Current Canadian Clinical Concepts

Microcomputers are gaining more acceptance as diagnostic, treatment and administrative tools within the broad realm of communication disorders. However, not everyone is aware of the adaptations that are available to enable the physically disabled user access to such systems. This article provides a brief overview of some of the products which are available commercially so that even a person with only one reliably replicable movement can use the full capability of a personal computer system. Keyboard modifications, keyboard emulating interfaces, software modifications and input acceleration systems are reviewed briefly. Readers with specific questions are asked to contact the author directly.

Comments, suggestions and contributed articles should be sent to the Co-ordinator:

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Software and Computer Peripherals in Working With the Multiply Handicapped Population

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No one can fail to be aware of the impact that the microcomputer is having upon society. But are people ready to incorporate its use on a daily basis in working with patients having communication disorders? The purpose of this article is to summarize the way in which software and computer peripherals can play a role in working with patients, particularly those who are physically disabled.

Mechanical Adaptations:

Most people are aware that use of a microcomputer can provide a number of advantages in a wide variety of situations. As professionals we see many applications in terms of data storage, manipulation and retrieval. Many of us use the microcomputer for its word processing capabilities. All of these same applications can be invaluable to the person who is physically handicapped. They can be made available to him/her if certain modifications are made to the system. The level of modification needed will be dictated by the skills and needs of the physically handicapped user. If the user has normal spelling skills but is hampered in using the computer keyboard because of an inability to hold down the CONTROL or SHIFT key simultaneously with another key selection, then something as simple as commercially available latch keys can solve the problem. If the user is more physically handicapped, then it may be necessary to consider options from a simple key guard all the way along the continuum to a complex electronic substitution for the keyboard. If only minor physical adaptations to the keyboard are necessary, then one might ask: "why use a computer rather than a typewriter?". If you ever have the opportunity to see the expression on a physically disabled youngster's face when he is able to hand in an assignment that looks perfect, is laid out professionally and is reproduced on the computer's printer the answer becomes obvious. Many physically disabled

persons may spend hours composing an assignment on a typewriter, but inevitably there will be errors and corrections throughout. Being able to produce a perfect copy in less time with more independence can work wonders for the user's self image and morale.

Keyboard Emulating Interfaces:
A transparent keyboard emulating interface, is an input system which is "transparent" to the host computer. It provides an alternate means of making key selections which the host computer believes are coming directly from its own keyboard. There are a number of such emulating interfaces available. Some are "semi-transparent" and others are "fully transparent". The advantage of being "fully transparent" is that none of the host computer's memory is tied up in the emulating interface operation and therefore all the computer's memory is available to run software. Most of the emulating systems allow single switch access to the computer by making use of some form of scanning. Using this type of system, the severely physically disabled user who can reliably control one movement is able to use a wide range of commercially available software. (At the risk of stating the obvious, the physically handicapped user being described would have the level of educational background that enables him/her to read, spell and manipulate cognitive concepts at the same level as the non-handicapped computer user.) One of the most frequently used "semi-transparent" interfaces is the Adaptive Firmware Card. With the AFC, the user is able to make "keyboard" selections using a single switch input. Several alphabetical or statistically-ordered alphabetical arrays can be shown at the bottom of the screen. The cursor moves through the array usually in a group scan. When the group containing the desired letter is illuminated, the user hits his/her switch. The cursor then moves individually through each letter in the group. When the individual letter desired is illuminated, the

user again hits his/her switch and the selected letter is displayed on the screen. Thus it requires two (2) entries.

Another emulating interface is the TETRAscan. This is a row/column scanning system which is "fully transparent" to the host computer. In row/column scanning the alphabet is displayed in a matrix, the display being organized according to frequency of use. The user visually fixates upon the letter he/she wishes to select. The lights on the display panel illuminate one row across at a time. The user activates his/her switch when the letter is illuminated. The lights on the display panel then scan letter by letter from left to right across the row. When the chosen letter is again illuminated the user activates the switch a second time and that character is entered into the text he/she is generating, in the same way that it would be had the character been selected on the computer's keyboard.

Software Modifications:
In addition there are a number of programs which have been written to make the keyboard available to the moderately disabled user. One of the most exciting ones to reach North America recently is MAC APPLE which was developed in Britain. In programs such as MAC APPLE, some keys are redefined so that the one-fingered typist is able to use them to operate such special functions as the CONTROL key which ordinarily require the simultaneous depression of two keys.

An issue which is receiving a lot of attention recently is that of input acceleration. The severely physically disabled user may be significantly restricted by the speed with which he/she can make selections. Because of the redundancy of language and the frequency of using such items as sentence starters, interjections, salutations, a number of abbreviations/expansion programs have been developed. With an abbreviation/expansion program, the user determines frequently used words and phrases and codes them with

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alphanumeric abbreviations. For example the user might be a movie buff who might wish to store "I'd like to go to the movies tonight to see..." He/she might code this as "MI". Whenever he/she typed in "MI" the computer would automatically expand it to the full utterance. Then all the user would need to add would be to type in the name of the movie. He/she would therefore produce a 44 entry statement with only three (3) entries (MI space). Using this type of software can greatly speed up entry time and make it possible for the augmentative communication aid user to truly have the ability to interrupt a conversation! The Mac Apple software includes input accelerations. Several other programs are available including two developed by the Assistive Device Centre in Sacramento for the Apple IIe and the TRS 80 Model 100 respectively, two developed by the Glenrose Rehabilitation Hospital for the TRS 80 Color Computer and a scanning version for the TRS 80 Model 100, plus two developed by Adaptive Communication Systems for the Epson HX20 notebook computer.

