# Assistive Technology for Cognitive Rehabilitation

Introduction:

Taking full advantage of the dawning of the information age, rehabilitative psychology and medicine are leading the forefront in developing integrative computer technologies for the cognitively and physically disabled. A multidisciplinarial approach to assistive technology (AT) development has yielded significant gains in the past few years (for an excellent example of this cooperative integration of scientific fields, see the Archimedes Project @ http://www.ability.org.uk/assistiv.html), and movement has begun towards the complete integration of the disabled into society.

Assistive technology (proper) refers to a whole host of prosthetic and rehabilitative products spanning all of the motoric and sensory modalities. The AT products/research discussed here will be limited to those useful for cognitive remediation, specifically memory retraining, and to those pertinent to the regional population.

Research:

Because of the relative lack of effectiveness of many internal mnemonic strategies in achieving long term benefits for TBI patients, many rehabilitation professionals have turned to the development and use of external aids in an attempt to compensate for lost cognitive function and achieve meaningful behavioral outcomes (Wilson, & Moffat, 1992). For the most part, patients have been able to take advantage of these environmental supports to improve their functioning in everyday life, although in many cases, extensive training in the use of the aid is required (e.g., Sohlberg, & Mateer, 1989). Large scale controlled outcome data regarding the use of AT devices is non-existent with the majority of findings constrained to single-case designs or case reports (e.g., Glisky, & Schacter, 1989; Herrmann, & Petro, 1990; Kapur, 1995), so if you are looking for a research topic, AT device research is virgin territory.

Products:

(See the appendices for AT device examples)

Practical Suggestions:

Within the context of therapeutic contact, the use of AT should be tailored to the individual. A couple of client variables that should be considered before AT implementation:

> Computer literacy/exposure - AT may become more of a hindrance than a help if the user is confused and frustrated by the intervention apparatus. In turn, prior computer exposure or knowledge may aid in the swift adaptation to an intervention device.

> Age of user - Age-related factors inherent in AT selection and effectiveness include motoric difficulties, such as arthritis, which may make small button interface usage

impossible; visual difficulties, such as cataracts, myopia, or glaucoma, which preclude the use of small font displays; and auditory loss, which suggest that a vibrating signal alarm would be a more appropriate selection.

Intellectual functioning - AT interventions should consider the intellectual capabilities of the client and adapt or select an apparatus accordingly.  AT devices requiring multiple keystroke or complex manipulation are not well suited for the LSU client populations.

Familial support - AT introduction and implementation effectiveness are tied to practice of use and maintenance of the intervention apparatus.  The presence of familial support may aid in this process (this assertion is purely speculative and research is needed in the area).

A couple of apparatus variables that should be considered:

Cost - Many over-the-counter AT mnemonic devices are prohibitively expensive for the average LSU client, so a cost/benefit analysis should be carried-out prior to apparatus selection.  Luckily, there appears to be an inverse relationship between over-the-counter AT device appropriateness and cost (i.e., less complex devices being cheaper).

Device design - The ergonomic design of the AT apparatus can make or break the effectiveness of any intervention.  Here's a couple of design features to be aware of when selecting a device:

1) Look for large displays allowing for the reading of textual information at least at arms length from the user.
2) Large function buttons are favored for all, but especially appropriate for the visual or motor impaired.  Look for function buttons that are evenly and widely spaced on the apparatus with the labeling of the button functions clearly visible.
3) Signaling alarms with a variable tone or volume control are preferable with variable tones that can be programmed for different mnemonic prompts being the most effective for multitask environmental retraining.  AT devices with vibrator alarms are effective for both auditorially normal and challenged individuals, but are necessary for effectiveness in the latter group.
4) AT devices that allow for unhindered movement and accessibility are favored. Look for devices that have either a belt or wrist attachment for maximum accessibility.  Those devices requiring untethered use are apt to be forgotten or left behind.
5) Memory capacity of the AT device must be sufficient for the intervention need. Those interventions requiring multiple prompts or large scale storage of information, such as a address book, should have at least 32K bytes.
6) Data transfer capabilities from the AT device to a central computer may prove useful if the device is to be programmed with appointment information by the therapist at regular intervals.
7) External power supply or backup capabilities are necessary for long term usage.  Those AT devices with a rechargeable base may prove particularly useful in meeting this requirement.

