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Augmentative Communication News

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INSIDE THIS ISSUE . . .

UPFRONT

This issue focuses on Visual Scanning. I was fortunate to speak with many individuals with expertise, information and exciting ideas about the topic (see Resources). Some interviews were conducted in New Orleans at the end of June while attending the first meeting of the U.S. Society of Augmentative and Alternative Communication (USSAAC) held in conjunction with RESNA. Very stimulating, fun, and *HOT* in New Orleans!

For Consumers attempts to relate what is known about how able-bodied humans "learn complex motor skills" to the experiences of those attempting to develop visual scanning techniques.

Clinical News focuses on issues and practices relevant to teaching visual scanning techniques. In **Equipment**, you'll find a brief description of available scanning communication aids and computer software that can facilitate the development of various types of scanning skills.

In **University/Research** ongoing research activities in Sweden are highlighted. For those planning to attend the 4th International Augmentative Alternative Communication Conference in Stockholm next August, the article may help you plan your August, 1990 "working" holiday in Sweden.

The **Governmental section** provides a brief update on the status of the Tech Bill in the U.S. *(cont. pg. 2)*

For Consumers

Visual Scanning: What's it all about?

Individuals who use visual scanning techniques typically have severe motor impairments that preclude and greatly restrict their direct access to communication devices and computers. Included are those with cerebral palsy, degenerating neurologic conditions, traumatic brain injury, and others.

Although visual scanning does indeed provide access, it is notoriously slow. Therefore, some consider it a choice of last resort. However, visual scanning can be and is a feasible option - worthy of consideration.

- Visual scanning may be less fatiguing motorically than direct selection techniques. For some, it is faster.
- Visual scanning may be accomplished in positions where direct selection access to devices is impossible, e.g., lying down.
- Many software programs and communication aids have visual scanning options.
- It's not an "either/or" proposition. All individuals should use multiple techniques to participate in communication, education, leisure, and vocational activities and to control their environment.

Visual scanning is a skill, and skills are learned.

Skill Development

The development of motor skills is a complex process. Most of us haven't given much thought to what's entailed. *Try to recall learning (or trying to learn) to ski, drive a car or wheelchair, type, use a light pointer, play racquetball, dance, or operate a communication aid to converse with a friend!* Because adults avoid learning new motor tasks, we tend to forget how complicated and difficult it can be.[2]

Models of complex motor learning can help professionals and consumers think about tasks like visual scanning. Robb[3] *(cont.pg.2)*

Upfront (from page 1)

Lots of Hotline calls this month: service delivery & public policy concerns, questions about aphasia software, requests for ideas re: clients. Whatever questions you may have, just call (408) 649-3050. I'll try to help. *Please keep in mind, we are on Pacific Standard Time.* Thanks!
We hope you are enjoying the summer (or winter for subscribers down under.) *We're planning a trip to New Zealand & Australia in September.* Remember, don't take those electronic communication aids in the water. . . swimming!

Visual Scanning (from page 1)

characterizes skill development as a process, which occurs in 3 phases:

Phase I - Plan formation: Initially, individuals must learn *what is to be done and why*. Phase I can take a few minutes, hours, days, or even months. This varies with the complexity of the task (e.g., type of scanning) and with the learner's capacities and limitations.

Phase II - Practice: The key in Phase II is for learners to engage in *meaningful, appropriate practice with feedback*. The amount of practice needed varies with the complexity of the task and the past experiences and capabilities of the individual. The literature suggests able-bodied persons of different ages approach practice differently. Children are curious and easily challenged; they *practice* to "see what they can do." Adults want results quickly and hope to achieve without putting forth much effort.

Feedback is the single most important factor. Simply doing something over and over again does not improve performance. *We sign our names again and again, but I'll bet your signature hasn't gotten any more legible than mine over time!*

Feedback can play 3 roles: *motivate*, *reinforce*, and/or *regulate* behavior. Errors occurring during practice are necessary for learning. However, without meaningful feedback (i.e., what caused the error and how to correct it), the learner is probably not going to progress. Simply giving positive reinforcement (e.g., saying "good job," or displaying "blinking blobs") may keep learners motivated and working at a task, but will not help them develop and refine skills! *"Teachers who develop a discriminatory eye for detecting errors in sequential and temporal patterning are the best source of feedback."*[4]

Phase III - Automatic execution: The last phase begins when the learner performs the total movement pattern with fairly consistent results. Stress and anxiety are reduced because tasks have become easier. Constant monitoring continues, but is relegated to subliminal levels. During this phase *complex skills become automatic, and individuals can concentrate on other factors* (e.g., communication, the content of a term paper, implementing rate enhancement strategies, etc.)

Research suggests that making major changes during Phase III, (e.g., changing the order of subroutines or introducing a different subroutine) is very difficult for able-bodied individuals to accommodate. This should make us cautious about presuming some sort of hierarchy to teaching visual scanning skills, (i.e., first introduce step scanning, then linear, then row/column, group/item, directed scanning.) To date, however, no evidence exists that training one type of scanning facilitates or interferes with learning others.

