, and directed him to look at the pictures. The tutor highlighted a picture and told the student its name. The program ran-

domly moved the pictures around the screen and the tutor asked the student to click on the picture reflecting the word the tutor used. Each time the student made a selection, the tutor responded to confirm the correct choice or to tell the student the name of the incorrect selection chosen. As a student moved through the lesson, he was asked to identify pictures by clicking on the one spoken by the tutor, and, for some students, to name the pictures as the tutor highlighted them. The program automatically recorded each students' verbal responses. Each time the student used the software, the software continued where the student previously had stopped.

We worked with each student three days per week. Since the program kept a record showing each student's correct and incorrect responses, the time involved in each response, as well as any verbal recordings made, we easily monitored each student's success and updated the vocabulary lessons as needed. The following chart shows how each student performed at the beginning of the study.

Table 2: Pre-Test Results

Student	Category	Specific Words	Baseline Data
SD	Emotions	Sad, mad, afraid, tired, sick, lonely, excited, frustrated, worried, safe	20%
AR	Food	Pizza, jelly, juice, pretzel, cracker, milk, ketchup, French Fries, noodles, toast	0%
MT	Food	Toast, juice, water, pretzel, pizza	0%
JL	Emotions	Mad, sad, tired, sick, excited, afraid, worried, safe, frustrated, lonely	30%
GP	Hygiene	Brush, shampoo, soap, tissue, toilet paper, toothbrush, toothpaste, band aid, deodorant, towel	0%

Results

Four of the five students benefited in some way through the use of this interactive animated software program. Three of the students demonstrated improved language skills by showing 80% to 100% on their post-test reports. Although we were not measuring it, we noted two students showed increased time on task, although one of these students was not able to demonstrate any vocabulary improvement. The following summarizes information on each of these students.

- Student SD (100% success). His videotape showed him spontaneously talking to Timo, such as saying "Hi Timo," "Okay, " and telling Timo he will see him again. He also was observed generalizing what he heard Timo say when greeting someone. At one point, he turned and said to another student, "Hello Billy, good to see you again." This is how Time greeted him each time he used the software. He was also observed greeting someone with, "How you are?"

- Student AR (80% success). He has had much success with this software, and has recently begun working on an augmentative communication system.

One particular observation documents his father entering the room to pick him up and seeing him using the computer, and saying the word "Peeza." His father had never heard him clearly say any word or had ever seen him using a computer.

- Student MT (0% success). He was unsuccessful using the PECS program and in using this software, although he demonstrated increased time on task with the computer before requesting a break. He was inconsistent in demonstrating understanding of language. He has a 1-1 assistant.

- Student JL (100% success). Although monitoring behavior outbursts was not part of the study, this student who bites, hits, and throws things demonstrated behavioral control when working with Timo. When he was removed from the computer for hitting it and told he would not be able to work with Timo unless he could control himself, he did. There was only one other computer attack in four months. He was very successful in improving his expressive and receptive language ability.

- Student GP (0% success). He was not motivated to use the computer. He was not able to profit from using the software.

Table 3: Post-Test Results

Student	Success	Additional Comments
SD	100%	Talks to Timo
JR	80%	Now uses voice output system
MT	0%	Needed hand-over-hand assistance Showed increased motivation and time on task
JL	100%	Improved computer behavior
GP	0%	Not motivated with computer

Conclusion

The purpose of conducting these case studies was to determine how effective using personalized vocabulary animated software is in supporting expressive and receptive language development needs of students experiencing Autism, PDD-NOS, and Communication Disorders. *Team Up With Timo* did provide the visual and oral animations that engaged three of these students in learning their targeted vocabulary. Two of these three students would regularly request to use the computer. They obviously liked the predictable, methodical interactions of *Timo*. Although the software program has built-in vocabulary lessons and pictures, we found the real value of using this software was that we could add vocabulary and appropriate pictures based on each student's needs. Since three students benefited from working with *Timo,* we intend to continue using the software with them.

Box 2: What Students Were Heard to Say

Hi Timo.

Okay Timo.

See you again Timo.

Hello Billy. Good to see you again!

How you are?

In summary, this study investigated the use of computer-based intervention for enhancing communication functions of children with autism in a structured and controlled simulated natural environment. The software program was developed based on daily life activities in the areas of play, food, and hygiene. The following variables were observed: delayed echolalia, immediate echolalia, irrelevant speech, relevant speech, and communicative initiations. The children were able to transfer their knowledge to the natural classroom environment after practicing in the controlled and structured setting that provided

them with opportunities to interact in play, food, and hygiene activities. Most of the children engaged in fewer sentences involving immediate echolalia and increased the number of communication intentions and the amount of relevant speech they produced.

Although this study represents a small sample of five students, it does add to the increasing body of knowledge regarding the value of using technology to improve language acquisition with students experiencing Autism Spectrum Disorders. We acknowledge this was a quasi-experimental study. We plan to conduct a more rigorous study using multiple sources of information to obtain stronger evidence, such as the use of videotapes and audio recordings scored by several observers to achieve inter-rater reliability. We also want to explore a study using a control group of students who solely use communication boards to improve language skills and compare the results with a similar group using interactive animated software programs.

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About the Authors:

Rita Mulholland is an Assistant Professor teaching graduate special education courses at Richard Stockton College, NJ.

Ann Marie Pete is a Special Educator working with preschool and elementary students experiencing autism in the Galloway Township School District, NJ.

Joanne Popeson is a Speech and Language Pathologist working with preschool and elementary students in the Galloway Township School District, NJ.

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