Au~entative Communication News

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INSIDE

THIS ISSUE ...

UPFRONT

Breakthroughs in speech output technology have opened doors to communication for people around the world. Today, a wide range of voice output communication aids (VOCAs) offer both synthesized and digitized technology to users of augmentative and alternative communication (AAC) devices.

Synthesized speech devices have been available since the late 1970s. To generate synthesized speech, the user must type letters or select words or symbols from a display. The computer then translates the input into machine-generated speech. Early synthesized speech devices were not very intelligible and had robotic, male-sounding voices. When the Digital Equipment Company (DEC) began licensing their high quality DECtalk synthesizer as an affordable software product to AAC manufacturers in the early 1990s, it enabled AAC companies to put high quality text-ta-speech synthesis in AAC devices and communication software products. This gave AAC users nine intelligible voice options. New synthesizers are becoming available that also offer intelligible speech.

In 1988, AAC manufacturers introduced a new family of VOCAs that generate digitized speech. The user, family member or clinician record sounds, words *(cont. on page 2)*

For Consumers

Seven AAC users and speech output

Machine-generated speech offers a powerful option to people with severe speech impairments. Synthesized and digitized speech output in AAC devices can not, of course, replace the gift of speech. However, speech output technology can make a profound difference. Computer generated speech can serve many of the same communicative functions as natural speech and thus meet a variety of communication needs. This section describes how some AAC consumers who use voice output communication devices benefit from speech technology. The article does NOT represent all types of people, applications or devices. Rather, it provides readers with snapshots of some individuals using different devices for different purposes.

Sofe~ and IntimaOl. Tiffany Adams, a 25-year-old high school graduate attends the Dale Macintosh Clubhouse in Anaheim, California, where she works in the clerical department. Most people have difficulty understanding her speech. Until six months ago, Tiffany relied solely on an alphabet board and an interpreter (her mom) to communicate. *(cont. on page 2)*

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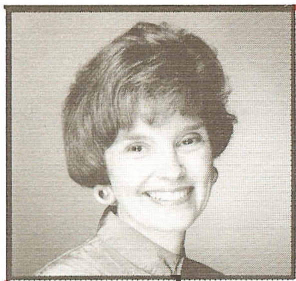

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For Consumers *(cont. (rom page 1)*

Although she tried several VOCAs over the years, she did not like them. They were "too big and required too much memorization. "

Tiffany has cerebral palsy and uses an electric wheelchair. Last year, she tried the LightWriter with DECTalk (Beautiful Betty voice) and liked it. She says it is small, easy to carry on her lap, and she can use it in a way that is similar to her alphabet board.

Tiffany says speech output has made some very important differences in her life. First, it makes her feel safe and, thus, more independent. For example, when she is in a mall, she now feels comfortable shopping by herself, because she knows that if she needs help, she can get it. Second, it enables her to have private conversations on the telephone with her boyfriend. She also likes how speech output allows her to: (a) get people's attention, (b) communicate with friends who do not read or cannot see, and (c) stop and chat when she is driving her electric wheelchair.

Tiffany Renae Adams, 17232 Foley Drive, Yorba Linda, CA 92886.
Email: TifRenae@aol.com

Work and Play. Kevin Smith works as a part-time augmentative speech aide for a school district. When Kevin graduated from high school in 1988, he had no plans. He also had no VOCA, despite the fact that he had been evaluated three times and each time an *AAC* device was recommended.

A multi-agency team conducted a fourth evaluation and decided to write grants and raise money for a device. In 1992, Kevin was able to purchase a Touch Talker. Training time was donated b¥ a speech-language pathologist on the team.

Today, Kevin uses a Liberator with Words Strategy. In addition to his job for the school district, Kevin leads an active social life, has lots of friends and enjoys casinos and church. (There's a combination!) He says speech out-

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Author: Sarah W.BlacKmOnC,
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put allowed him to get his job and is useful in his work with children. In addition, it gives him the option to do public speaking and work as a counselor in a summer camp, and is useful for advocacy work.

Kevin Smith, 3600 Missile St., Prichard, AL 36612. Phone: (334) 457-8734

Lecturing and AdvocaQ'. Michael B. Williams is widely known for his public speaking abilities. In 1996, he was honored as the ISAA *CfW* ords + Distinguished Consumer Lecturer and currently serves on the ISAAC executive committee in the Sentient Systems Consumer Leadership Chair. Michael is the author of *Alternatively Speaking.* I asked him how he goes about preparing an effective speech using his Liberator with Words Strategy.

"I always begin work on a speech by thinking about it. Writing an effective speech requires both creative and technical skills. My Words + lecture took six weeks to do. This included thinking about the speech, researching personal history, writing three or four drafts on a word processor, downloading the speech to my Liberator, and massaging and tweaking it until it sounded right."

His wife, Carole, adds, "Michael spends days ruminating about a speech before touching the keyboard. The tweaking he refers to means listening in a silent room to each sentence, some sentences many times before they sound right."

Michael says that he uses his special technical knowledge of the Liberator's hidden DECtaik abilities to make his speeches more interesting and effective. For example, he:

- judiciously uses the different voices of the VOCA. This adds interest and spice to his talks and often surprises the audience by catching it off guard.
- constructs hard-to-understand words out of phonemes rather than using standard text-to-speech methods.
- gives certain words more stress than others.
- puts slight pauses between some words in the middle of a sentence to heighten the dramatic effect.

Michael says: "The way to do this technical magic is often not contained in the user manuals, and, as I discovered while helping a fellow augmented communicator, these tricks vary from device to device."

In response to a query about how he programs his speeches for delivery, Michael replied, "I program my VOCA so I can deliver the speech sentence by sentence. This gives me precise control over the timing of delivery, something that is absolutely critical to giving an effective talk."

Finally, I asked Michael and Carole to share other things they feel have made Michael a better speaker. Carole said, "Michael reads voraciously, so the sound of good writing is always being freshly layered on his brain. Writing for speech is not the same as writing for print. Michael also listens to a lot of music and has read a lot of poetry. He thinks about the sound of words."

Michael said many things have influenced him including: "Watching my minister grandfather sweat over the preparation of his sermons as a kid; reading great speeches of the past; being old enough to appreciate Martin Luther King and John F. Kennedy at the height of their speaking powers; seeing Mark Twain Tonight with Hal Holbrook multiple times; and going to see Richard Pryor as often as I could when he was at the top of his game." He added, "Holbrook and Pryor really taught me how to tell and pace a story."

Michael B. Williams, Alternatively Speaking, 1 Surf Way, #237, Monterey, CA 93940. Email: mbwill@well.com

TewDorary access. Ruth Leff described a man who is employed as an actor and singer. A year or so ago, he was diagnosed with vocal nodules and had to have them surgically removed. After the surgery, his doctor ordered him not to speak for two weeks, *i.e.*, vocal rest. During the period when he was nonspeaking, he used a Crespeaker, a simple text-to-speech device, to communicate with his family. He and his family said that having speech output made it easier for everyone.