Alternate Keyboard:

Some physically disabled users may have adequate control to hit keys for input but may be restricted from using the computer keyboard because their range of motion is too restricted, or conversely they may require an expanded keyboard where the individual keys are placed more widely apart. Quadraplegics with high level cervical lesions, for example, may not have the ability to use a mouth stick to reach all the keys on the computer keyboard. In this instance an alternate keyboard such as the TARGET keyboard may be appropriate. The TARGET keyboard displays all the characters from the computer keyboard on a small concave surface. A balanced mouthstick attached to the keyboard can be pointed at any one of the characters, and characters can be selected by a slight puff of air.

For persons who need an expanded keyboard there are a number of options available. One of the most versatile, and user-friendly, options available is the UNICORN keyboard which operates in conjunction with the Adaptive Firmware Card. The Unicorn is a membrane keyboard with 128 programmable locations. The target area for every location can easily be programmed for each client, and the items selected can be determined for each individual. If the Unicorn is being used as an alternate keyboard for the computer then the traditional keyboard layout (QWERTY) can be configured for the individual user. However the uses of membrane keyboards are far more versatile than simply being programmed as an alternate QWERTY keyboard. So far the computer applications discussed have centred around the possibilities for clients who are able to read and spell. But there are many exciting opportunities for those clients who are pre-readers or who use alternate symbol systems. It is possible to program the membrane keyboard with pictures or symbols and combine the output as graphics and synthesized speech. As an example, one may program individual Blissymbol boards for several clients and, using the software available through Talking BlissApple, each individual may build up utterances by touching Blissymbols on an overlay above the membrane keyboard. These utterances are displayed as Blissymbols on the screen, and may in addition be spoken through the speech synthesizer and/or printed out on the printer attached to the computer. There are many advantages to the user in actually being able to manipulate the symbols independently and in having the "hard copy" of the utterances he/she has built.

For clients who are not yet at the level of developing symbol systems, peripherals such as the UNICORN, or graphics tablets such as the POWERPAD or the KOALA PAD may be combined with a speech synthesizer such as the ECHO II or a speech/sound/music synthesizer such as the MOCKINGBOARD. Using this type of combination, areas on the membrane keyboard may be programmed so that when a picture of a train is touched, the sound of

a train is heard. The possibilities are endless. Touching a picture of a telephone might result in hearing "Hi Johnny, how are you today?"

Cautions:
As a word of caution, the more peripherals one ties together, the more complex the programming task becomes. Software and peripherals do not automatically "talk" to each other. Frequently special utilities have to be developed. It is certainly not necessary that everyone become a programmer, but it is essential that a friendly programmer be on site so that one can explain what is needed and he/she can provide the magic to make it happen.

There are may other topic areas which might be covered in an overview such as this. Questions concerning the various types of speech synthesis and the relative ease of changing parameters such as intonation, amplitude, speech rate and filter frequency could be addressed. Descriptions of the methods in which computers can be used to teach spelling skills or develop dictionaries for users with limited spelling competence would be of interest to explore. However space does not permit this type of elaboration. The use of microcomputers as diagnostic, treatment and administrative tools in speech-language pathology is a challenge. Yet, the words of a colleague and mentor summarize this challenge, "You can do it. Remember all it takes is patience, perseverance and the ability to follow directions accurately. And if that doesn't work, READ THE MANUAL AGAIN!"

MICROCOMPUTER EQUIPMENT REFERENCE LIST

Name: Adaptive Firmware Card
       Target keyboard
       latching switches
       keyguards
Supplier: TASH, 70 Gibson Drive, Unit 1, MARKHAM, Ontario, L3R 2Z3

Name: TETRAscan
       scanWRITER
Supplier: Zygo Industries, P.O. Box 1008, PORTLAND, Oregon, 97207

Name: ACS Epson SpeechPac
Supplier: Betacom, 6160 Van Der Abeele, ST. LAURENT, Quebec, H4S 1R9

Name: MacApple
Supplier: North American supplier not yet determined.

Name: TRS 80 Model 100 with 32K
       memory
       TRS 80 Color Computer
Supplier: Radio Shack

Name: Unicorn membrane keyboard
Supplier: Cacti Computer Services, 130-9th St., S.W., PORTAGE LA PRAIRIE, Manitoba, R1N 2N4

Name: Talking Bliss Apple
Supplier: Blissymbolics Communication Institute, 350 Rumsey Road, TORONTO, Ontario, M4G 1R8

Name: Power Pad by Chalkboard
       Koala Pad
       Mockingboard Sound/Speech
         Synthesizer by Sweet Micro
         Systems
       Echo II and Echo G.P. by
         Sweet Electronics
Supplier: available through local computer dealers

Name: Abbreviation/expansion programs
Supplier: Assistive Device Centre, California State University, 6000J Street, SACRAMENTO, California, 95819

          Adaptive Communication Systems, Box 12440, PITTSBURGH, PA, 15231

          Glenrose Rehabilitation Hospital, 10230 - 111 Avenue, EDMONTON, Alberta, T5G 0B7

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