Capacities/ Limitations of Man

Information about human processing capabilities and limitations that may affect the acquisition of visual scanning skills is considered below:

1. The **sensory capacities of learners** (i.e., depth perception, peripheral vision, acuity) are generally not improved through practice. *Comment: Many individuals with severe motor problems have visual acuity, perception, field cuts, and/or fixation difficulties. This will profoundly affect their ability to use visual scanning. We often must look for ways to compensate for, rather than remediate these problems.*

2. To **detect signals,** humans must distinguish the figure from the background. Loud noises, novel stimuli, and verbal praise can heighten the ability of humans to detect signals. *Comment: The stimulus (e.g., cursor, LED, pointer, target) should be the most obvious thing around. Other aspects should be minimized during training. Learners must be able to maintain their gaze on targets while they activate switches.*

3. **Selective attention** is important to the development of complex skills. Humans can (and do) filter out irrelevant information. *Comment: Persons with central nervous system problems and young children often have difficulty filtering out "irrelevant" stimuli (e.g., "attention problems," "distractibility," "hyperactivity.") Setting up contexts that allow learning to occur is critical.*

4. **Perception**, i.e., interpretation of sensory information, is influenced by instructions and an individual's experience with a task. Also, feedback affects perception (see Phase II). *Comment: Individuals who are learning new skills need all 3 types of feedback.*

5. **Vigilance tasks** depend on a person's monitoring capacities. Monitoring capacities are dependent on how much, how fast, how predictable stimuli sources are, as well as on the memory capacity of individuals. If events occur slowly, learners can more easily recognize and process sensory input. Tasks requiring vigilance are acquired more easily with frequent rest periods.

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Comment: Instructions, demonstrations, and practice sessions must be controlled. Long practice sessions may not be productive. Rate enhancement techniques require vigilance.

6. **Reaction time** (i.e., time taken to initiate or begin a movement) is affected by learning, anticipation, and the amount of information people must process, as well as their motor capabilities. The more choices someone has, the longer the reaction time. *Comment: Visual scanning arrays typically contain an enormous amount of information. If someone must search for targets, reaction time will increase. Dynamic arrays and encoding techniques also increase the amount of information processing required and will affect reaction times.*

7. **Movement time** (time between initiation and completion of movement) is affected by the need for accuracy. Able-bodied humans can and do trade off speed and accuracy. *Comment: Activating a switch involves reaction and movement time. Thus, motor planning plays a major role in the speed and accuracy of visual scanning skill development.*

Performance of Able-bodied Persons on Scanning Tasks

Direct selection vs. scanning. Ratcliff[5] compared the accuracy of able-bodied children using direct selection and scanning techniques on the Light Talker (1st through 5th graders) on a direction-following task. Results indicated a significantly *greater number of errors for all those using scanning.*

Visual vs. Auditory Scanning. Fried-Oken[6] compared the performance of 90 adults using 3 scanning approaches on a sentence recognition task: visual only, auditory only, and visual/auditory. The task was designed to simulate typical conditions for communication device users. Results showed *response accuracy and reaction times were significantly better for the visual scanning only condition*. Auditory scanning was the poorest and combined scanning fell between the two. Makes sense!

Clinical News

Visual Scanning: Training Approaches

Visual scanning is the sequential presentation of choices (letters, words, or pictures). As options are presented by a person or machine, the user signals (i.e. looks up, vocalizes, pushes a switch) just at the "moment" the desired item (or group, which contains the item) is highlighted. Master teachers, clinicians, researchers with whom I spoke, agree visual scanning techniques involve multiple skill components: motor, motor planning, visual, perceptual, kinesthetic, cognitive, and linguistic. Prior to introducing visual scanning techniques, certain assumptions are made:

1. *Individuals are positioned in ways that allow and facilitate function*. Seating specialists often focus on adaptive seating for wheelchairs; however, communication occurs everywhere so other positions are considered. Steps toward positioning the body to augment function are summarized in Table I.

Table I. Positioning for Function

STEPS	STRATEGIES TO CONSIDER
1st Stabilize pelvis (normalize tone, & reflexes)	Seat belt; Type of cushion; Contour and angle of insert (e.g., allowing gravity to assist)
2nd Stabilize trunk	Angle at hips (generally 90°), Midline orientation: Shoulder harnessing; Strapping; Lap tray, Side supports
3rd Stabilize arms	Arm restraints; Protracter pads
4th Stabilize lower extremities, feet	Lap tray adaptations, Dowels 90° at ankle and knees Orientation of insert Ankle straps; shoe cups; calf straps; toe loops; foot rests

2. *An appropriate interface is established.* Professionals with experience and expertise in assessing the human/machine interface (e.g., rehabilitation engineers, O.T.s, some educators and speech-language pathologists) make these decisions in consultation with the individual and family. Anatomic sites under the control of the individual are identified, and movement patterns described. Abnormal reflexes often are a major consideration. Finally, interface/switch options are assessed and selected. Assessment software can be helpful.[7] Table II lists questions to get answers to.