Ruth Leff, Crestwood, PO Box 6624, N. Sidney Place, Milwaukee, WI 53209. Phone: (414) 352-5678

Voice/or a blind child. Hope is a twelve-year-old girl who is blind and has a severe speech impairment. She is ambulatory and uses some manual signs; however, many people she wants to communicate with do not sign. Hope attends a special classroom for children with visual impairment on a regular school campus. Although she is beginning to develop an interest in reading, her literacy skills are quite limited.

(continued on page 10)

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Four clinical programs

Speech output devices have different impacts on different people, at different ages, in different environments. Projecting across distances (whether it be a room or a continent) is a universal benefit of speech output.. However, other applications are more specific to individuals or situations. For example, Schaeffler suggests that speech output teaches young children the power of communication when they are first gaining an understanding of the use of AAC.. 1 It also gives children a way to communicate with their peers, and allows adolescents and adults to communicate with unfamiliar partners. VOCAs support independence, employment, friendships and intimacy. They also give adult AAC users a way to communicate with children and others who cannot read communication displays.

Many feel that speech output also strengthens instruction and learning. For example, speech output devices offer a way to "self practice" and "self monitor. ,,1 Expert AAC users often practice for hours upon hours to develop automaticity using their device. Speech output also may assist an AAC user to spell, learn grammar and attach meaning to graphic symbols. This section gives four examples of how master clinicians use speech output to enhance daily communication and learning among their AAC clients.

1. Community integration

John Costello, a speech-language pathologist in Boston, has worked for years with group home staff. He developed this strategy to support people with severe mental retardation to successfully communicate in the community and establish social relationships beyon~ their support staff and family. "Success (in the program) is wanting vanilla i'1 cream and getting it," he says.

Desired Outcomes. (1) Effortless and successful communication of a single message in the community. (2) Increased independence and interaction during routine community activities. (3) No need for instruction or guidance. (4) Recognized by community workers as a viable and competent communication partner.

Settings. Community restaurants, library, theaters, shops.

Target population. Adults with severe mental retardation who can use a single spoken message in the community. Diagnoses include cerebral palsy, tuberous sclerosis, Angelman, Noonan and Down syndromes.

Support required: Group home staff in consultation with a speech-language pathologist who is knowledgeable about AAC.

Technology. Easy-to-use digitized speech devices that are portable, allow single messages and have a volume control.. Costello uses the Big Mac switch (AbleNet), the One Step Switch (AbleNet), or a Voice Recording Picture frame (Radio Shack). He prefers the One Step Switch because of its size, portability and low profile and because it is most often accepted by staff. For individuals who can handle more than one message and/or have difficulty accessing these devices, alternative choices are made.

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Step 1	Select a message.
Step 2	Store message before each outing for each client. . Always use the same voice and one that is age and gender appropriate. The person who supports the AAC user in the community should NOT record the message. The voices should sound different. . Record in a quiet environment and speak slowly and clearly.
Step 3	Use the message in the same place, at the same time, on a regular basis.
Step 4	Document progress after each outing. Use a log: Date, Name, Where went, Accompanied by, Message spoken, Specific response ofperson(s) in community.

Description of the intervention. Table I summarizes the steps to using a single message in the community. Staff preprogram a message for use on a regular community outing. Examples are:

- Library: *"May I borrow this book, please? "*
- Restaurant: "I *need a receipt, please, "or "I'd like the sunshine breaJifast #2 and black coffee. "*
- Movie: *"Could I have two adult tickets, please?"*

During regular outings, the augmented communicator uses the device. Staff make every effort to go to the same place around the same time of day in order to provide a consistent learning environment and support developing relationships with consistent communication partners. Community workers become good partners through repeated exposure.

Results. Data collected by group home staff seem to show that even C

limited use of speech output in the community:

- promotes increased social contact.
- increases opportunities for social integration.
- creates incidental learning opportunities for adults with severe communication problems.
- educates people in the community about disability issues.
- promotes increased expectations of competence by communication partners in group homes and community.
- increases the number of people who become familiar with the communication/speech patterns of these individuals.

The strategy is not without difficulties, of course. Costello shared the following problems:

- Environmental. When the context is noisy and community personnel are busy, trying to implement the program is a mistake. It is important to choose times and contexts where things are quiet and relaxed.
- Staff. Staff are responsible for providing access to the device and support for using it appropriately. When staff don't support the program, it will fail. This barrier is difficult to overcome.
- Consumer/AAC user. Some consumers are shy and reluctant to participate; others may refuse. Still others may continually activate the device. Staff need to make individual accommodations to ensure success.
- Technology. The biggest problem with technology has been messages being incidentally erased because of the proximity of the record and play buttons. Another problem occurs when the VOCA does not have a volume adjustment.

Edie Thayer, Tracy Bombara and Sallie Bartner developed Project AICEs (Augmentative Intervention in Community Events and Situations) for the Vineland New Jersey school district.[4] The three-year-old project teaches volunteer student tutors to support children and adolescents who use AAC in the school and community. Three years ago, eight high school students volunteered to be tutors. This year, 60 peer tutor volunteers are participating. This has led the Vineland school board to consider offering a five credit high school course, *Assistive Technology for Persons with Disabilities*, in September 1998.

Desired Outcomes. For students who use AAC: (1) Friendships and communication with peers. (2) Competence in using AAC techniques. (3) Success in the community. (4) Enhanced participation in classes. (5) Success in academic areas. (6) Independence and advocacy skills. For tutors: (1) Understanding of disability issues and assistive technology. (2) Friendships with students who have disabilities. (3) Skills in supporting students who use AAC. (4) Advocacy skills.

Settings. School and community.

Target Populations. All district students with AAC needs.

Support required. Administrative support to set up the program, faculty/staff advisor for AICEs club to provide ongoing training to volunteers. Daily support of AAC users is provided by volunteer tutors.

Technology. VOCAs currently used are: Dynavox 2C, DynaMyte, AlphaTalker, Liberator, DeltaTalker, IntroTalker, Touch Talker.

Description. Some tutors meet daily during homeroom. The AICEs Club meets once a week after school. Tutors currently support four high school students, one elementary student and one preschool child. Peer tutors learn to: (a) program devices, including tweaking the speech in VOCAs to make it more intelligible and interesting; (b) help AAC users select vocabulary; (c) make sure devices are operating; (d) encourage students to use devices appropriately and independently; and (e) "trouble shoot" technology problems.