Cutting Edge:

Recently, virtual reality (VR) technology has been applied toward the remediation of cognitive and physical disability. Researchers at the Human Interface Lab at the University of Washington have applied the use of VR toward the rehabilitation of gait disorders inherent to Parkinson's disease, and researchers in Italy have constructed an assessment and rehabilitation task for executive dysfunction. Given VR's ability to simulate any environ, the possibilities for VR/AT integration appear limited only by the imagination and ingenuity of the developer.

Telecommunication devices, such as the digital pager, have also opened new doors into AT applications (see appendices for Neuropage product description). Rehabilitation batteries like the ARCeLAB and Ackerman/Banks systems (see appendices) are beginning to take advantage of modem transfer technologies to allow for therapeutic observation from anywhere in the world. Soon, these modem-related applications will extend into the Internet, thus producing a global reach for the rehabilitative specialist and allowing for effective rural intervention.

References:

Glisky, Elizabeth L., & Schacter, Daniel L. (1989). Extending the limits of complex learning in organic amnesia: Computer training in a vocational domain. Special Issue: Memory. Neuropsychologia, 27(1), pp. 107-120.

Glisky, Elizabeth L. (1994). Models and methods of memory rehabilitation. A Workshop presented at the 14th Annual National Academy of Neuropsychology Conference, Orlando, FL.

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Herrmann, D.J., & Petro, S.J. (1990). Commercial memory aids. Applied Cognitive Psychology, 4, pp. 439-50.

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Sohlberg, McKay M., & Mateer, Catherine A. (1989). Introduction to Cognitive Rehabilitation: Theory & Practice. Guilford Press: New York. pp. 30-33.

Wilson, B., & Moffat, N. (1992). Clinical management of memory problems. London: Chapman & Hall.

Appendices:

Device Examples



*Digital Recorders*

**[A] VOICE IT™ DIGITAL PERSONAL NOTE RECORDER**
Why write it when you can Voice It? Credit card size and less than
½" thick. Instant message recall of all or selected messages.

| Item # | Description | Mfg. # | Unit | List | Our Price |
|--------|-------------|--------|------|------|-----------|
| 666-479E | 40-Second Capacity | VT-40 | EA | 69.95 | 29.99 |
| 745-273E | 90-Second Capacity | VT-90 | EA | 59.95 | 39.99 |

**[B] OLYMPUS NOTECORDER 300 DIGITAL RECORDER**
90-second recording/playback time. Message skip forward or
backward. Memory indicator and message skip function.
Volume control.

| Item # | Description | Mfg. # | Unit | List | Our Price |
|--------|-------------|--------|------|------|-----------|
| 122-432E | Digital Recorder | Notecorder 300 | EA | 59.95 | 49.99 |

**[C] VOICE IT™ VT-300 PERSONAL DIGITAL NOTE RECORDER**
5 minutes of recording capacity. 4 channels help organize
messages. 3 record speeds. 2 erase options.

| Item # | Description | Mfg. # | Unit | List | Our Price |
|--------|-------------|--------|------|------|-----------|
| 830-714E | Voice It™ VT-300 5-Minute Recorder | VT-300 | EA | 89.95 | 59.99 |

**[D] SONY ICD50 DIGITAL RECORDER**
Records on IC chip instead of tape. Up to 16 minutes of recording
time. Up to 60 messages. Random access to any message. Alarm
function. 2 separate message files. Full function backlit LCD display.

| Item # | Description | Mfg. # | Unit | List | Our Price |
|--------|-------------|--------|------|------|-----------|
| 111-957E | Digital Recorder | ICD-50 | EA | 189.95 | 149.99 |