Table II. Questions to consider

Does the person activate the switch? How long does it take? Can the person hit without prehits or multiple activations. Can he activate it at a particular time? Does he stay on the switch? How long? Can he stay off the switch? Can he release the switch on verbal command? on a visual target? Can he coordinate the timing of activation and release with the visual components of task, i.e., tracking, fixation, etc.? Can he see the display and activate the switch? Does he fatigue?

3. *The position and stability of the switch and the display is optimized.* This is an often overlooked, yet critical step. Visual, perceptual and motoric factors are pertinent. Decisions are made re: how far away and at what angle the switch(es) and visual display is placed and mounted. Ways to mount and stabilize switches are available from commercial manufacturers/distributors. Get some help! Goossens' and Crain in their wonderful new book describe success using chlorinated polyvinyl chloride (CPVC) pipe mounts.[8]

4. *Major alterations in the position of individuals, switches, and the device/display are completed prior to implementing high technology.* Scanning training often begins with no tech or low tech approaches while positioning/seating and interface decisions are being made.

5. *If individuals do not understand the task of scanning, yet need a means of interacting with some independence, a conceptual bridge can be built through instruction.* To do so, increase a person's familiarity with the task demands by maximizing important features, presenting important sequences and relations in a coherent whole, & minimizing information load by stripping the task of all but essential elements.[9]

The level at which individuals can accomplish different scanning techniques is unknown. Some say 2 year olds can use switches to make simple choices. Normal 3 year olds can use the Versascan *(cont. pg. 4)*

with remote lamps and the Zygo 16.[9] Light's[10] research shows linear scanning requires two coordinated motor/cognitive operations (monitoring the relation of the cursor movement through a visual array of pictures and timing activation of the switch to make a selection) and concludes it is probably a 4 year level task that can be taught to those younger.

- She analyzed the performance of 3 children (experts) who successfully used automatic linear scanning to access a computer (2 were able-bodied, 1 was nonspeaking and severely physically disabled.) Errors were similar, i.e., anticipating the cursor's movement and activating the switch prematurely. The 2 able-bodied children visually tracked the cursor, while the physically disabled child focused on the target, a more advanced strategy.

One thing is for sure. Clinicians disagree. Some report 3 1/2 year olds learn row/column scanning. Most report success only for those above 4 years old (developmentally). Few ventured a guess for directed and block scanning...maybe 7 year olds? Researchers! We need to know when to build bridges and how.

Task Analysis

In the past, professionals *(I'm guilty)* taught visual scanning techniques without first analyzing the task or thinking beyond its motor components. Steps to a task analysis are:

- 1. Always try the task yourself.
- 2. Ask others who have mastered it, how they do it? Observe what they do.
- 3. Break the task down into the motor, visual, cognitive, linguistic, social requirements. Then, consider how components are coordinated.
- 4. Develop a training strategy based on what you know about the equipment (i.e., switch, software, hardware) and have observed about a client.
- 5. Implement your strategy, evaluate the effects, and make modifications.

Training Guidelines

The 3 Phases described in *For Consumers* provide the framework for this section. Assessment is treated as an integral and ongoing part of the process of skill development so is not considered separately.

I. Understanding Scanning

Phase I emphasizes cognitive factors, minimizing motor, linguistic, social, and visual components. Whereas young and mentally handicapped individuals may require months of training, older children and adults will catch on after a brief demonstration and description.

- Demonstrations Showing the sequential ordering of subroutines and giving information about the purpose or objective of the task.
- Descriptions Communicating about what learner is to learn (e.g., I'm pushing the switch, I'm watching the target. Here comes the cursor. There, I got it!).

Because visual scanning skills develop at a young age without technology (e.g., watching people, locating and looking at desired objects, making choices), we often begin with a "low/no tech" emphasis. For example:

- Linear scanning of objects, pictures, people. "Let me know...do you want this, this, or this?" Individual indicates "Yes" as you point to choice by smiling, vocalizing, looking up, touching a buzzer, turning toward a red pad, etc..
- An Etran or Eye-Gaze Vest which provides communication and language training also can be used to introduce visual scanning techniques (i.e., locating targets, making selections.)
- Linear, row/column or block/item scanning using symbol, word, or alphabet boards can easily be introduced as listener assisted techniques.

Few have difficulty understanding what a switch does. If there is a problem, consider the following:

- VanTatenhove[11] describes 3 levels of responses from young and severely mentally handicapped children: a) Child focuses on switch with limited, if any, awareness of its relationship to anything else; b) Child focuses both on switch and the "effect" with awareness of the relationship. c) Child sees switch as a way to make things happen and focuses on the goal (e.g., making screen change; advancing slides in projector, activating a loop tape to call friend).
- When switches are a distraction, make the consequence of switch activation (e.g.,visual display, fan) more obvious and the switch invisible. For example, use a computer and turn off the lights.