Urban Summer Camp. For two weeks AICEs tutors and students who use AAC invite guest speakers (*e.g.*, the Fire Chief, a neurologist, local business managers) to talk to the group. Prior to the visit, students prepare questions, program AAC devices and practice using them. After the talk, speakers and students participate in lively discussions.

The Urban Camp also involves community outings. These are planned by the students and require lots of communication. They also make everyone more aware of access barriers in their local community. Students have learned advocacy skills and now routinely ask, "Is your restaurant accessible to (cont. on page 6)

Table II. Repurted il-n~~lctut'the AICEs Prc~iectun students nhu use AAC and their pl'er tutors

AAC users	More mature as a result of interactions with peers who teach them what is and is not age appropriate. Enhanced self esteem-tutors "accept them." Improved school performance and increased independence.
Parents	Very pleased with the progress their children have made in all areas.
Commuuity leaders	Appreciate and are impressed with all the students. 'Something wonderful happens when AAC users and peers are together."
Peer tutors	Enjoy learning about AAC devices and bec?~~ng involved with AAC users. Demonstrate creativity, technology skills, sensltivity, acceptance and warmth.
Teachers	Have stopped worrying about needing to spend extra time o~ tec~lo~ ~ause the students take care of everything. Are free to focus on the child~en s abilities., Several have expressed amazement at the children's test ~ores. ~dnure the tutors way of communicating and enjoy seeing the spontaneous mteractlons.

Clinical News (CQni from page 5)

people who use wheelchairs?" "Do you hire persons with disabilities? "

Results. Anecdotal evidence suggests that Project AICEs results in a number of positive outcomes. (See Table II for examples.) In addition to the results as perceived by those involved, Thayer and Bombara note that the service delivery model within the school district has shifted from an expert-based to a school- and community-based model, because peer tutors have the expertise needed to support the use of AAC devices and techniques. Also, they indicate that they did not expect to see such rapid rates of change in teacher attitudes, student self-esteem, student independence and community involvement..

Finally, the students involved in Project AICEs have presented at international and national conferences, as well as to local and state groups. Peer tutors assume responsibility for making sure everyone's technology works during these events. The students are also helping a school district in Florida replicate the project by communicating with their peer tutors over e-mail.

3. Voice Output in the leu

At Children's Hospital in Boston, John Costello works in an 18 bed, multidisciplinary pediatric intensive care unit (lCU). He and his colleagues from Nursing and Child Life have developed a protocol for patients who are temporarily unable JO speak following surgery:

Desired outcomes. (a) Ability for patients to communicate with staff and family immediately after surgery. (b) Ability for patients to go to surgery with an increased sense of comfort regarding post-surgical communication issues.

Setting. Pediatric ICU. (Also relevant to adult ICUs.)

Target Populations. Individuals who are unable to speak after surgery, ages 2 years and older, both English and non-English speakers. Patients are referred by: Otolaryngology (airway management issues, tracheal reconstruction, stenosis, tracheostomy); Cranio-facial/ orofacial construction/ reconstru ctio n; Oncology (tumors of oral, facial and cerebral nature); Muscular Dystrophy clinic; Cystic Fibrosis clinic; Heart and Lung Transplant teams. Most patients regain their speech. Approximat~ly five percent of the children are nonspeaking pre-<>peratively.

Technology. *Digitized speech devices (e.g.,* MessageMate 40, CheapTalk 4 and 8, IntroTalker); *Synthesized speech devices* (Dynamyte); *Peripherals (e.g.,* Switch Module, Jelly bean Switch, TASH Microswitch, AbleNet Universal Mount, BoardMaker software for PCS); *Non-electronic communication displays* (alphabet boards, miniboards, eye-gaze boards, listener assisted auditory scanning arrays).

Support Personnel Required. A speech-language pathologist with expertise in AAC sets up the program, conducts initial training and monitors the use of AAC in the ICU.

Description of Intervention.
Step 1. *Pre-operative Instruction.* A week or so before surgery, the speech-language pathologist meets with the patient and family to: (a) Talk about their perceptions, fears and expectations; (b) Assess the patient's motor, sensory and literacy skills and ascertain which symbols and access techniques to use for communication. Note: Access decisions are based on the patient's pre-operative skills as well as any likely post-operative complications (*i.e.,* eyes swollen shut, limited mobility of arms, halo traction); (c) Select vocabulary. (The patient chooses vocabulary with guidance from the clinician. Efforts are made to reflect the patient's personality through vocabulary selection); (d) Record or program the vocabulary (The patient often records his or

~~ operathe AAC lIlstrm:hClIl
1. New learning can occur during a period of lower anxiety
2. Less "medical" influence on comprehension
3. Active participation in own care
4. Feeling of control
5. Increased sense of comfort
6. Feeling of being "worked with" rather than "worked on"

her own voice); and (e) Teach the patient to use AAC strategies and devices to communicate. Table 1lI summarizes the benefits of pre-()perative AAC instruction.

Costello reports that frequently requested vocabulary items are:

Personal needs: "Bathroom; ice; wet cloth; mouth brush; pee; please brush my teeth; can I ___?; I am thirsty; I am really, really thirsty; put on my glasses; wipe my nose."

Psychosocial needs: *Emotional* - "I am scared, mad, OK, not stupid, tired, lonely, confused."

Control- "Leave me alone; Wait five minutes; I don't want that; I want privacy; Hold me; No chest PT; Just do it quick, please; I don't want you back."

Social - "Thank you; I'm sorry; I appreciate it; What is your name; I love you; I love you too; How is_?; Thank you for your help; I want to see _; Did you feed the dogs?; Is everyone okay?"

Medical needs: "I need to throw up, cough, be suctioned, sleep. I am in pain; I want medicine, to sit in the chair, to go to bed, a pillow behind my head, more pillows; I don't want medicine; I have a headache; I am hot, cold, itchy; My ___ hurts; Bed up/down; Turn me over; Put a towel _; Move my __ ."

Step 2. Bed-side Intervention. During the ICU admission, the speech-language pathologist:

- monitors the individual's cognitive and physical status.
- re-intro"uc~s strategies for commUillcatlOn.
- makes sure the individual can access communication at all tim~~. Moun~ and/or carefully posltions equlpment.
- provides staff and family with support and instruction, if needed.

Step 3. Discharge Interview. At discharge, the speech-language pathologist conducts interviews with the patient and family and solicits feedback from staff.

Results. AAC is an important service in the ICU environment at Children's Hospital. . To date, Costello has used the protocol with more than 70 individuals, ages two to 40 years. Staff, family and patients summ,!rize the benefits in Table IV.

Costello feels that digitized VOCAs are useful for non-English speakers because they allow any language to be recorded. He suggests three ways to program a VOCA depending upon who will use it. For example:

- If a Illl1irnt uses a VOCA with staff and family who speak English, then messages are stored in English and symbols are in the patient's native language.
- If a p.ati_entuses a VOCA with staff and family who do not speak English, then half of the messages are stored in English and the other half in the patient's native language. Symbols on the display are in the patient's native language.
- Sometimes staff also use a VOCA with patients and families who do not speak English. All messages are stored in the patient's native language. English symbols are placed on the display so staff can ask questions and give information.

~CilllCllil	
Staff report	"Takes them less time to interpret patients' needs "Can -get specific information without needing to solicit it "Able to "chat" with patient "Seems to impact medical status. Observations include less fatigue, sleep better, decrease in heart rate, increased oxygen ~turation statistics, accurate self report of status so there is a more efficient response to needs.
Family report	"Allows siblings to play an active role "Felt better knowing child could communicate if parent wasn't there "Helped prepare child and family for the procedure and recovery process "Hearing child's voice mattered.
Patient report	"Less stress "More prepared for surgery "Felt more in control "Felt better being active in own recovery and care.

4. Speech output and literacy development

Carol Civils and her colleagues are interested in fmding ways to use VOCAs to help children learn to read.[6] Research and experience suggest that students with severe speech impairments are at-risk for phonological and linguistic deficits because written English is based on the sound-symbol correspondence code.[7] Therefore, they believe that children who use AAC should receive systematic, early training to increase phonological awareness and decrease the risk for significant reading and spelling problems.[8]

Desired outcomes. (a) Systematic provision of a reading curriculum with students who use AAC devices or computers with speaking word processors. (b) Improvement in students' reading, writing and oral language through a full range of literacy activities. (c) Improvement in phonemic awareness and related skills. (d) Increase in participation and spontaneous *(cont. on page 14)*

Governmental

Medicare AACtion

with lewis Golinker, ESQ.

In the Boston Tea Party of 1773, the American colonists took direct action against a tax imposed by their British governors by throwing the tea into the harbor. Some 225 years later, a group of Americans equally intent on creating change came together in Boston to initiate Medicare AAction. The goal this time? The taxes that support Medicare should ultimately pay for all AAC devices. The first steps are to: (1) help families and individual speech-language pathologists pursue the Medicare claims, appeals and denials that will eventually get Medicare's attention, and then, (2) persuade Medicare to review and change its AAC funding policy. The idea to launch a Medicare initiative originated with Peter Strugatz, President of the Board of Directors of Communication Independence for the Neurologically Impaired, and a family member of someone who had amyotrophic lateral sclerosis. Leading the Medicare AAction initiative is Lewis Golinker, Esq., an AAC advocate and lawyer who has fought for (and won) funding for people who use AAC. His work has overturned policy barriers that denied access to AAC devices and services. Initial supporters of this initiative are: Advocacy, Inc. (TexasP & A), AssistiveTechnology, Inc., Communication Independence for the Neurologically Impaired, Mayer-JohnsonCo., Prentke Romich Co., Sentient Systems, Inc., United Cerebral Palsy Assoc., and the Universities of Nebraska and North Carolina. Individual supporters are David Beukelll'.an,Sarah Blackstone, John Costello, Garth Corbett, Esq., Lewis Golinker, Marta Kazandjian, Pam Mathy, Pat Ourand, Howard Shane, Peter Strugatz, and David Yoder.)

Background

Medicare is the largest health-eare funding program in the U.S. It serves adults over 65 and many adults with disabilities, both developmental and acquired. Thousands of Medicare recipients are in need of AAC intervention.

Medicare is a "cost reimbursement program," meaning that it provides payment afkr a Medicare recipient receives a particular form of treatment, or afkr a needed device is delivered. Medicare eligibility is based on age and/or health! disability status, not income level..* In reality, few Medicare recipients with an expressive communication disability have sufficient resources to buy a needed AAC device unless they are certain that they will get reimbursed. But does reimbursement occur?

Medicare's "guidance" related to AAC devices is internally inconsistent, making it possible for some people to get devices with relative ease, while others face a daunting challenge. Medicare recipients seem to fall into three groups:

- People needing an artificial larynx or trach spea,king valve. For them Medicare "works" and reimbursement is available.
- Pi!Qple who need other types of AAC devices who have the ~rivate resources to acquire them. This includes individuals whose speech impairments are caused oy conditions and/or disease processes that affect the neuromuscular system. Examples are amyotrophic lateral sclerosis, multiple sclerosis, traumatic brain injury, brain stem strokes, aphaSia, cerebral palsy, mental retardation and many others. Reimbursement is available as long as the person continues to appeal the negative Medicare decision through to the level of the administrative law judge *(AU)* hearing. This requires considerable resources including time, information and support.
- People who are unable to find the resources necessary to acquire a device and/or to pursue an appeal.. This group comprises the largest number of people. These ~ple can not get access to devices. Efforts are being planned to help raise the fundmg necessary for them to purchase devices and then pursue Medicare appeals. Because these funds will not be able to accommodate everyone who needs a device, people in this group will be the ones who benelit most from the ultimate revision of the current Medicare policy.

The current Medicare guidance directs Medicare decision makers to deny reimbursement claims for all AAC devices other than the artificial larynx and trach speaking valve. Individualized review is not allowed either at the initial decision or at the first two appeals decision levels. However, at the third level of appeal, which occurs before a federal administrative law judge (ALl), an in-person hearing is held. The "guidance" to deny funding for all AAC devices except an artificial larynx or trach speaking valve is no longer binding at the AU level, so the judge is free to disregard it.. It

*Note: This process is in clear contrast to Medicaid, which requires beneficiaries to seek prior approval before a device is obtained, Medicaid is a means-based program,

is important to note that all Medicare recipients who have needed an AAC device and who have continued to appeal up to the AU level of review have won.

Medicare AACtion

Delays in reimbursement caused by decision makers who are forced to apply the Medicare guidance are unnecessary at best. At worst, they impose significant hardships on many individuals and their families. For these reasons, Medicare AACtion has begun a campaign to revise this Medicare guidance, and with it, the reimbursement delays. The Boston gathering reached consensus on a strategy to: (a) remove Medicare funding barriers for AAC devices and (b) ensure that the ensuing decision-making criteria for AAC devices would be fair, as well as medically and scien- tifically appropriate. To imple- ment the strategy, the group identified the need to gather:

- materials that clearly' document t4e effe.ctiveness of AAC de- vices With specific disabilities.
- evidence that irreparable harm can occur and tragically has occurred when AAC devices are not available to those who lack intelligible speech.
- funds to support the successful l~plem~ntation of this initia- tive (estimated at $25,000 US).

The United States Society of Augmentative and Alternative Communication (USSAAC) pledged to enlist the support of its members to help raise funds and build a groundswell of support for this initiative.