When you plan to introduce a specific device or computer program that uses scanning, adults and older children will readily grasp the task. For younger children,

- games, play activities, and familiar routines provide learning contexts. Computer software and training aids can be very helpful (see Equipment).[12,13,14]

If you can't tell what someone understands, Cook[15] describes a protocol that can help:

Observe motor behaviors in response to: a) non time-contingent switch activation (prompt free); b) hold/release activities; c) time contingent switch activation; d) hit/release activities; and e) choice making.

II. Practicing Scanning

Everyone needs lots of practice in Phase II. Adults, like children, require carefully thought out intervention approaches to skill development.

In Phase II, tasks with low cognitive/linguistic/visual loads are used to allow motor and motor planning skills to develop. Clinicians monitor fatigue and positioning of the individual, switch, and display before, during, and after practice sessions. Even small changes can affect performance.

- Teach clients to go to a "home base" between switch activations. Make it a real resting spot.[8]
- Help individuals locate and/or fixate on targets by pointing, highlighting with a light, blocking out other parts of the display, and/or providing verbal, auditory and visual cues.
- Give individuals time to experiment.
- To deal with anticipation problems, instruct person to focus on the target. Slow down the scan. Blocking out parts of display completely, at first, then gradually making parts more and more transparent may help.
- Provide meaningful feedback. This requires watching what individuals do and analyzing their behaviors, especially their errors. For example, Light[10] describes a seemingly random pattern of switch activations, which, on closer analysis, revealed that switch activations occurred each time the facilitator spoke, with little regard to the cursor position on the screen. Further analysis of the problem showed the person could indicate with a "yes" response when a target picture was pointed to and could push a switch in response to a visual cue, but had difficulty combining these operations.
- Use a simple training device with voice output, if possible. Person can select clothes for a doll, trucks for race, ingredients for a cake, or what lipstick to put on you (e.g., green, purple).
- Use peers to model switch use and play games.

How we arrange the visual display will help determine the success of training. Table III provides guidelines.

Table III. Optimizing Scanning Displays

- Place targets at individual's midline (note: may be to the right or left of "true" midline)
- Ask individual and vision specialists how far away and what size displays/symbols should be. What individual does in order to see. Is color important?[16]
- Consider placement of most frequently used targets (vocabulary) with regard to cognitive, motor and language demands. How will individual sequence language?
- Figure out which are easiest to most difficult positions to access on an array. Start by asking person to get to the easiest cell on the array. Never begin with row 1, column 1. Be very systematic about how you progress.
- Think of the future (e.g, will number of locations accessed increase or decrease?).
- Take into account the type of scanning and whether or not encoding or other rate enhancement techniques will be overlaid on the scanning task.

In the beginning, speed and accuracy are of little importance. However, once an individual can accomplish the task with *(cont. pg. 5)*

some degree of accuracy, begin increasing speed, or the number of items in the array, or decrease the size of items. **Change one thing at a time so you can determine its effect!**

III. Using Scanning to Accomplish Tasks and Achieve Goals

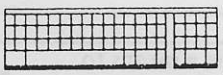
Relying on scanning to communicate, complete homework assignments, requires being able to scan fast, without thinking about it. Automaticity (seen in touch typists, drivers, musicians, athletes) is needed. Speed and accuracy are major factors during Phase III, which never ends.

- Accuracy: Some feel an accuracy level of at least 80% is necessary for operational competency in scanning. How accurate should someone be before you increase speed? We don't know! Keep in mind, however, that even able-bodied people are not 100% accurate using row/column scanning techniques.
- Speed: Cook suggests thinking about thresholds rather than absolute values (i.e., range between the fastest and slowest rate at which client can select messages. Kraat reminds us when we increase rates, we should provide clients time to accommodate to the increase.
- Fatigue factors change during a day. Give options to alter speed of scan.

Scanning is a means to an end....not the END. Ultimately, scanning techniques provide independent access to tools and enable individuals to participate in activities, interact, and accomplish a range of tasks more independently. Be patient. . . it takes a long time to develop complex skills.

News

Hyper ABLE DATA for Macintosh computers with 20 megabytes on a hard disk will be available soon. It is very, very nice. Assistive device products and companies are listed in an easily assessable format that makes sense. and can be assessed quickly. Price of the CD-Rom version is $50 per year. 1/4" Tapes are $122. Floppies (20 of them) are $199. 6-month updates included. This Data Base combines Trace Resource Books information with Able Data. For further information or to order call (608) 262-6966.



Equipment

Techniques, Devices, and Software

Single dimensional scanning techniques can be listener assisted or technology driven. They include:

Circular: Linear scan in a clockwise arrangement. Requires use of all eye muscles, a difficult visual/motor task. Pointers (which are always visible) may make the task cognitively easier that lights (which blink and disappear).

Step/Element: Linear scan. User activates a switch to advance cursor/light/pointer toward target. Time "is a switch." When user pauses, location is accepted as desired selection, or a second switch may be used.

Regular/automatic: User activates switch to begin linear (vertical or horizontal) scan and again to select item. Cognitively more difficult than circular because light/cursor disappears at end of row or column and then reappears.

Inverse: Linear scan. User holds down switch until cursor gets to desired item. Then, releases the switch to select item.

To enhance rate and provide access to more vocabulary, **multi-dimensional approaches** are used. These are more complicated; errors occur more frequently. High and light tech options are possible.

Row/column: Most commonly used technique in communication devices. User activates switch, device scans down rows until user activates switch, then device scans across columns, until user activates switch to select desired item.

Block/item: Best example is alphabet configurations on the Adaptive Firmware Card. Linear scan. When cursor arrives at block containing item, user activates switch. Then, cursor scans items until user activates switch to make choice.

Directed Scanning is a combination of direct selection and scanning. It generally involves multiple switches, i.e., technology. Those interviewed feel we don't pay enough attention to directed scan options in augmentative communication.

Directed scan: User has multiple switches (e.g., joystick) controlling the direction of the cursor. Items are selected when switch is released (i.e., inverse scanning.)
Note: Use of the mouse/track ball is a kind of free form directed scan. Proportional control devices are not addressed here.

Rate enhancement features are required if scanning techniques are to meet communication needs, particularly conversation. Some options employed are:

2-speed linear scan: (1-2 switches.) Regular or inverse. Scan proceeds rapidly to the vicinity of the target. User activates switch. Cursor proceeds more slowly until selection is made.

Letter/word prediction: Based on frequency or recency of occurrence, machine guesses letters/words as user creates message. A dynamic technique (i.e., user must constantly monitor the display and make decisions.) Interferes with automaticity. To date, evidence is limited re: performance effects. Woltosz reports impressive rates on a copying task.[1]

Encoding: User accesses vocabulary and linguistic structures through codes, e.g., Minspeak, abbreviation expansion, etc. Because codes often must be memorized, automaticity is affected. To what extent this affects scanning rates over time is unknown.

Software

Many programs are available to teach scanning techniques.[12] Programs listed in Table IV provide opportunities for individuals to practice various types of visual scanning techniques on the Apple II family of computers, and, at the same time, have fun! Remember to be aware of what you are teaching by doing a task analysis before you use a program.

Table IV. Scanning Training Programs

Don Johnston Devel. Equip. Wauconda, IL (312) 526-2683
Interaction games $65 Linear and row/column scans and switch training. 2 persons.
Learn to Scan $60. Horizontal, vertical scans. 8 programs with varying difficulties.
Motor Training Games $35 14 games covering a wide range of scanning techniques.
Make It and Make It in Time $60 each. Cause/effect, timing, judgement in time sequences, scanning techniques include group item and linear scans. Children and adults.
Rabbit Scanner & Run Rabbit Run $29.95/$39.95 Horizontal scanning; timing

R.J. Cooper & Assoc,Dana Point, CA, (714)240-1912
Early and Advanced Switch Games $30. Switch training.
Switch progressions $37 More switch training, timing.

Computerade Products, Cardiff, CA 92007 (619) 942-3343
Catch the Cow $13. Scanning trainer.
Catch-and-Match $29.95. Follow-on to other training program. Also, a 2 to 20 choice array.

UCLA Intervention Prog. L.A., CA (213) 825-4821
Where is Puff, Let's go shopping, Pic-Talk $18 each. Provide switch and scanning opportunities

Perhaps the most powerful tool we have is the Adaptive Firmware Card. With the Apple II gs computers, its flexibility provides access to a wide range of software. The technical manual is *(cont. page 6)*

Table V. Communication programs

Communication Enhancement Center, Boston, MA
Target $75 Trains linear, row/column, stepped, directed scanning. 4-49 locations.
Scan & Speak $75 Adds memory capability to Target.
Rehabilittion Engineering Center, Palo Alto, CA
Step By Step $100 Choice making, 9 cells.
ENABLE Syracuse, NY
Magic Cymbals. $150 Semantically organized pictorgraphic symbols. Construct phrases

full of good clinical, as well as technical ideas. The Talking scan option is very powerful.

Table V lists some communication programs available for the Apple II family. They provide individuals with exposure to visual scanning techniques as a means to accomplish communication tasks.

Communication Devices with Visual Scanning Options

Manufacturers offer an increasing number of visual scanning devices. Single dimensional devices are typically considered "training or educational aids" because of vocabulary restrictions and portability factors. Multidimensional devices are commonly chosen to serve the conversational, computer access, writing needs of individuals who are unable to use more direct methods. Tables VI and VII take a snapshot of what is currently available.