If you have any information that might help, or questions about policy issues related to Medicare funding for AAC devices, call, write or e-mail Lewis Golinker, 202 The Commons, Suite 507, Ithaca, NY 14850. 607-277-7286 (phone), 607-277-5239 (fax), LGolinker@aol.com (Email).

International implications

While all nations develop health care reimbursement programs independently, some things about Medicare AACtion seems to resonate internationally. Strategies for changing funding of AAC devices and services in health benefits systems are based on a set of universal tenets, some of which are listed in Table V. It is often important to make what is obvious to us clear to policy makers, judges and administrators of funding agencies. To change a health·benefits system requires understanding how the system works. While countries differ in the details, we are often required to demonstrate a person's right to AAC coverage and funding.

- Health benefits systems have some general eligibilityrules: either a person is eligible or not. Advocates have to demonstrate that the client/intendeduser is a current participant in the benefits program, *i.e.*, is eligibleto claim benefits from whatever program they try to access.
- Health benefits systems have some menu of benefits that are stated to be covered. Advocates must show that the AAC device being sought fits within one or more of the benefits provided by that program.
- Health benefits systems may have special eligibility rules for one or more of those benefits. If so, advocatesmust present information that the client/intended user can meet the special eligibility or access criteria that AAC devices fall within.

Tahll' ". AAC tl'n~I~

1. There is a universal need to increase access to fundinll' for AAC devices and services.
2. The goals and benefits~ of AAC intervention are universal. . AAC devices and related services should enable the user to meet his/her communication needs arising throughout the day.
3. AAC int~rv~ntion is a well-known, widely accepted, sclenllfically legitimate treatment for expressive communication impairments.
4. Appropriate devices, techniques and strategies reduce the level of disability and the correspo~ding IIOCiallllOCietallimitations arising from havmg a severe speech impairment.

- Whether the phrase is "medically necessary" or something else, health benefit programs generally require some proof that the AAC device constitutes treatment for some conditionthat is (a) known to be effective for persons with similar conditions (b) an appropriate interventio~ based on the nature and severity ?fthe person's condition and (c) 10 some marmer cost-effective *(i.e.,* the least costly, equally effective alternative).

Next Steps

Increasing access to funds for AAC devices and related services requires collaborative planning on the part of AAC stakeholders in each and every country. Somehow, we need to change health-care systems everywhere so people who need VOCAs (and the services that support their effective use) have access to them. From time to time, and in the U.S. at this moment, changing the system seems to require intentional action. As Golinker says, "we must rise up collectively to protest against constraints imposed by government programs and policies that are outdated. and misguided."

If yo,"!WIsh to make a tax deductible donation toward the removal of AAC funding barriers in Medicare. send your check to USSAAC, P.O. Box 5271. Evans~n, IL 60201 USA. Be sure to note "Medicare AACtion" on your check.

For Consumers

(continued from page 3)

A few years ago, Hope was introduced to a 32 location Macaw, a digitized speech device. Her speech- language pathologist, Mimi Deegan, placed fabric puff paint in the upper left hand corner of each square. Hope not only memorized where to find her vocabulary, but also learned to use all four levels, and was switching levels to combine words. Recently, she received a 128 location Great Green + 2 Macaw. Deegan transferred the 32 vocabulary items from each page on her 32 location Macaw on four quadrants to the first level of the Great Green Macaw. Currently, Hope is learning to use two additional pages that contain curriculum-based vocabulary. She also is learning some Braille, which may gradually replace the fabric puff paint.

Hope uses the speech output device in her classroom and in the community during orientation and mobility training. Her teacher is fmding new ways for her to use it to interact with nondisabled students and teachers in school.. Deegan reports, "Hope always carries the device with her. Every week she finds a way to tell me what new vocabulary she wants in her device. "

Mimi Deegan, 604 Amador Street, Richmond, CA 94805.
Phone: (510) 233-8598

Voice for a hearing· imyaired l:hi1d.. Kyle also is twelve-years old. He has Marshall-Smith syndrome, a rare genetic disorder that results in brittle bones. He has a tracheostomy and a progressive hearing loss (moderately impaired in his better ear). He wears a hearing aid. Kyle has had numerous surgeries, which have caused him to spend time in a "halo collar" and required some months of home schooling. He uses sign language, but his signs are not intelligible except to familiar partners. Kyle has Talking Screen on a laptop computer, which he uses at home, during school and with his large extended family. Speech output enables his communication partners to understand what he wants, needs and thinks.

Kyle is a very communicative child and a visual learner.. Kelly Mollison, his speech-language pathologist, says the visual display seems to help him focus and overcome some of his learning difficulties. He currently uses almost 70 levels on Talking Screen and has figured out how to add and delete icons on his pages. Kyle's top page contains conversational categories (greetings, topics, closing statements, partings). He can sequences three words on a page. He also likes to read books like *Brown Bear, Brown Bear* to his younger sister's classmates. Mollison concludes that although Kyle is becoming increasingly deaf, speech output allows him to communicate with a broader audience and also helps him to focus on language. Kyle will use Mayer-Johnson's symbol set of manual signs as soon as they are available.

Kelly Mollison, 4602 East Sunset Drive, Phoenix, AZ 85028.
Phone: (602) 991-6140

Auditory scanning. Joshua is seven-years-old. He was born prematurely, has visual impairments (bubble vision/ strabismus), and severe motor problems. A few years ago, Joshua began using a Baclofen pump to reduce spasticity. This has enabled him to use a communication device and electric wheelchair, and has increased his general level of comfort. Joshua attends school at the Rehabilitation Institute of Pittsburgh. Until two years ago, he communicated by yes/no responses, facial expressions and vocalizations. Now he also uses a Dynavox with a head switch and auditory scanning. He uses a pillow speaker to listen to his auditory scan and is trying out a speaker device that fits in his ear, so his partners don't hear the scan. Joshua has a master page, plus 60 to 70 pages that link together.. His mom reports that he uses his vocabulary creatively.

Joshua's mom, Judy Greenwald, says that the Dynavox "gives Joshua control over his world." "After he began using it," she reports, "the school changed his placement from a functional skills curriculum to an academic curriculum. He has a page with the alphabet and has started to spell. He also is beginning to go to his local school one day a week. Another huge advantage of speech output," she concludes, "is that other people realize that Joshua is intelligent.."

Judy Greenwald, 316 Dewey Avenue, Pittsburgh, PA 15218.
Email: greenwald@serviceware.com

Efficacy of speech output

Research on the efficacy of speech output in AAC devices has focused primarily on the effects of machine-generated speech on communication partners. The first consideration of VOCAs is intellibility. Unless speech is understandable and acceptable, other characteristics don't really matter.