$ Governmental
Update from Washington

States in the U.S. wishing to be granted monies alloted through P.L. 100-407 to implement an assistive technologies program for their citizens await the results of the competition. Awards will be announced sometime this summer, early fall. Also a technical assistance contract will be made soon to an organization/agency to assist states in implementing their plan. Cohen, Rehabilitation Program Specialist, NIDRR cautions states not receiving grants to "'get ready." Year 2 competitions will be coming soon. Call Cohen at (202) 732-5066.

Table VI. Single Dimensional Visual Scanning Aids

PRODUCT	COMPANY	PRICE	TYPE	SWITCH	SPEECH	PRINT	FEATURES
Clock Communicators	Steven Kanor, Inc. 8 Main St., Hastings-On-Hudson, NY 10706	$60-76	Rotary	1	No	No	Pointer; Adjustable speeds; Several available with music and size option
Dial Scan	Don Johnston Devel. Equip. P.O. Box 639 Wauconda, IL 60084	$195	Rotary	1,2	No	No	Pointer; Transparent, allowing face-to-face/ double--sided pictures; Clockwise/couter-clockwise; Variable speeds
Versascan	Prentke Romich Co 1022 Heyl Rd, Wooster, Ohio 44691	$799	Rotary	1,2	No	No	16 removable lamps, also remote lamps Translucent overlays, colored lamp covers
Sequential Scanner	Steven Kanor, Inc.	$71-86	Linear/step	1	No	No	2-4 compartments which light
Scan Wolf	AdamLab, 33500 Van Born Rd. Wayne MI 48184	$375	Linear/step	1	Yes	No	6 x 6 (36 selection areas); 30 levels Speech programmed at factory
Zygo 16C	Zygo Industries, Inc. P.O. Box 1008, Portland OR 97207-1008	$1145	Linear	1	Yes w/Parrot	No	4 x 4 matrix
Steeper	Zygo Industries, Inc.	$1445	Omni directional	1-2	Yes	No	Backlighted, 4 x 4 matrix, Display can be angled 30° and 60°

Table VII. Multi Dimensional Visual Scanning Aids

Zygo 100	Zygo Industries, Inc.	$1950	Row/column	1	No	No	Limited memory, 16 messages
PACA	Zygo Industries, Inc.,	$1250/ $2500	Linear Row/column	1,2	Optional	Yes 24 col.	Literacy required Conversation note taking, writing, and calculation Predicts based on frequency of use
Switchboard	Zygo Industries, Inc.	$1495	Linear Row/column Directed	1-5	No	No	4 to 49 locations; overlays for several options
Macaw (scanning)	Zygo Industries, Inc.	$1495	Linear Row column	1-4	Yes	No	60 seconds high quality digitized speech 120 seconds standard speech
scanWRITER	Zygo Industries, Inc.	$4,200	Row/column	1-5	Optional	Yes 20 col.	Various message storage options; calculator; Interface to computers, Literacy required
Tetrascan (keyboard emulator only)		$2250	Directed				
Light Talker	Prentke Romich Co	$4290	Linear, Row/column., Directed	1-5	Yes	Optional	Express/Minspeak firmware w/rate enhancemen 8, 32, 128 locations
Talk-O	Tash Inc., 70 Gibson Drive, # 12 Markham,Ont.L3R4C2	$2,300 + access option	Linear Row/column Directed	1-5	Yes	No	Multiple access options purchased separately, 120 seconds of recorded speech
Scanpac (Evalpac)	ACS 354 Hookstown Gr. Rd Clinton, PA 15206	$3,695 $3995	Linear Directed Block/item	1-5	Yes	Yes	Rate enhancement techniques.; 15 memory levels
WSKE II	Words+, Inc. distributed by ACS above	$3395	Row/colum Directed	1-5	Yes	Optional	Prediction, abbrev. expansion, Literacy. keyboard emulator. Datavue Spark
EZ Com	Words+, Inc	$3395	Row/column	1	Yes	Optional	Designed for visual problems. Datavue Spark
Equalizer	Words +	$3395	Row/column Directed	1-5	Yes	Optional	Datavue Spark. Literacy. Prediction learns user's patterns. Calculator, drawing, games, music
Special Friend (scanning)	Shea Products, Inc. 1721 W. Hamilton Rd, Rochester Hills, MI 48309	$3250	Row/column	1	Yes	No	26 programmable pages

University &Research

Research in Sverige

This issue highlights research activities in Sverige (Sweden) . . . the beautiful Nordic land where assistive devices are FREE!* Sweden will host the Fourth International Conference on Augmentative and Alternative Communication (ISAAC) August 12-18, 1990. Figure 1 illustrates the location of research projects** mentioned below. *Note: you may find this a useful guide if you travel to Sweden.*

In BROMMA, the **Swedish Institute for the Handicapped,** *(P.O. Box 303; Bromma, Sweden, S-151 26)* promotes and coordinates research and development activities in assistive technology areas. The institute also evaluates and tests products, disseminates information, conducts research, and builds the knowledge base in Sweden.

Projects include: *Communication support for persons with speech handicaps* (E. Olsson) - interventions for those with aphasia, dysarthria, laryngectomy, etc.

Come Again (M. Lundman & M. Magnusson) - use of computer conferencing systems by communication-impaired adults.

Inventory of communication aids for the mentally retarded and *Communication for a profoundly mentally retarded adult* (J. Brodin & L. Larsson) - use of technical aids by individuals with severe retardation.

Evaluation of computer-based aids and software (I. Friman) - recommends products for approval and provides information.

*Note: There is an assistive device center network that distributes approved assistive devices/aids: 90 centers for hearing impairments; 30 centers for visual impairments; 35 centers for orthopedic problems; and 35 for mobility/communication impairments. Five-seven Regional Resource Centers are being established to work in close affiliation with existing centers. They will provide direct services to multihandicapped clients, and disseminate information, education, and technical assistance to professionals.

**Information used is from Registration of Nordic Projects relating to disability (1988): Nordic Committee on Disability.

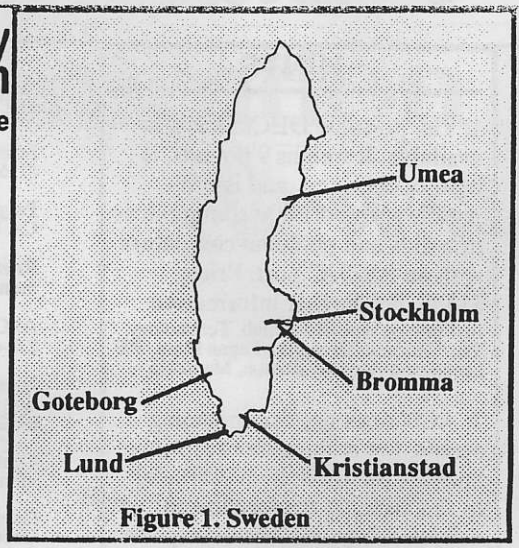


Figure 1. Sweden

In STOCKHOLM, **The Royal Institute of Technology** has always focused on technology applications for individuals with disabilities. AAC related projects within The Dept of Speech Communication and Music Acoustics *(Box 70014, Stockholm, Sweden S-100 44)*, are: *Speech synthesis for disabled persons* (R. Carlson and B. Granstrom) - Text-to-speech and Bliss-to-speech systems in multiple languages. A current focus is development of different speech styles and speaker types (i.e., child) and additional languages.

Development of speech output for communication and education and *The use of computer and synthetic speech in teaching reading and writing* (K. Galyas) - Applications of Multi-Talk and development of software to assist in teaching reading and writing, and in training those with aphasia, etc.

Word prediction for mobility and/or language impaired (S. Hunnicutt) - Software to assist individuals unable to read/write to construct written messages. Users provide limited information (e.g., 1st letter of words, no. of syllables.) A smart, natural language processing program in the computer "guesses" the word from a list of 10,000.

Also in Stockholm is **Stiftelsen ALA** *(Box 5410 Stockholm, Sweden, S-114 84).* Projects which investigate behaviors affecting and interventions aimed at improving interaction include: *Investigating the relationship among motor abilities, cognitive development and communicative ability in severely multiply handicapped* (M. Granlund & C. Olsson) and *Social interaction in special classes with mentally retarded* (K. Gooransson).

Additional projects are aimed at developing teaching materials and methods, for specific populations. These are coordinated by the **Swedish National Institute of Teaching Materials** *(Box 27052 Stockholm, Sweden, S-102 51)*, and are carried out throughout Sweden

- Deaf-blind children and adults. L. Forsfalt. **(KRISTIANSTAD).**
- Multiply handicapped students using technical aids. G. Persson. **(UMEA).**
- Video & interactive video for mentally retarded. M. Liden **(UMEA).**
- Computers in education of handicapped pupils. U. Garthelson & H. Hammarlun **(STOCKHOLM/BROMMA).**

In LUND, the **Center for Rehabilitation Engineering (CERTEC), Lund Institute of Science and Technology** *(Box 118, Lund, Sweden, S-221 00)* has projects related to AAC (e.g., *A hygienic suck-and-blow switch* (I. Jonsson & L. Holmberg). They recently created a multidisciplinary training program at the Institute. Goals are to help professionals specialize in the assistive technologies area and develop related research skills.

In GOTEBORG, the University of Goteborg carries out research in the **Department of Education** *(Box 1010, Molndal, Sweden, S-431 26,)* and the **Department of Handicap Research** *(Brunnsgatan 2, Goteborg, Sweden, S-413 12)*. An example is: *Communication in young children with a physical handicap and speech impairment* (E. Bjorch-Akesson). A longitudinal interaction study of 7 preschool children and parents. Also, at the **Statens Institute for Laromedel** *(RPH-RH, Box 21071, Goteborg, Sweden, S-400 71)* the *Software development & methods for children with severe motor problems* project (E. Landin, E. Olsson) is ongoing.