Intelligibility of speech synthesizers

Many factors influence the intelligibility of digitized and synthesized speech. These include: (a) the technical sophistication of machine-generated speech; (b) how speech is programmed in the device; (c) the placement and size of the speakers; (d) characteristics of the individuals involved and (e) the environments in which the device is used.

Digitized speech

No one I spoke with knew of any studies that evaluated the intelligibility of digitized speech or its use in today's communication devices. While one might assume that the intelligibility of digitized speech in a VOCA would be similar to natural speech, clinical experience suggests otherwise. Differences exist in the quality of the digital-to-analog converters, playback mechanisms and speakers. Anecdotal reports indicate that the speech produced by some VOCAs with digitized speech others.

Synthesized speech

A number of studies have investigated the technical features of synthesized speech which influence intelligibility. They are summarized below.

Technical Quality? High quality speech synthesizers are more intelligible than low quality synthesizers. No surprise! Early intelligibility studies demonstrated that DECtalk, a high quality speech synthesizer, was preferable and more understandable to able-bodied listeners (both children and adults) than a number of other speech synthesizers being used in AAC devices (Echo, IT+, Infovox, Votrax). However, DECtalk was expensive and originally available only as hardware. A breakthrough occurred when Digital Equipment, Inc. began to license DECtalk as software for use in AAC devices.

Recently, an intelligibility study compared five synthesized speech voices: (1) *DECtalk's Peifect Paul* and (2) *Beautiful Betty,* (3) *MacinTalk* (4) *MacinTalk's Pro Male,* and (5) *Pro Female voices.* Results showed that the *MacinTalk* was significantly less intelligible than the four other voices. The DECtalk and Macintalk Pro voices, however, were "roughly equivalent on intelligibility measurers under optimal conditions." [1] AAC manufacturers might be interested to know whether *Macintalk Pro* voices are acceptable to AAC users, as natural environments.

Rate. Reportedly, the most comfortable speech rates for adults listening to *DECtalk* voices are between 150 to 200 words per minute (wpm). The default setting for DECtalk is 180 wpm. Donald Fuller from the University of Arkansas, and his colleagues recently conducted two studies designed to investigate the influence of rate on the intelligibility of synthetic speech for persons in various age groups.[13] They used the *DECtalk* voices *Peifect Paul* and *Beautiful Betty* programmed into a Liberator. Presenting stimuli at rates between 120 and 250 wpm in increments often wpm, they set the "cutoff rate for acceptable intelligibility" at a level of 85 percent correct responses. At each of the tested rates, subjects answered simple questions, repeated spondee words *(e.g.,* icecream; lighthouse), and followed commands. A total of 97 subjects participated, with eight males and females in each of the six age groups: (1) 5-6 year-olds, (2) 10-12 year olds, (3) 14-16 year olds, (4) 20-24 year olds, (5) 35-50 year olds and (6) 65-80 year olds.

Results of the two studies showed that while gender did not affect performance age did. For all groups, the range of acceptable intelligibility rates varied. Acceptable rates for the *Beautiful Betty* voice, for example, ranged from 120 to at least 210 wpm across ages except for the youngest children, who tolerated rates

wpm. Admissible rates for *Peifect Paul* were slower. They ran ed fr 120 g~ om wpm to at least 180 wpm for people between 10 and 50 years of age. The~ youngest and oldest age groups t01erated rates from 120–160 wpm.

Fuller suggests that the default rate for DECtalk voices of 180 wpm may be too fast for some listeners. In fact, the default rate approached the upper end of the acceptable range of intelligibility for most of their subjects and exceeded the rahge for the youngest subjects in both studies, and for the oldest subjects in the Perfect Paul study.[1] These researchers are continuing this line of research with other DECtalk voices.

Jeffrey Higginbotham and colleagues also investigated differrgces in optima1listening rates. They found that "less complex passages" were understood at faster rates (140 wpm). However, for complex material, intelligibility rates improved when *DECtalk* was used at very slow rates (5.5 words per minute, which approximates the typical rate of AAC users). Both rates are below the DECtalk default rate of 180 wpm.

Pauses. Pauses also influence rate. Higginbotham and colleagues investigated ~hether programming pauses in the message would influence the intell~ibility of synthesized speech. They compared three methods:

spersed between words, *e.g.*, The+ +dog+ +is+ +ferocious.

b. Sentence method. Pauses interspersed between consecutive s~ntences, *e.g.*, The dog is fero-CIOUS+ + The cat is cute.

c. Mixed m.ethod. Interspersl'ng pauses between words and phonemes (intra- and inter-word pauses), e.g., The+dog+is+ f+e+r+i+o+u+s.

Their results showed that pausing between words was the most effective way to increase intelligibility. The mixed method was least effective.

Language skills a,flisteners. The language skills of communication partners have an impact on comprehension of synthesized speech. Non-native English speakers made significantly more errors transcribing English sentences produced with DECtalk than native speakers.[17] In addition ~hi1~ren with languag~ ImpaIrments and individuals with mild mental retardation have more difficulty understanding synthetic s~h than nondisabled children.[18,19]

NOise cOnditiOns. Loud environments almost always have a negative impact on a listener's understanding of speech. However, researchers have found that noise has a more deleterious effect on the intelligibility of DECtalk than on natural speech. Even when the signal-to-noise ratio is just + 10dB, DECtaik vgices become less intelligible.[2,21]

EXpOsure tO synthetic speech. Communication partners seem to adjust to the accents of high quality speech s!,nth~sizers. Thus, repeated listenmg opportunities are likely to improve a listener's understanding of synthetic speech. David McNaughton and colleagues confIrmed this for the Kit the Kid voice on DECtalk over fIve trials.[22] However, they also reported that even after repeated listenmg experiences, the less sophisticated Echo synthesizer was not effective in classroom situations.

Summary

To summarize, most listeners are able to understand the high quality speech synthesisin today's communication devices. This confirms the efficacy of using DECtalk and, perhaps, other high quality speech synthesizers in AAC devices for social communication.[23] However, individuals with he~ring impairments, non-native speakers of a language, persons with language impairments, those WIth mental retardation, younger children and older adults have more diffIculty understanding synthesized speech than natural speech, even in optimized conditions.

Current research clearly suggests that a number of strategies can improve the intelligibility of synthetic speech: (1) repeated listening opportunities; (2) placing pauses between words; (3) decreasing the rate of speech output, particularly for com?~exmaterial and (4) using addItional amplification in noisy environments.

(cQnJinuedQnpage 13)

Beyond Intelligibility

Intelligibility, although crucial, is not the only feature of speech output technology. Voice characteristics such as gender, age, prosody, inflection and naturalness must be considered as well as ~ccess to different languages. 4 An important research agenda is beginning to emerge. Some researchers are examining the impact that VOCAs have on the real lives of AAC users.