Thanks to Lars Augustsson, Gunnar Fagerberg, Sheri Hunnicutt, Elisabet Olsson for sharing information about Sweden at the recent RESNA conference in New Orleans. Many thanks also to Karoly Galyas.

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3 Robb, M. (1972). The dynamics of motor-skill acquisition. Prentice-Hall, Inc.: Englewood Cliffs, NJ.

4 Robb, p. 65, see above.

5 Ratcliff, A. (1987). A comparison of two message selection techniques used in AC systems by normal children with differing cognitive styles. Unpublished dissertation, Univ. of Wisconsin-Madison.

6 Fried-Oken, M. (1989) Sentence recognition for auditory and visual scanning techniques in electronic augmentative communication devices. Paper presented at RESNA Conference, New Orleans, LA

7 Single input control assessment.$70 Easter Seal Communication Institute, 24 Ferrand Drive, Don Mills, Ontario, Canada M3C 3N2 (416) 421-8377.
Switch assessment program. $40. and Text Entry assessment program $40. Assistive Device Center, CSUS, 6000 J. Street Sacramento 95819 (916) 278-6442.

8 Goossens', C. & Crain, S. (in preparation) Utilizing switch interface with children who are physically challenged: Communication strategies. Available in early 1990, College Hill Press.

9 Light, J. (manuscript in preparation). Teaching automatic linear scanning for computer access to a severely physically disabled preschooler.

10 Bristow, D. (July, 1989). Personal communication.

11 VanTatenhove, G. (1988). Assessing the ability of very young & low-functioning students to use switches as a tool for controlling communication devices. In S. Blackstone, C. Cassatt-James, D. Bruskin (Eds.) Augmentative Communication: Implementation Strategies. ASHA:Rockville, MD.

12 Musselwhite, C. (1988) Using scanning switches with the microcomputer. Communication Outlook. 10:1, 12-13.

HINTS

1. The portable DECtalk is now available. It weighs 9 pounds, is battery operated, and is compatible with portable communication aids and personal computers with an RS232C port. Price, $1585. For further information
Institute on Applied Rehab. Technology, The Children's Hospital, Fegan Plaza, 300 Longwood Avenue, Boston, Ma 02115

2. ACN does not list upcoming events. I'm making an exception because the topic is so pertinent to this issue. A conference on *Adaptive Play and Microcomputers* will be held in Asheville, NC, September 21-22, 1989. Musselwhite will share her creative approaches & expertise in a fun and energetic fashion. For information contact
Irene Wortham Center, P.O. Box 5655, Asheville, NC 28813

13 Burkhart, L. has 3 excellent books full of ideas and instructions for making homemade technology and applying it creatively to enhance learning, 8503 Rhode Island Avenue, College Park, MD 20740.

14 Lahm, E. (1987). Software designed to teach young multiply handicapped children to use the computer for controlling their environment: A validation study. Unpublished doctoral dissertation: George Mason University, Fairfax, VA.

15 Cook, A., Hussey, S., & Murphy, J. (1988). Using technology in a diagnostic-therapeutic paradigm for severely disabled clients. Paper presented at ISSAC Conference: Anaheim.

16 Collier, B., Blackstein-Adler, S. Thomas, D. (1988). Visual functional issues in AAC-Clinical observations and implications. ISAAC Conference: Anaheim.

Resources

(Call these people about visual scanning. They have given it lots of thought!)

Jennifer Angelo, University at Buffalo, NY (716) 831-3141.

Peggy Barker, Stanford Rehab.Eng. Center, CA (415) 853-3345.

Roxanne Butterfield, Don Johnson Developmental Equipment, IL (312) 526-2682.

Al Cook, Assistive Device Center, CA (916) 278-6442.

John Costello & Maggie Sauer, Communication Enhancement Center, MA (617) 735-8392.

Cynthia Cress, Trace Research & Development Center, WI (608) 262-6966.

Carol Goossens', AC Service, U.C.P. of Greater Birmingham, AL (205) 251-0165.

Ina Kirstein, Oakland Public Schools, Pontiac, MI (313) 858-1901.

Robert Koch, 641 So. Palisade Drive, Orem, UT (801) 226-7997.

Arlene Kraat, Queens College, NY (718) 520-7358.

Janice Light, Hugh MacMillan Center, Ontario, CANADA (416) 425-6220.

Judy McDonald & Paul Schwedja, Adaptive Peripherals, Inc., WA (206) 633-2610.

Michael Palin, ACS Distributor, CA (707) 864-6321.

Sue Procter, Private practice, CA (408) 336-8265.

Ann Ratcliff, Loma Linda University, CA (714) 824-4998.

Gail VanTatenhove, Private practice, FL (407) 876-3423.

Walt Woltosz, Words+, CA (805) 949-8331.

Larry Weiss, Zygo Industries, OR (503) 684-6006.

Christine Wright, Stanford Rehab. Eng. Center, CA (415) 853-3345.

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