Today's claims that VOCAs enhance daily communication skills are based primarily on face validity, rather than on experimental research. We know, for example, that people who use VOCAs can give lectures, get jobs, be barmitzvahed, talk on the phone, participate in group discussions, sing, tell jokes and so on. Few studies, however, systematically examine the effects of using speech output devices on users' communication and life in different environments. Also, few studies have compared the use of VOCAs to other AAC methods. Some examples of this research on the functional use of VOCAs are briefly summarized below:

Buzolich showed that synthesized speech assisted individuals who use VOCAs to be more dominant a~ in control of conversations.

Iacono reported that a young child learned "words" more quickly when signs were accoml&anied by speech output.

Soto, Belfiore, Schlosser, & Haynes demonstrated that VOCAs positively affect the user's acquisition of r~uest functions and preferences. 7

Romski & Sevcik's longitudinal research led them to hypothesize that speech output helped students with severe mental retard~tion to learn graphic symbols. 8

Schlosser, Belfiore, Nigam, Blischak & Hetzroni found that, in fact, use of a VOCA results in more efficient graphic symbol learning for some young adults with severe! profound mental retardation. 29

Schepis and Reid reported that the frequency of interactions between a young woman and support personnel increased when the woman used a VOCA to request desired items. 3D

Schlosser, Blischak, Belfiore, Bartley and Barnett examined whether the use of speech output and orthographic feedback had an effect on spelling in a student with autism. Results showed that speech output was effective in combination with orthographic feedback and by itself. They concluded that speech output, while not essential, appeared to increase the efficiency of the child lWning to spell familiar words. 3

The future

Today's VOCAs cn allow individuals who are unable to speak to be understood by most other people. They Can also enhance daily communication under a variety of conditions and can make learning more efficient for some individuals. However, at this time, speech synthesis does not yet allow AAC users to express nuances of emotion, personality or individuality. Future advances in these areas await further research and development..

We can, however, conclude from the research that when purchasing a VOCA, consumers need to consider both the variety of their communication partners and the ways in which they to plan to use speech output.. It is necessary to demonstrate the advantages of speech output across contexts.

Administrators and funding agencies will soon be asking for proof that the time and money invested has a positive cost benefit.. Researchers can help demonstrate the efficacy of VOCAs in specific contexts (as compared to other AAC approaches) and ways in VOCAs increase participation, productivity and quality of life in the community, at home, in school and at work..

Clinical News
(continued from page 7)

communication with teachers and peers within the learning environment.. (e) Improvement in teachers' perceptions of the learning ability of students who use AAC. (t) Increase in teachers' feeling of competence when working with students who use VOCAs.

Setting. School, clinical settings.

Target Populations. Individuals who use AAC devices and are developing literacy skills.

Technology. Dynavox 2C, DynaMyte and other VOCAs with high-quality text-to-speech synthesis.

Description of Intervention. This program adapts student's VOCAs for use with an appropriate reading program. Civils and her colleagues are currently using *Project Read: Phonology*, a research-based, multi-sensory approach for students who have difficulty mastering the code of written English by traditional or whole language programs.[9] However, they say that for students who already have phonological awareness and linguistic skills, any traditional or whole language reading program could be utilized.

Civils reports the case example of an eight-year-old boy with chromosomal anamolies, who is nonspeaking and developmentally delayed. He had minimal phonemic awareness and very limited literacy skills. Over a six month period, he has progressed. The special education teacher (Marie Williams) sees him for two, 30 minute sessions per week.

Table VI. Using a VOCA to teach phonemic awareness: A case example

~proved on task behavior during reading instruction (from seconds to 30 minutes at the current time).
Improved skills in reading and writing.
can sequence three letters on VOCA and computer to produce words' sequencing 3-4 words to produce sentences.
Demonstrates comprehension by making appropriate comments and using pop-up pages.
Enters class eagerly; motivated to read and communicate; demonstrates pleasure at his successes.
Uses device appropriately to get from vocabulary pages to keyboard pages for spelling.
Uses invented spelling.

A speech-language pathologist (Carol Sivils) provides consultation during one of the sessions and sees the child for a third session to focus on interactive storybook activities that reinforce his literature-based program, which is supplemented with a structured presentation of skills using Project Read materials. In addition to his VOCA, which has a page for sound-symbol associations, he sometimes uses a computer for writing and reading and other multi-sensory methods, such as fmger spelling and special signs.

He is currently on Unit 2 of *Project Read: Phonology*, and has learned the vowel phoneme (short /a/) and consonant phonemes (t,s,m,b,c,f,r,h,j,l,p,n) in the initial position of words. Civils set up the Dynavox keyboard so it contained all the letters he needed. When he presses a letter button, the device "says" the correct phoneme. If the child presses a sequence ofletters, the device says the correct syllable, word, and so on. The Dynavox screen shows the correct grapheme(s). To hear the sound sequences, he presses the message bar. In addition, he uses a generic conversational pop-up page so that he can communicate everyday messages while they are working on Project Read materials. He uses a dictionary page to "search" for words. When the VOCA is connected to a printer, he prints his work in a font size and color that meet his preferences and need for visual clarity.

Civils reported that she uses additional pages so he can build phrases and sentences, as part of activities related to the short books he reads daily.

Results. Using a VOCA allows this child to hear and see the sound letter relationships his peers are learning in school.. His special education teacher reports, "it is easy to teach students to read using a VOCA. It allows them to respond the same as any other student." Table VI documents some of the changes noted after six months of systematic literacy instruction supplemented by specific training in phonemic awareness. This child is eager to read and is beginning to use invented spelling. And yes, his phonemic awareness skills have improved dramatically.

REFERENCES

1 Carol Schaeffler. (November, 1997). Personal communication.

2 Costello, J.M. Simple AAC technology to support community inclusion of adults with severe developmental disabilities. Presented at the American Speech-Language-Hearing Association, November 20, 1997, Boston, MA.

3 John Costello. (December, 1997). Personal communication.

4 Edie Thayer and Tracy Bombara. (December, 1997). Personal communication.

5 Costello, J.M., Bruce, B.L. & Horn, M. Communication with the temporarily nonspeaking f'atient in the pediatric lCU: The Children s Hospital-Boston Model.. Presented at the American Speech-Language--Hearing Association, Boston, MA, November 20, 1997.

6 Carol Civils. (December, 1997). Personal communication. Using the Dynavox 2C to facilitate the development of reading skills in children with severe speech and physical impairments. Handout from Southeast AAC conference, Birmingham, AL., October 3-4, 1997.

7 Koppenhaver, D.A. & Yoder, D.E. (1992). Literacy learning of children with severe speech and physical impairments in school settings. *Semmars* in *Speech and Language.* 13:2, 143-153.

8 Foley, B.E. (1993). The development of literacy in individuals with severe congenital speech and motor impairments. *Topics* in *Language Disorders.* 13:2, 16-32.

9 Project Read - Phonology. Available through Language Circle Enterprises, P.O. Box 20631, Bloomington, MN 55420.

10 Pisoni, D. B., Manous, L.M., & Dedina, M. U. (1987). Comprehension of natural and synthetic speech: Effects of predictability on verification of sentences controlled for intelligibility. *Computer Speech and Language,* 2, *303-320.*

11 Rupprecht, S.L., Beukelman, D.R., & Vrtiska, H. (1995). Comparative intelligibility of five synthesized voices. *MC Augmentative and Alternative Communication.* 11:4,244-247.

12 Donald Fuller.. (December, 1997). Personal communication.

13 Scott, S., Tedford, L. & Fuller, D. (1998). Age group differences in the intelligibility of two DECtalk voices presented at various rates. Manuscript submitted for peer review to *MC* ..

14 Donald Fuller. (December, 1997). Personal communication.

15 Higginbotham, D., Drazek, A., Kowarsky, K., Scally, C., & Segal, E. (1994). Discourse comprehension of synthetic speech delivered at normal and slow presentation rates. *Augmentative and Alternative Communicatum.* 10:3, 191-202.

16 Hig~ibo~ham, D. & Bair~, E. (1995). AnalySIS of listeners' summanes of synthesized speech passages. *Augmentative and Alternative Communication.* 11:2, 101-112.

17 Reynolds, M.E., Bond, A.S. Fucci, D. 1996. Synthetic speech intelligibility: Comparison of native and non-native speakers of English. *Augmentative and Alternative Communication.* 12,1 :32-36.

18. Dahle, A. & Goldman, R. (1990, November). Perception of synthetic speech by normal and developmentally disabled children. Paper presented at the annual conference of the American Speech-Language- Hearing Association, Seattle.

19 Massey, H. (1988). Language-impaired children's comprehension of synthetic speech. *Language, Speech and Hearing Services* in *SchOols. 19:401-407.*

20 Fucci, D., Reynolds, M., Bettagere, R. & Gonzales, D. (1995). Synthetic speech intelligibility under several experimental conditions. *Augmentative and Alternative Communication.* 11:2,113-117.

21 Koul, R.K. & Allen, G.D. (1993). Intelligibility and speech interference thresholds of high -quality speech synthesizers in the presence of mterfenng speech. *Journal of Speech and Hearing Research.* 36:790-798.

22 McNaughton, D., Fallon, Tod, Weiner & Neisworth (1994). Effects of repeated listening experiences on the intelligibility of synthesized speech. *Augmentative and Alternative Communication. 10:2,* 161-168.

23 Pat Mirenda. (November, 1997). Personal communication.

24 Beukelman, D. & Mirenda, P. (in press, 2nd edition). *Augmentative and Alternative Communication: Management of severe communication disorders in children and adults.* Baltimore: Paul H. Brookes Publishing Co.

25 Buzolich, M. (1984). Interaction analyses of augmented and normal adult communicators. (Doctoral dissertation, University of California, San Francisco, November, 1983). University Microfilms International, Publication #82-03,722.

26 Iacono, T. A. & Duncum, J.E. (1995). Comparison of sign alone and in combination with an electronic communication device in early language intervention: Case study. *Augmentative and Alternative Communication.* 11:4, 249-259.

27 Soto, G., Belfiore, B., Schlosser, R. & Haynes, C. (1993).Teaching specific requests: A comparative analysis on skills acquisition and preference using two augmentative and alternative communication aids. *Education and training* in *Mental Retardation.* 28,169-178.

28 Romski, M. and Sevcik, R. (1996). *Breaking the Speech Barrier: Language Development through Augmented Means.* Baltimore: Paul H. Brookes Publishing.

29 Schlosser, R., Belfiore, P., Nigam, R., Blischak, D., & Herzroni, O. (1997). The effects of speech output technology in the learning of grahic symbols. In B.A. Iwata, J. Bailey, N. Neef, D. Wacker, A. Repp & G. Shook (Eds.) *Behavior Analysis.* in *Developmental Disabilities* (Reprint volume I, 3rd Edition) 321-333. Reprinted from *Jqurnal of Applied Behavior AnalysIS.;* 28, 337-549.

30 Schepis, M. & Reid, D. (1995). Effects of voice output communication aid on interactions between support personnel and an individual with multiple disabilities. *Journal of Applied Behavior Analysis.* 28:73-77.

31 Schlosser, R., Blischak, D., Belfiore, P., Bartley, C. & Barnett, N. (submitted for publication). The effects of synthetic speech output and orthographic feedback on spelling in a student With autism: A preliminary study.

RESOURCES

Tracy Bombara, Easter Seals Rehabilitation Center, 630 West Division Street, East Dover, DE 19904 (Phone) 302-678-3353.

Carol Civils, Children's Developmental Center, United Way Agency and UCPA Affiliate, 4805 College Drive, Baton Rouge, LA 70808 (Phone) 504-923-3420. (Fax) 504-922-9316.

John Costello, Communication Enhancement Center, Children's Hospital, 300 Longwood Avenue, Boston, MA 02115 (Phone) 617-355-8392. (Fax) 617-355-6882. (Email) costello -i@al.tch.harvard.edu

Donald Fuller, University of Arkansas - Little Rock, Audiology-Speech Department, 2801 South University Avenue, Little Rock, AR 72204. (Phone) 501-569-3155. (Fax) 501-569-3151. (email) drfuller@uair.edu

Carol Schaeffler. (November, 1997). Personal communication. Director of Premier Health Care Assistive Technology Center, Brooklyn College, 2900 Bedford Avenue, Boylan Hall Room 4125, Brooklyn, NY 11210. Phone 718-421-7635

Ralf Schlosser, Bloorview MacMillan Centre and Univesity of Toronto, 350 Rumsey Road, Toronto, ON M4G lR8, Canada.

Edie Thayer, Vineland Public School, 625 Plum Street, Vineland, NJ 08360. (Phone) 609-794-6767. (email) Thayere@algorithms.com

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List of AAC speech output devices mentioned by those interviewed in this issue

Name of Devices	Manufacturers
Boardmaker	Mayer-Johnson Company
LightWriter, Macaw, Giant Green Macaw 2+	Zygo Industries
Dynavox 2C, Dynamyte	Sentient Systems Technology
Big, Mac; One Step, Jelly Bean Switch, Universal Switch Mount	AbleNet, Inc.
Message Mate, Talking Screen	Words+, Inc.
Microswitches	TASH, Inc.
Liberator, Delta Talker, Alpha Talker, TouchTalker, IntroTalker	Prentke Romich Company
Voice Recording Picture Frame	Radio Shack
CheapTalk 4 and 8	Toys for Special Children